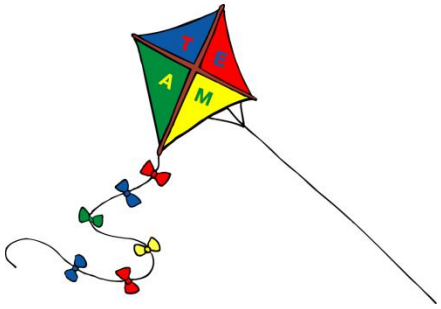
Twyford St Mary's C of E Primary School



Progression of Skills in all four number operations
KS2

Lower Key Stage 2

The principal focus of mathematics teaching in lower key stage 2 is to ensure that pupils become increasingly fluent with whole numbers and the four operations, including number facts and the concept of place value. This should ensure that pupils develop efficient written and mental methods and perform calculations accurately with increasingly large whole numbers.

At this stage, pupils should develop their ability to solve a range of problems, including with simple fractions and decimal place value. Teaching should also ensure that pupils draw with increasing accuracy and develop mathematical reasoning so they can analyse shapes and their properties, and confidently describe the relationships between them. It should ensure that they can use measuring instruments with accuracy and make connections between measure and number.

By the end of year 4, pupils should have memorised their multiplication tables up to and including the 12 multiplication table and show precision and fluency in their work.
Pupils should read and spell mathematical vocabulary correctly and confidently, using their growing word reading knowledge and their knowledge of spelling.

National Curriculum 2014

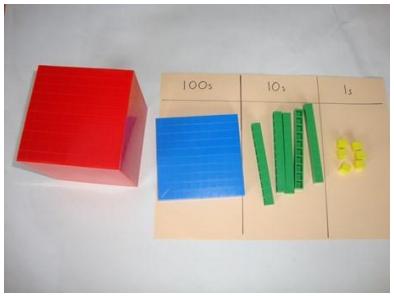
Recognising place value

Year 3

- recognise the place value of each digit in 3 -digit number (hundreds, tens, and ones)
- find 10 and 100 more or less than a given number
- count backwards through zero to include negative numbers
- read and write numbers to at least 1000 in numerals and in words read
- Roman numerals to 100 (I to C) and understand how, over time, the numeral system changed to include the concept of zero and place value.

Use the pattern to complete the missing values.

I	1		XXI	21
II	2		XXII	22
III	3		…	23
IV	4		XXIV	24
V	5		XXV	25
VI	6		XXVI	26
	7		XXVII	27
VIII	8		XXVIII	28
…	9		XXIX	29
X	10		XXX	30
…	11		XXXI	31
XII	12		XXXII	32
XIII	13		XXXIII	33
XIV	14		…	34
XV	15		XXXV	35
XVI	16		XXXVI	36
XVII	17		XXXVII	37
XVIII	18		XXXVIII	38
XIX	19		XXXIX	39
XX	20		XL	40



> 113

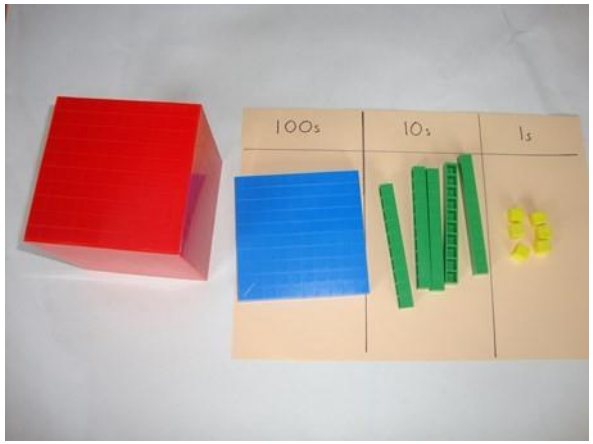
Prove it. How do you know? Show me.

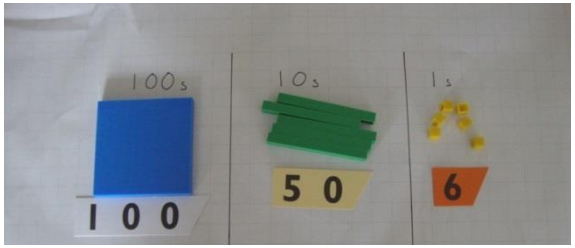
Year 4

- Find 1000 more or less than a given number
- Count backwards through zero to include negative numbers
- Recognise the place value of each digit in 3 and four-digit number (thousands, hundreds, tens, and ones)
- Read and write numbers to at least 1000 in numerals and in words round any number to the nearest 10, 100 or 1000
- Read Roman numerals to 100 (I to C) and understand how, over time, the numeral system changed to include the concept of zero and place value.

Recognising place value

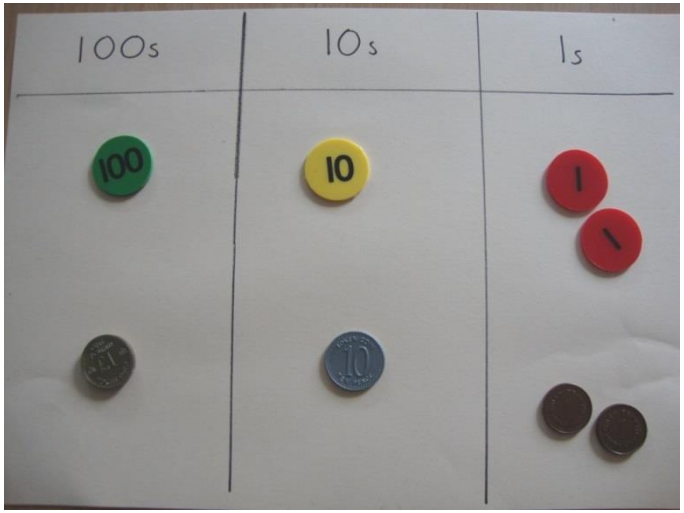
What is the same / different about these representations?





Year 4

- Round any number to the nearest 10, 100 or 1000
- Order and compare numbers to and **beyond 1000**
- Identify, represent and estimate numbers using different representations



Same and different

Which calculations are the same? How do you know?

230 + 30 210 + 50 290 – 30

245 + 15 247 + 13

Addition

Moving to formal methods.

Year 3

- Add and subtract numbers with up to 3 digits, using formal written methods of columnar addition and subtraction.

Year 4

- Add and subtract numbers with up to 4 digits, using formal written methods of columnar addition and subtraction where appropriate

Start by partitioning the numbers using the expanded method.
This allows the children to clearly understand and show the exchange.

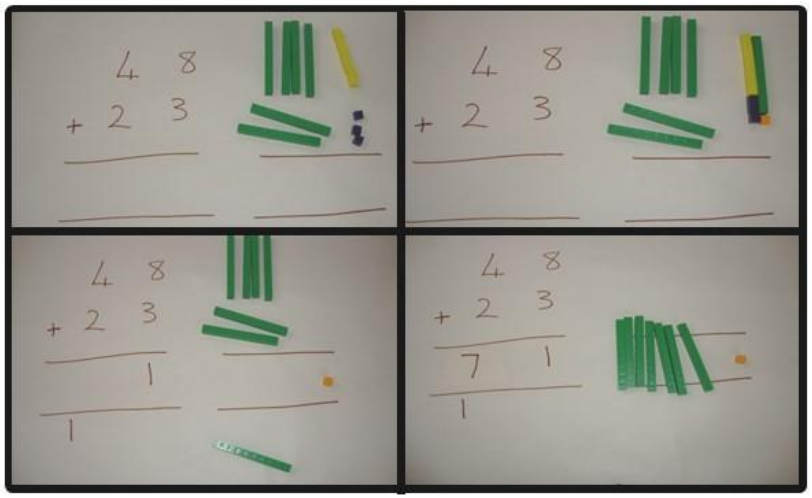
```
  T U
  2 5
+ 4 8
  1 3
  6 0
  7 3
```

```
  536
+ 85
  621
  1 1
```

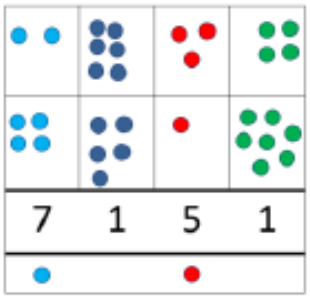
Key skills progression

Carrying 10s
Carrying 100s / 1000s
Carrying in more than 1 column (e.g. 10s and 100s)

Move on to the shortened form of columnar addition.
Add up the units and exchange 10 ones for one 10.



Children can draw a pictorial representation of the columns and place value counters / dienes blocks to further support their learning and understanding.



Year 3

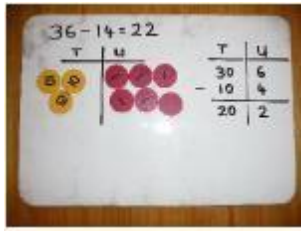
- Recognise fractions that total 1 or a whole
- Add and subtract fractions with the same denominator

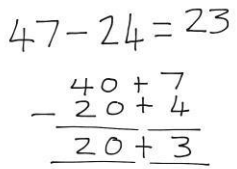
3/4 + 1/4 = 4/4 or 1 whole

Subtraction

Column method without regrouping

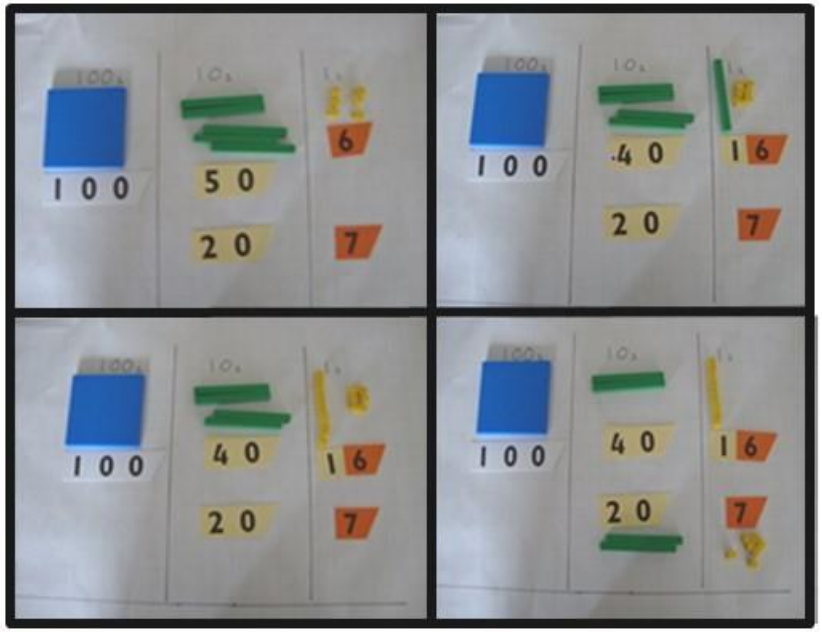
Start by partitioning the numbers using the expanded method.



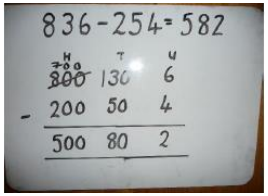


Column method with regrouping

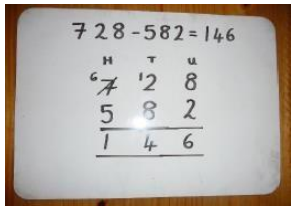
Model using practical apparatus alongside written methods so children understand what is happening.



Children can start their formal written method by partitioning the number into clear place value columns



Moving forward, the children use a more compact method.



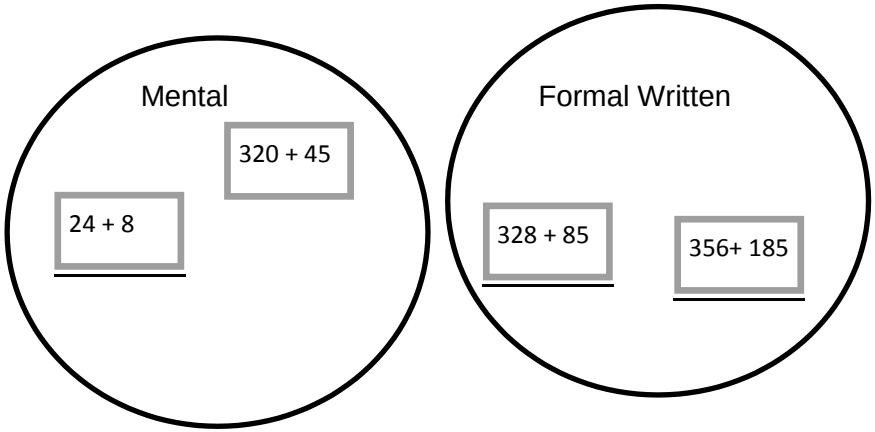
Key skills progression—exchanging or regrouping

- No regrouping/exchanging required
- Regrouping tens (exchanging from 1s for 10s only)
- Regrouping from hundreds only (exchanging from 10s)
- Regrouping in more than 1 column (e.g. exchanging both 1s and 10s for 100s)

Addition

Making choices about when formal methods are appropriate.

Being able to sort these calculations. Being able to explain which methods would be used and why.



Year 5 and Year 6
Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why

Subtraction

Year 3
Add and subtract numbers mentally, including:

- A three digit number and ones
- A three digit number and tens
- A three digit number and hundreds

Year 3
Estimate and check the answer to a calculation and use inverse operations to check answers

Which of these will give the following approximate answer? 50

78 – 40
175 – 122
139 – 90
89 - 50

Upper Key Stage 2

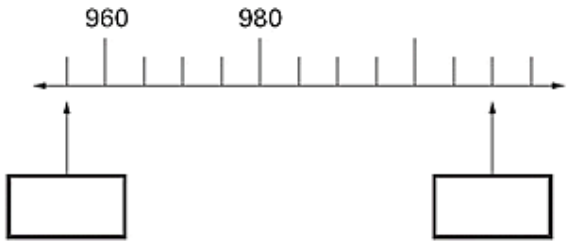
The principal focus of mathematics teaching in upper key stage 2 is to ensure that pupils extend their understanding of the number system and place value to include larger integers. This should develop the connections that pupils make between multiplication and division with fractions, decimals, percentages and ratio.
At this stage, pupils should develop their ability to solve a wider range of problems, including increasingly complex properties of numbers and arithmetic, and problems demanding efficient written and mental methods of calculation. With this foundation in arithmetic, pupils are introduced to the language of algebra as a means for solving a variety of problems.

Teaching in geometry and measures should consolidate and extend knowledge developed in number. Teaching should also ensure that pupils classify shapes with increasingly complex geometric properties and that they learn the vocabulary they need to describe them.
By the end of year 6, pupils should be fluent in written methods for all four operations, including long multiplication and division, and in working with fractions, decimals and percentages.
Pupils should read, spell and pronounce mathematical vocabulary correctly.

National Curriculum 2014

How many of these would make a million?

Think about how you would record it?



Place Value and Counting

Year 5

- read, write, order and compare numbers to at least 1 00 000 and determine the value of each digit

Read the numbers on the scale. Which number is between… and …? Where would 4250 be approximately?

Year 6

- read, write, order and compare numbers up to 10 000 000 and determine the value of each digit

Order the planet sizes from smallest to largest

Make a scale model

Planet	Diameter km
Mercury	4878
Venus	12104
Earth	12756
Mars	6787
Jupiter	142796
Saturn	120660
Uranus	51118
Neptune	48600
Pluto	2274

Year 5

- count forward or backwards in steps of powers of 10 for any given number up to 1 000 000

2500, 2600, 2700 etc Will 3850 be in your sequence? Why, why not? Create a sequence with 2450 in it. Describe it.

Addition

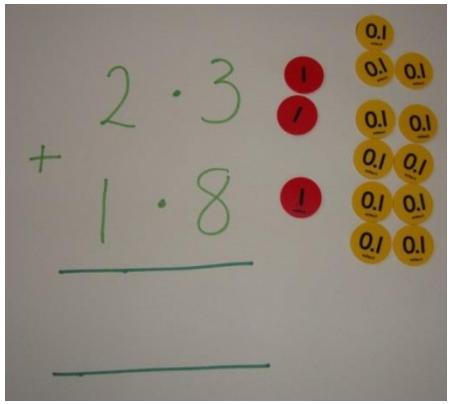
Year 5

- add and subtract whole numbers with more than 4 digits,
- including using formal written methods (columnar addition and subtraction)
- add and subtract numbers mentally with increasingly large numbers

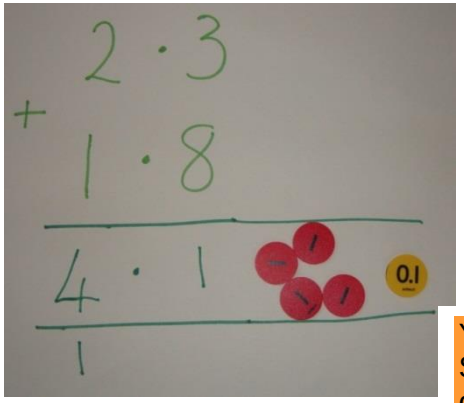
Non Statutory (Fractions)

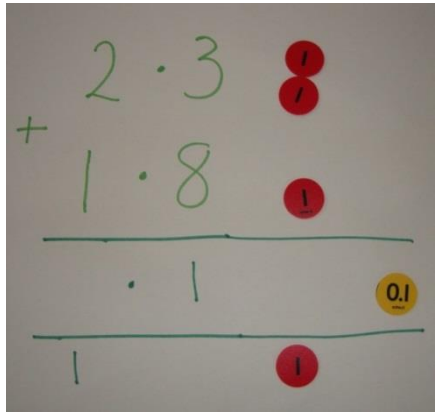
- They mentally add and subtract tenths, and one digit whole numbers and tenths
- use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy

Working with decimals



Add up tenths first, then whole numbers



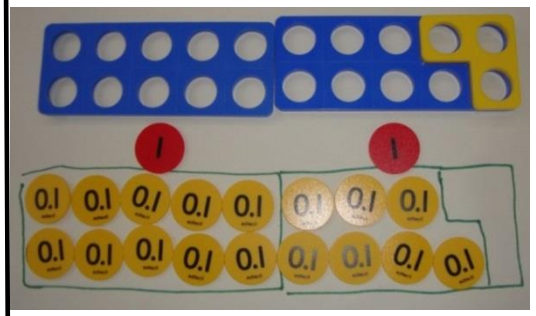


10 x 0.1-1 whole so exchange for 1 counter. 0.1 left in tenths column.

Subtraction

Children should continue to use concrete apparatus as required. They need to understand the structure of the maths.

This also applies for decimals.



2 - 0.3 = 1.7

1.7 + ☐ = 2

Year 6

Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why

True or false?

3.6 – 2.5 = 4.6 – 3.5

Explain how you know without calculating.

Addition and subtraction

789 + 642 becomes

$$\begin{array}{r} 7\ 8\ 9 \\ +\ 6\ 4\ 2 \\ \hline 1\ 4\ 3\ 1 \\ \hline \quad 1\ \ 1 \end{array}$$

Answer: 1431

874 – 523 becomes

$$\begin{array}{r} 8\ 7\ 4 \\ -\ 5\ 2\ 3 \\ \hline 3\ 5\ 1 \end{array}$$

Answer: 351

932 – 457 becomes

$$\begin{array}{r} {\scriptstyle 8\ \ 12\ \ 1} \\ 9\ \not{3}\ \not{2} \\ -\ 4\ 5\ 7 \\ \hline 4\ 7\ 5 \end{array}$$

Answer: 475

National Curriculum 2014– Appendices

Counting and place value

Year 3
- Count from zero in multiples of 4, 8, 50, 100...

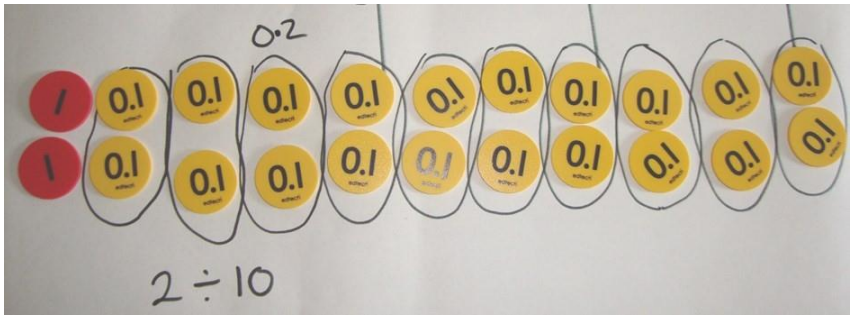
50p 100p 150p 200p

50p, £1, £1.50, £2

Or 50p, 100p, 150p, 200p

Count in different contexts using the language associated with the context.

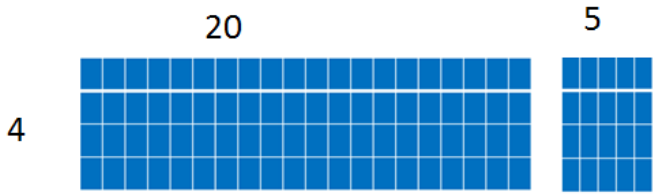
Year 4 (Fractions)
Count up or down in hundredths; recognise hundredths arise when dividing an object by one hundred and dividing tenths by ten.

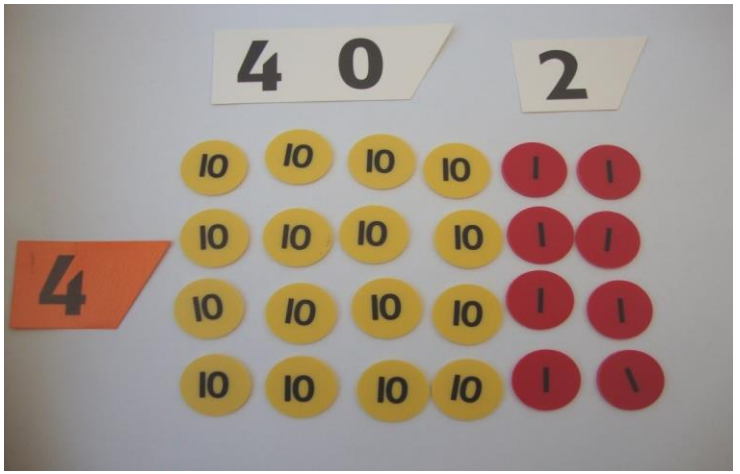


Year 3 (Fractions)
Count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts and in dividing one digit numbers or quantities by 10.

Moving towards formal written methods of multiplication and division

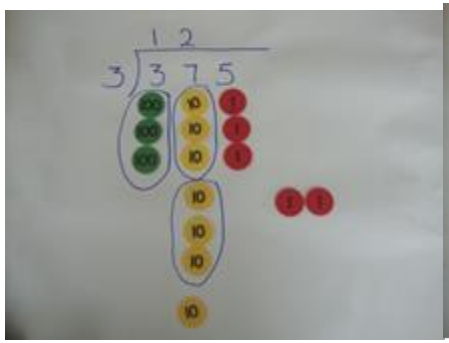
Multiplication

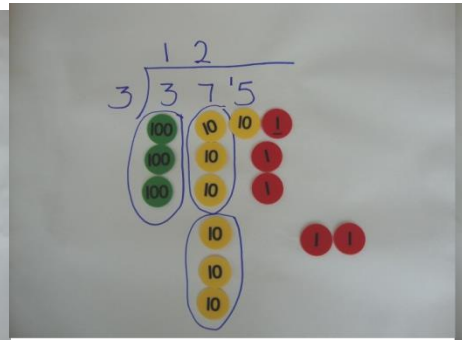


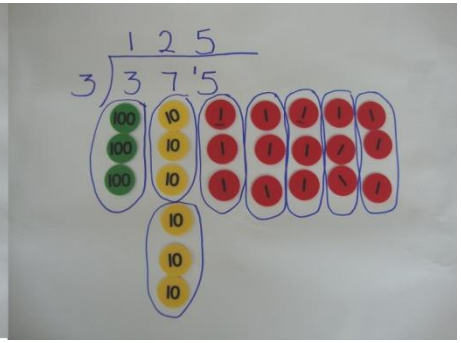


2 5
X 4
2 0 (5 x 4)
8 0 (20 x 4)
1 0 0

Division







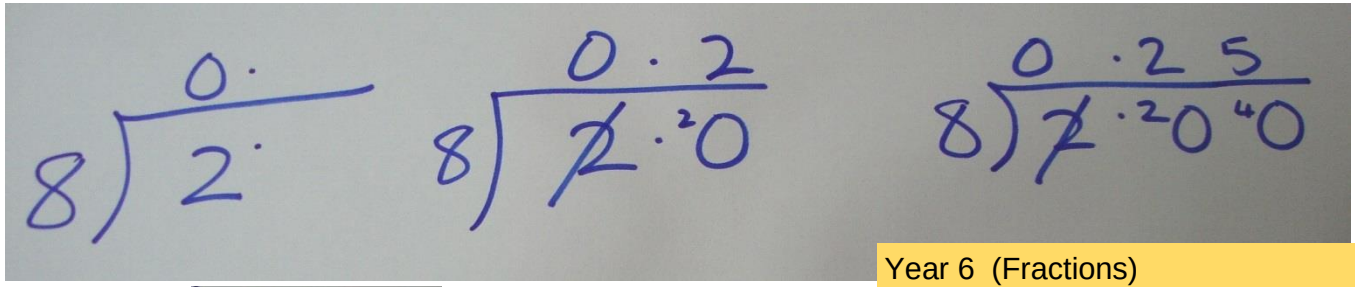
Exchange or regroup the ten that cannot be grouped into 3s.

Year 4
Multiply 2 digit and 3 digit numbers by a one digit number using formal written layout. (see appendices of National Curriculum)

Developing written methods of multiplication and division

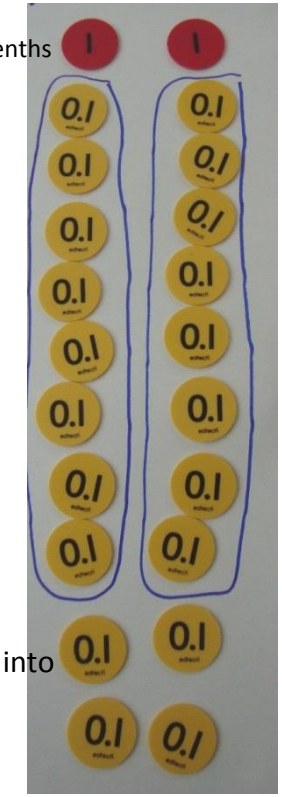
Division using decimals

Children need a good grasp of exchanging or regrouping where 0.1 x 10 = 1 and 0.01 x 10 = 0.1



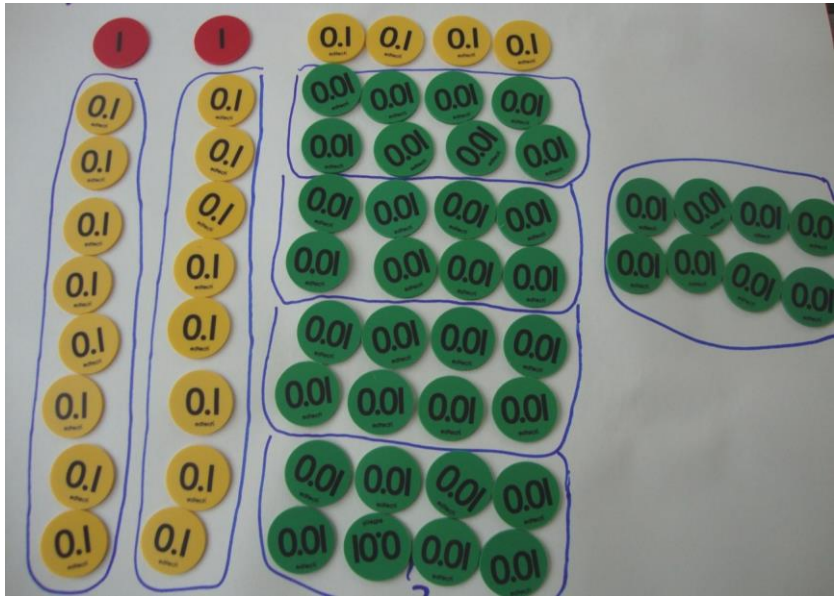
Group into 8s (as the divisor)

regroup 2 into tenths



Group into 8

0.4 to regroup into hundredths



Year 6 (Fractions)

Use written division methods in cases where the answer has up to two decimal places.

True or false? Prove it.

How do you know?

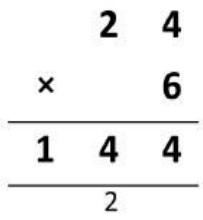
Show using a model.

0.2 x 5 = 0.5 x 2

0.2 x 4 + 0.2 = 0.2 x 5

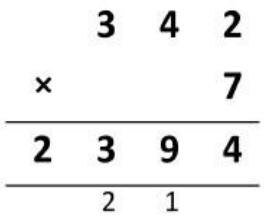
Short multiplication

24 × 6 becomes



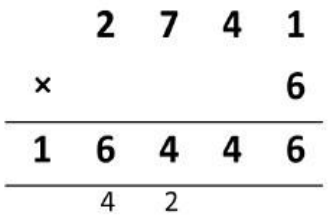
Answer: 144

342 × 7 becomes



Answer: 2394

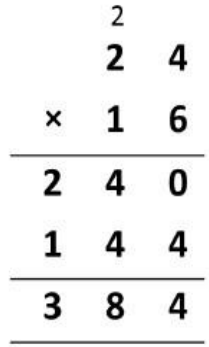
2741 × 6 becomes



Answer: 16 446

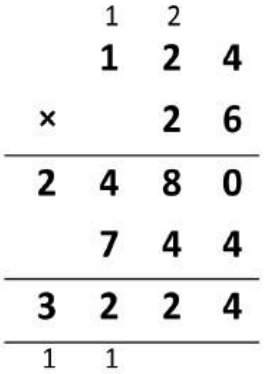
Long multiplication

24 × 16 becomes



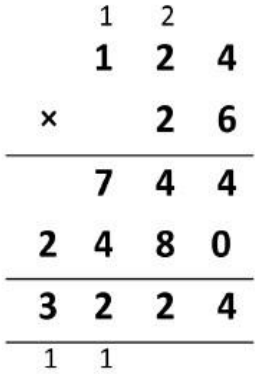
Answer: 384

124 × 26 becomes



Answer: 3224

124 × 26 becomes



Answer: 3224

Short division

98 ÷ 7 becomes

$$\begin{array}{r} 1\ 4 \\ 7\overline{)\,9^{2}\ 8} \end{array}$$

Answer: 14

432 ÷ 5 becomes

$$\begin{array}{r} 8\ 6\ \text{r}\ 2 \\ 5\overline{)\,4\ 3^{3}\ 2} \end{array}$$

Answer: 86 remainder 2

496 ÷ 11 becomes

$$\begin{array}{r} 4\ 5\ \text{r}\ 1 \\ 1\ 1\overline{)\,4\ 9^{5}\ 6} \end{array}$$

Answer: $45\frac{1}{11}$

Long division

432 ÷ 15 becomes

$$\begin{array}{r} 2\ 8\ \text{r}\ 12 \\ 1\ 5\overline{)\,4\ 3\ 2} \\ 3\ 0\ 0 \\ \hline 1\ 3\ 2 \\ 1\ 2\ 0 \\ \hline 1\ 2 \end{array}$$

Answer: 28 remainder 12

432 ÷ 15 becomes

$$\begin{array}{r} 2\ 8 \\ 1\ 5\overline{)\,4\ 3\ 2} \\ 3\ 0\ 0 \quad 15\times 20 \\ \hline 1\ 3\ 2 \\ 1\ 2\ 0 \quad 15\times 8 \\ \hline 1\ 2 \end{array}$$

$\frac{\cancel{12}}{\cancel{15}} = \frac{4}{5}$

Answer: $28\frac{4}{5}$

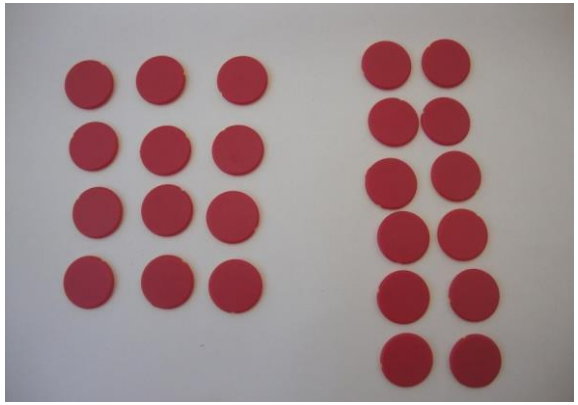
432 ÷ 15 becomes

$$\begin{array}{r} 2\ 8\cdot 8 \\ 1\ 5\overline{)\,4\ 3\ 2\cdot 0} \\ 3\ 0 \\ \hline 1\ 3\ 2 \\ 1\ 2\ 0 \\ \hline 1\ 2\ 0 \\ 1\ 2\ 0 \\ \hline 0 \end{array}$$

Answer: 28·8

Factors, Primes, Square and Cube Numbers and application to other domains

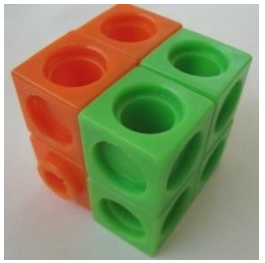
Use the counters to find factors of 12 by making arrays. What others can you find? How many arrays can you make with 13 counters?



Year 5
Identifying multiples and factors, including finding all factor pairs of a number and common factors of two numbers.

2 x 2 = 4

2 x 2 x 2 = 8



Year 5

Recognise and use square numbers and cube numbers, and use the notation for squared $^{(2)}$ and cubed $^{(3)}$.

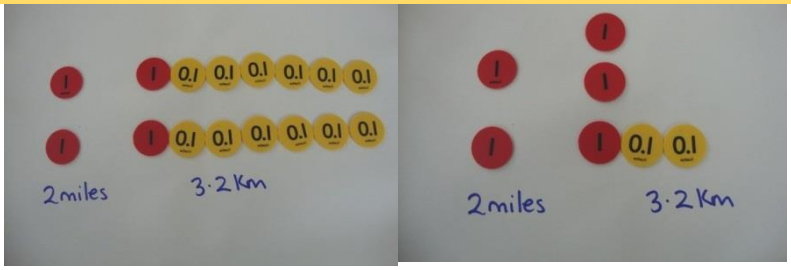
Year 4
Recognise and use factor pairs in mental calculations.

The number in the blue box is the same. What could it be?

□ X □ X □ = 64

Year 6 Ratio and Proportion

Solve problems using the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts.



Year 6 (Measures) *See Year 5 objectives also*

Convert between miles and km.

Solve problems involving the calculation and conversion of units of measure, using decimals notation up to 3 decimal places where appropriate.