STANLEY GROVE SCHOOL WRITTEN CALCULATION POLICY

These are the **written methods** which will be taught to the children. The methods are in developmental order and teachers will use earlier or later methods as appropriate to the children whom they are teaching and their level of understanding.

Children should still experience a wide range of practical activities to underpin their learning and then the skills should be extended into a wide range of real life and problem solving situations.

Decimals need to be delivered early in Key Stage Two.

Updated: Oct 2021 by the teaching staff, subject leader and senior leadership team.

ADDITION

Step One: Covered in Reception and secure by end Y1

Oral counting
Numberline and concrete objects to support. Pictorial representation important, as are practical activities.

Move to informal recording and bar modelling (mathematical graphics). Symbols introduced when appropriate to record simple number sentences.

Step Two: To be secure by end Y1

Adding along a numberline and adding using bar modelling:

Number lines will be demarcated in increments of one to begin with.

4+3=

Step Three: To be secure by end Y2

Partitioning:

27+29= 56

20+20=40
7+ 9=16

40+10+6=56

Can also do as 'car parks' for each total. One car park for tens and one car park for the ones, then add the totals (see Big Maths).

27+29= 56

40 16

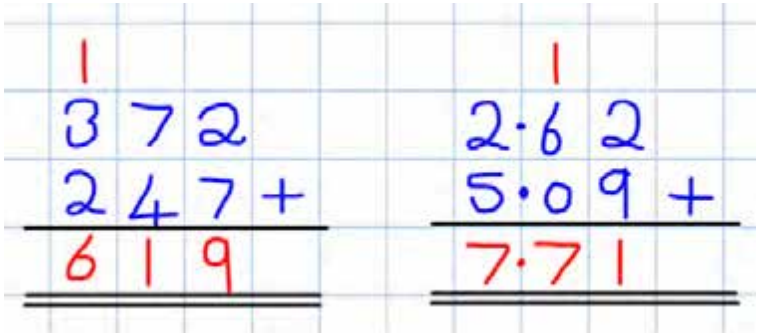
Can be extended into three digit numbers.

Linear Partitioning:

372+217=

300+ 70+2
200+ 10+7 +
500+ 80+9 = 589

Step Four: No carrying forward to be secure by end KS1. With carrying forward and decimals to be secure by end Y3.



When carrying forward, children are taught to place the digit above the others already in the column, so that it does not get lost or forgotten (indicated here in red).
Children are taught that decimal points sit on the line, not in a box of their own and that decimal point must be aligned.

SUBTRACTION

Step One: Covered in Reception and secure by end Y1

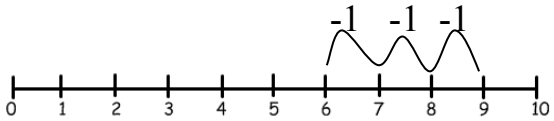
Oral counting
Numberline and concrete objects to support. Pictorial representation important, as are practical activities.

Move to informal recording and bar modelling (mathematical graphics). Symbols introduced when appropriate to record simple number sentences.

Step Two: To be secure by end Y1

Subtraction using bar modelling and along a numberline:
9-3=6

Children will be taught to count both backwards to find the missing amount and forward to find the difference.
9 – 3 = 6



Step Three: To be secure by end Y2

Review and secure finding the difference and the associated language (including using bar modelling).

Partitioning Subtraction:
Taught where no taking from the next column along is needed.

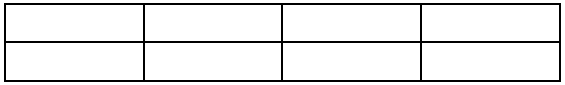
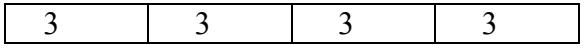
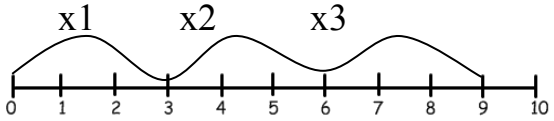
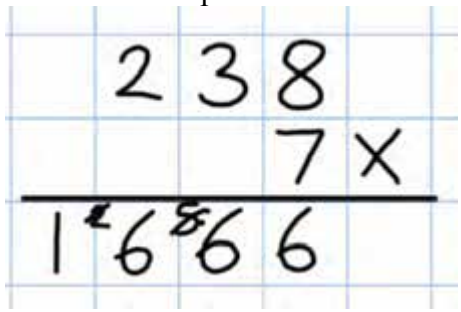
26-14=

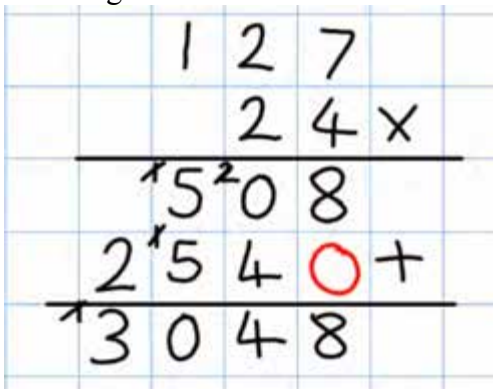
20 6
10 4 -
10 + 2 = 12

Step Four: Formal method no 'taking' to be secure by end KS1. Formal method with 'taking' to be secure by end Y3. With 'taking' and decimals to be secure by end Y4.

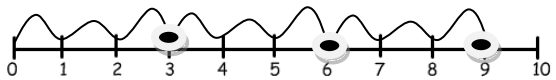
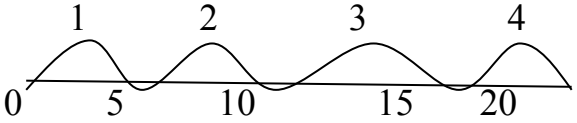
The term 'take' is used when it is necessary to make a number larger. When a number is taken from, the new number should be written above and the one taken written in the column. Numbers with decimal points should be introduced as soon as children are ready and, as previously, they should be aligned.

MULTIPLICATION

Step One: Covered in Reception and secure by end Y1	Step Two: To be secure by end Y1	Step Three: To be secure by end Y2	Step Four: 2 digit x1 digit secure by end Y3. 3 or 4 digit x 1 digit to be secure by end Y4.
Discussion in terms of 'groups of' and 'lots of' Introduction of basic arrays linked to counting 'groups of' as visual stimulus – children are not expected to record in this way. Plenty of concrete then pictorial models used.	Using arrays: 4x2  Bar modelling: 4x3  And introduce equal leaps on a number line: 3 x 3 = 9  	Partitioning to multiply using Smile Multiplication from Big Maths. Partition the larger number into tens and ones or hundreds, tens and ones first. 16 x 2 =32 is the same as: 10x2 (20) 6x2 (12) Then add totals: 20=12=32	Children are taught the short form method for multiplication:  Carry digits forward under the line to enable the method in step five. Carried forward digits must be small and placed in top left of box in next column, then crossed out once used.

Step Five: To be secure by end Y5.	Step Six: To be secure by end Y5.
Children are taught to use '0' as place holders for larger calculations, including HTUxTU  The children will be expected to accurately calculate in this fashion for five and six digit numbers.	Using method to calculate with numbers which include decimal places: The children will be expected to accurately calculate in this fashion for five and six digit numbers, including numbers with two decimal places. We teach the children to do the sum in exactly the same way as a whole number sum with no decimals (see Step 5), then to put the same number of decimal places in the answer as there are in the sum. For example: 127x24=3048 as in Step 5 So: 12.7x24=304.8 (one decimal place in the question, so one decimal place in the answer) And: 12.7x2.4=30.48 (two decimal places in the question, so two decimal places in the answer)

DIVISION

Step One: Covered in Reception and secure by end Y1	Step Two: Covered in Y1. To be secure by end Y2 where 'remainders' would also be included.	Step Three: To be secure by end Y3.
Focus on 'sharing' as a practical idea as well as a social concept. Practical activities sharing objects into groups of so many: E.g.: there are eight sweets and four children, let's share the sweets into groups of four and see how many sweets we'll get each.	Division on a number line (link with 'Where's Mully?' from Big Maths): Focus on 'dividing into groups of' as language to secure understanding. Count up the number line in groups of the divisor (3 in this case) to see how many groups there would be. 9 ÷ 3 = 3 1 group 2 groups 3 groups  Then larger range and extending above known multiples (e.g. 42 ÷ 2) 20 ÷ 5 = 4 groups  For Y2: If it was 22÷5 use same method but show remainder 2 at the end. (22÷5=4 r.2)	All children will be taught the standard short method for division as soon as they fully understand place value and the principles of division as well as having a secure grounding in the vocabulary of the method. 0 2 1 r 3 6) 1 12 9

Step Four: To be secure by end Y4.	Step Five: To be secure by end Y5
Children to be taught to add decimals to the end for dividing money etc. $$\begin{array}{r} 1\ 4\ 8\cdot 4 \\ 5\overline{)\,7\,{}^{2}4\,{}^{4}2\,.{}^{2}0} \end{array}$$	Children are taught to divide by a 2 digit number as follows: 435÷25= $$\begin{array}{r} 0\ 1\ 7\ .\ 4 \\ 25\overline{)\,4\,{}^{4}3\,{}^{18}5\,.{}^{10}0} \end{array}$$ Put the first 6-7 multiples of the number in a column down the side next to the sum: 25 50 75 100 125 150 175

FRACTIONS

Adding Fractions

Example 1: Secure by end Y2

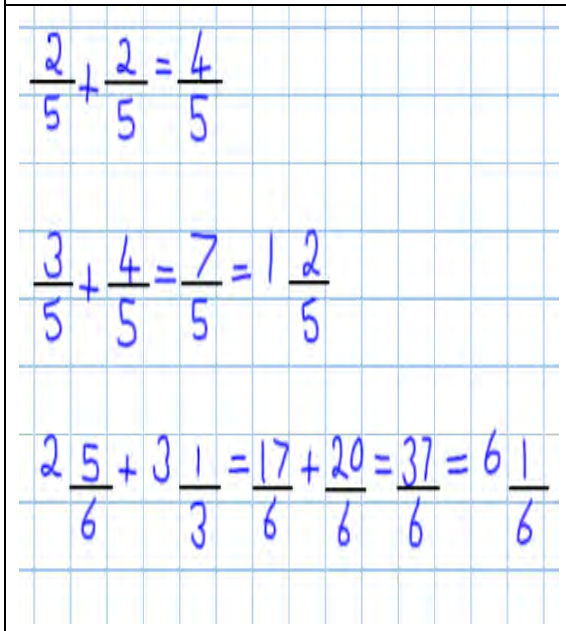
Example 2: pictorially using bar model secure by end Y3 and using maths only secure by end Y4. Converting between mixed numbers and improper fractions needs to be secure by end Y4.

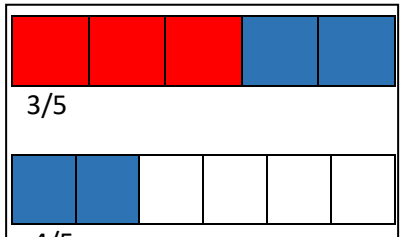
Example 2 with mixed number same denominator addition to be secure by end Year 5 (1 3/5 + 2 4/5 for example)

Adding fractions with different denominators secure by end Y5. (5/6 + 1/3 for example)

Simplifying answer to an addition secure by end Y5

Example 3: Secure end Y6





3/5

4/5

= 7/5 which we see is 1 whole and 2/5

Subtracting Fractions

Example 1: Secure by end Y2

Example 2: pictorially using bar model secure by end Y3 and using maths only secure by end Y4. Converting between mixed numbers and improper fractions needs to be secure by end Y4.

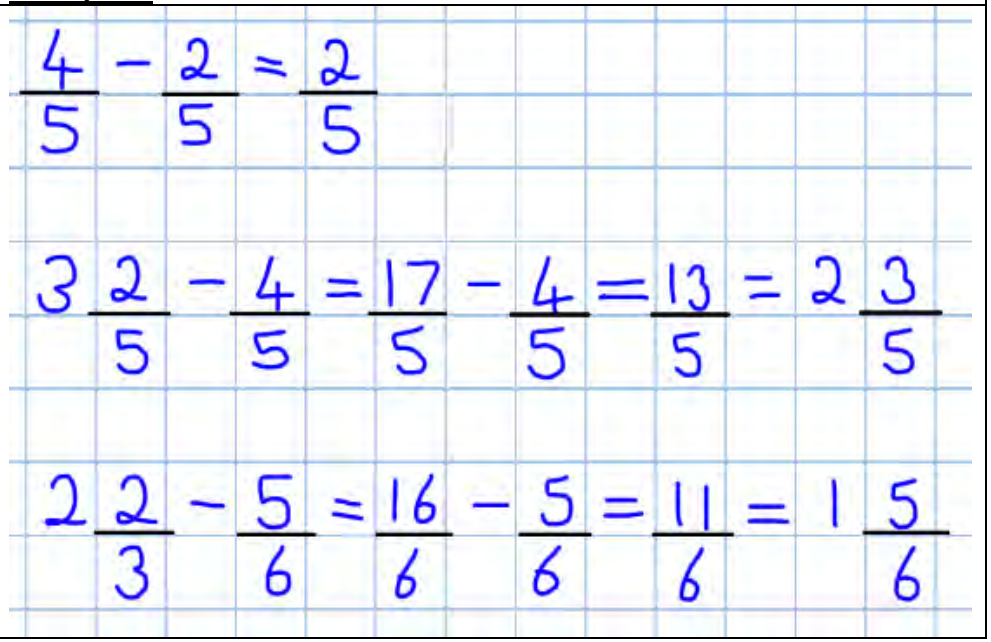
Example 2 with mixed number same denominator subtraction where no conversion of mixed number to improper fraction needed also to be secure by end Year 3 (4 3/5 - 3 2/5 for example)

Example 2 with mixed number same denominator subtraction where conversion of mixed number to improper fraction needed to be secure by end Year 5 (4 3/5 - 3 4/5 for example)

Subtracting fractions with different denominators secure by end Y5. (5/6 - 1/3 for example)

Simplifying answer to a subtraction secure by end Y5

Example 3: Secure end Y6



Addition and Subtraction Fractions outcomes (taken from Stanley Grove Scheme of Work):
Year One:

- Recognise 1/3, ¼, ¾, 2/4 of a shape.
- write simple fractions for example ½ of 6 = 3 and recognise the equivalence of 2/4 and ½

Year Two:

- Recognise 1/3, ¼, ¾, 2/4 of a shape, length, shape, set of objects or quantity.
- write simple fractions for example ½ of 6 = 3 and recognise the equivalence of 2/4 and ½
- add and subtract fractions with the same denominator within one whole [for example, 5/7 + 1/7 = 6/7}

Year Three:

- add and subtract fractions with the same denominator within one whole [for example, 5/7 + 1/7 = 6/7}
- recognise and show, using diagrams, families of common equivalent fractions
- add and subtract fractions with the same denominator (inc whole numbers) 2 1/3+ 2 1/3

Year Four:

- solve problems involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non-unit fractions where the answer is a whole number
- add and subtract fractions with the same denominator (inc whole numbers: 2 1/3+ 2 1/3)

Year Five:

- add and subtract fractions with the same denominator and multiples of the same number

Year Six:

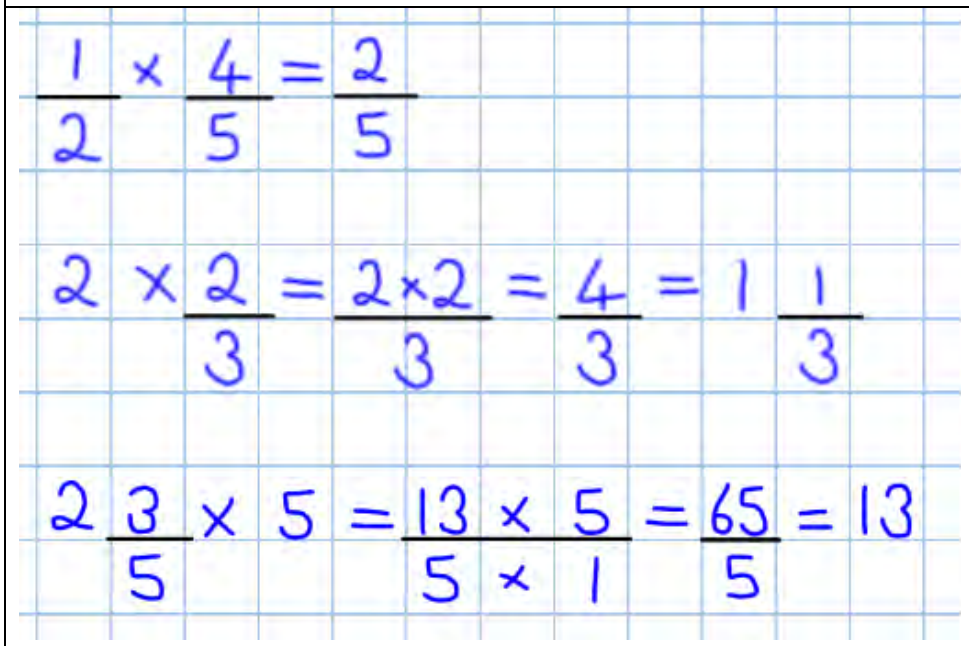
- add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions

Multiplying Fractions

Example 1: Secure by end Y5

Example 2: secure by end Y5

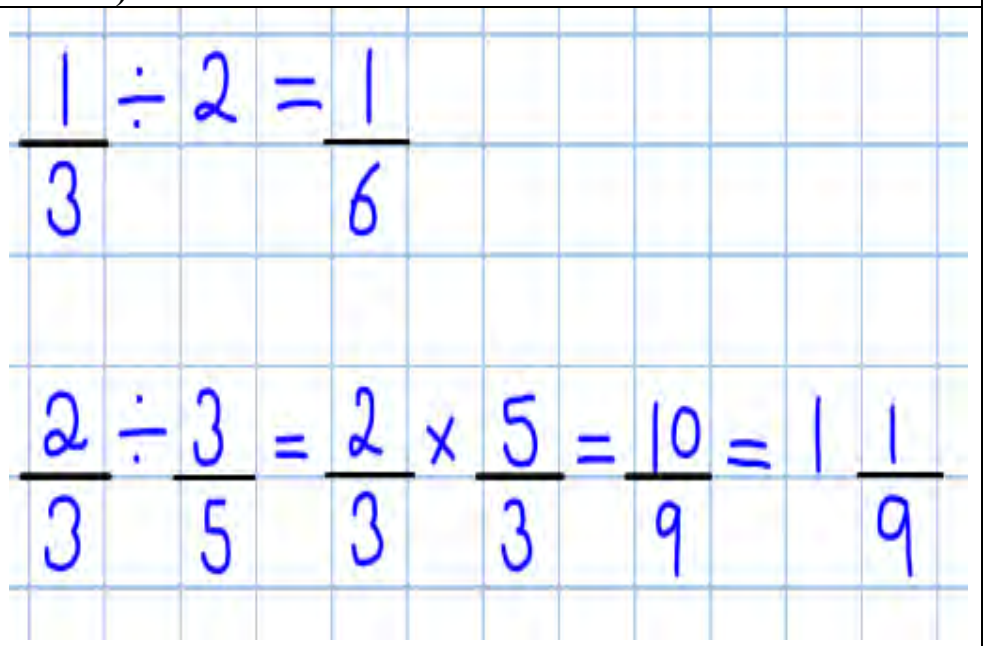
Example 3: Secure end Y6



Dividing Fractions

Secure end Y6:

Use KFC method:
KEEP the first thing (1/3).
CHANGE the sign (from divide to multiply).
FLIP the final thing (2 – or 2/1 – becomes ½)
Now do the sum as you would multiplying a fraction. (1/3 x ½ =1/6)



Multiplication and Division Fractions outcomes:

Year Five:

- multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams

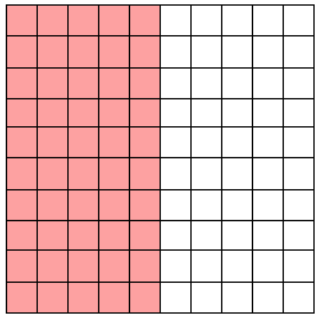
Year Six:

- multiply simple pairs of proper fractions, writing the answer in its simplest form [for example,1/4 x ½ = 1/8)
- divide proper fractions by whole numbers [for example,1/3 divided by 2 = 1/6]

DECIMALS AND PERCENTAGES

Y2:

- Introduce decimals via money/simple measures: £1.50 or 1.5kg. Teach 100p=£1.00
- Introduce ½ as 50 out of a 100 on a 100 square on IWB. Introduce sign % and explain that this means 'out of 100', so 50% means 50 out of 100 or ½.



Y3:

- Count up and down in tenths. Relate 0.1 to 1/10 using visual. Relate to 10/10 being one whole and 1 being one whole one.

0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
1/10	2/10	3/10	4/10	5/10	6/10	7/10	8/10	9/10	10/10=1 whole

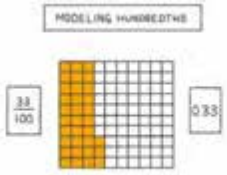
- Find ½ of 3,5,7,9
  Go to the even number BEFORE, find half of that and just add .5 to that answer. Half of 2=1 of half of 3=1.5

- For Mastery children only: Decimal equivalents of ½, ¼, ¾. Link to and use 100 square as shown in Y2. E.g. show that ¼ =25/100=0.25=25% etc.

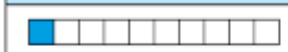
- Children know 100p=£1.00 from Y2. Teach that 100cm=1m

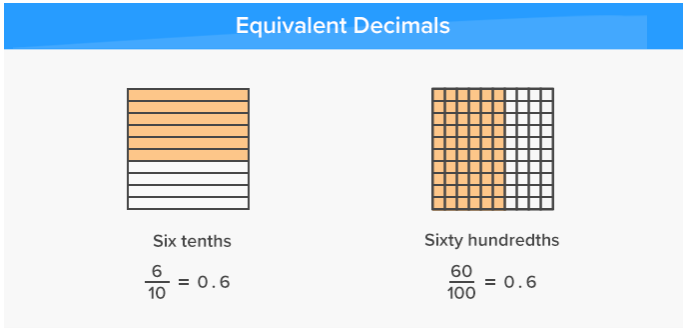
Y4:

- Count up and down in hundredths. Use 100 square to show that 1÷100 = 1/100 = 0.01=1%. In below, show that 33/100=0.33 (and 33% Mastery chn)



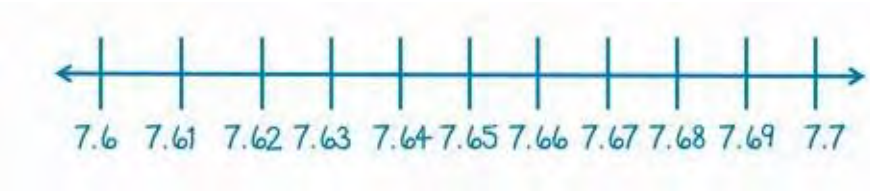
- Recognise and write decimal equivalents of any tenths or hundredths (and for ¼, ½, and ¾)

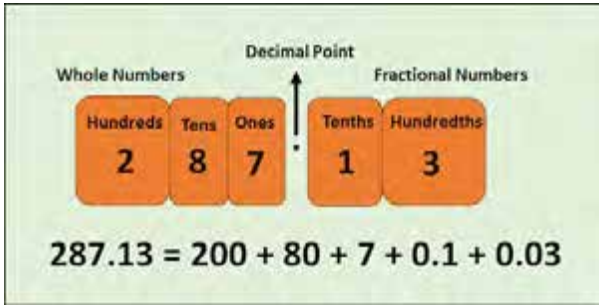
Bar model	Fraction	Decimal
	$\frac{1}{10}$	0·1
	$\frac{5}{10}$	0·5
	$\frac{6}{10}$	0·6
	$\frac{3}{10}$	0·3

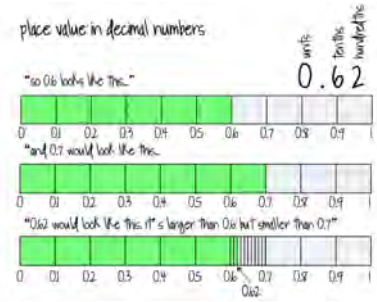


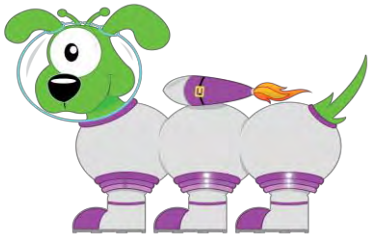
For Mastery children, also show percentages: 60% 60%

- Recognise place value using tenths and hundredths. Use number lines and place value cards (also see Big Maths book/Sqiggleworth).



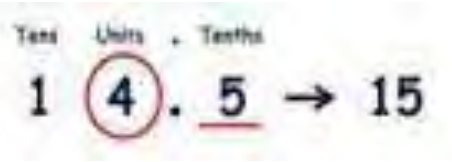






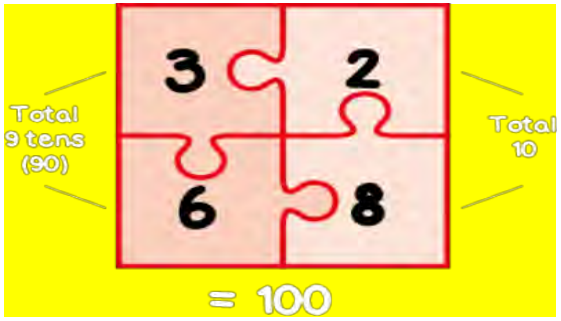
- Compare and order decimals. Stack the numbers. Check the highest value digits first, if the same, check next highest.
  0.63
  0.35
  0.36
  0.56

- **IF POSS IN Y4, (this is Y5 work).** Round decimals with one decimal place to nearest whole number. If the tenths are 5 or more round the units up; if less than 5, leave the units as they are.



- Find missing decimal piece for 1 or 10. Use number bonds to 10 for missing piece to make 1. E.g. 0.4+ ? =1.0 (6=4=10). Use a bar model split into 10.

For missing decimal piece to 10 use jigsaw numbers. So 3.2+6.8=10



- Find out effect of dividing a one or two digit number by 10 and 100.

Divide by 10: move decimal point one place left. Divide by 100 move decimal point 2 places to the left. We show the children that in fact, the digits that move right one or two places, but explain that it is easier to move the decimal point than it is to move all the numbers.

- Use decimals in context of money/measures and use to solve problems.

1. To add/subtract decimals, align the decimal points for written column method. For mental method, add or subtract the numbers then put the decimal place back in the same place. Example: 0.9+1.1=2.0 (9=11=20 and match up the decimal place exactly as it is in the question).
2. To multiply decimals mentally: use Smile Multiplication. 0.6x7=4.2 Do 6x7=42, then count the total number of decimal places in the question and put the same number of decimal places in the answer.

Children know 100p=£1.00 from Y2 and 100cm=1m from Y3. Teach 10mm=1cm and show notation:

Decimals used for money:

1p=£0.01/ 3p=£0.03/ 80p=£0.80/ 152p=£1.52

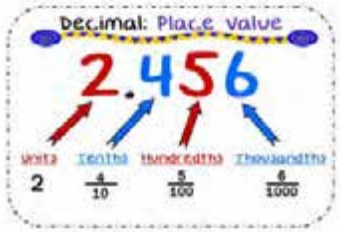
Decimals used for metric measures:

8mm=0.8cm/ 25mm=2.5cm/ 174mm=17.4cm

1cm=0.01m/46cm=0.46m/ 130cm=1.3m

Y5:

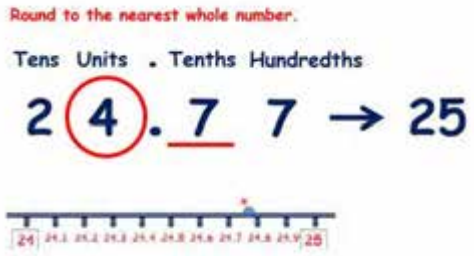
- Recognise and use thousandths and relate them to tenths/hundredths and decimal equivalents.



Number	Place Value (of the red digit)	Value of the Digit (of the red digit)
3.145	Ones	3
3.145	Tenths	$\frac{1}{10}=0.1$
3.145	Hundredths	$\frac{4}{100}=0.04$
3.145	Thousandths	$\frac{5}{1000}=0.005$

- Compare and order numbers to three decimal places. Stack numbers. See Y4 for detail.

- Round decimals with one decimal place to nearest whole number. (See Y4)
- Round decimals with two decimal places to the nearest whole number and to one decimal place. See below for whole number (if right of the decimal point is 50+ round to next whole number. If the hundredths are 5+ round the tenths up) This same method should be continued into Y6.



- Solve problems involving numbers to three decimal places.

1. To add/subtract decimals, align the decimal points for written column method. For mental method, add or subtract the numbers then put the decimal place back in the same place. Example: 0.9+1.1=2.0 (9=11=20 and match up the decimal place exactly as it is in the question).

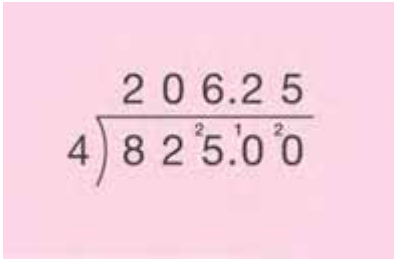
2. To multiply decimals mentally, use Smile Multiplication. 0.6x7=4.2 Do 6x7=42, then count the total number of decimal places in the question and put the same number of decimal places in the answer. So 0.6x0.7=0.42 because there are two decimal places in the question and thus two decimal places in the answer. For written multiplication, leave out the decimal point, do working, then put decimal point back in. E.g: 3.245x6 treat as 3245x6 then put two decimal places back in the answer because there are two decimal places in the question.

3. To divide/multiply decimals by 10/100/1000, see Y4 teaching and recap, then teach multiplying decimals (up to 3 decimal places) by 1000 moving decimal point 3 places right, inserting zeros as needed and dividing decimals by 1000 by moving decimal point three places to the left.

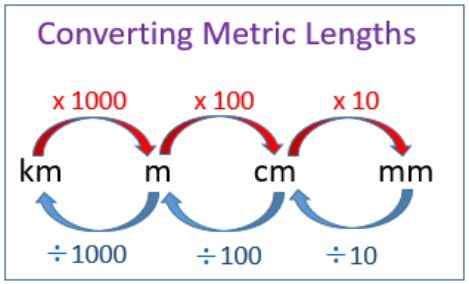
2.37÷1000=0.00237 3.256x1000=3256

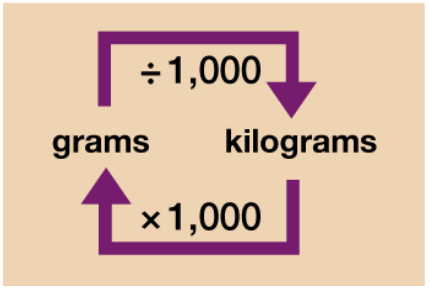
4. To divide numbers using a written method where there is a remainder to be given as a decimal, put the decimal place after the whole number inside the bus stop, followed by 2-3 zeros and put a decimal place above the bus stop in exactly the same place as in the question. See below:

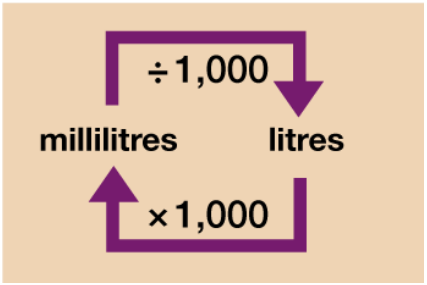
825÷4= 206.25



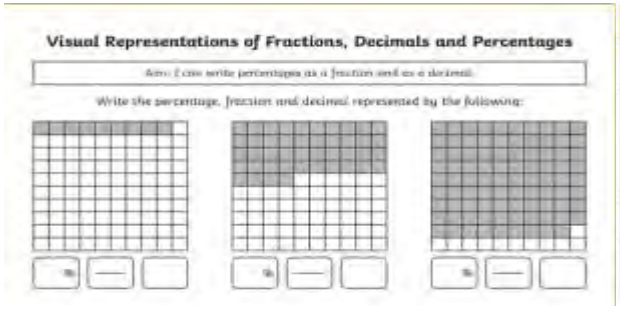
- Convert metric units. 47mm=4.7cm 138cm=1.38m 80g=0.08kg 2650ml=2.65L



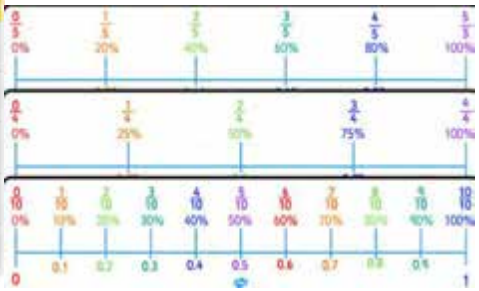




- Recognise % symbol and make connection between fractions decimals and percentages.



Fractions	Decimals	Diagram	Out of 100	Percentages
1/10	0.1		10/100	10%
2/10	0.2		20/100	20%
3/10	0.3		30/100	30%
4/10	0.4		40/100	40%
5/10	0.5		50/100	50%



Ensure children are taught about equivalent fractions before this step.

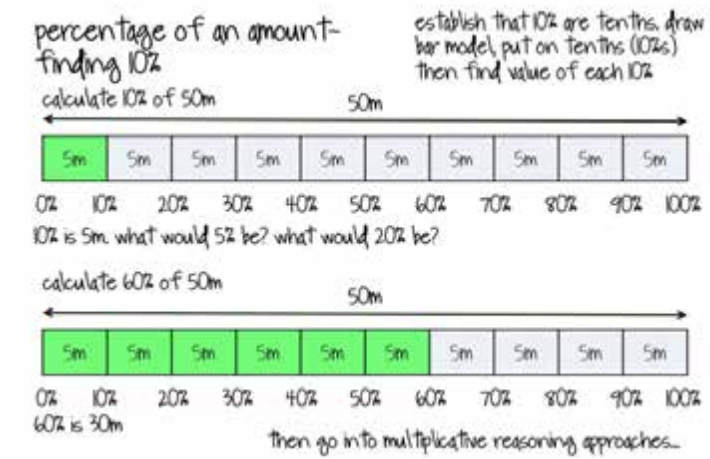
- Find percentage of amounts

Teach find 10% (divide by 10) so 20% is find 10% and double it.

Teach find 5% by halving 10% so 15% is find 10%, find 5% and add.

Remind 25% is same as find quarter (halve then halve again). Times this by 3 to find 75%

Remind 50% is same as finding half.
Can also use bar models to show pictorially:



Y6:

- For addition, subtraction, multiplication and division with decimals, see Year 5.

Note that for formal written multiplication, multiplying by a 2-digit number is introduced. This is made easier by leaving out the decimal point in working out, and replacing it in the answer (e.g. 12.34x24 is worked as 1234x24 and 2 decimal places are put back into answer). For mental multiplication with decimals where hundredths are used, again use Smile Multiplication and count the number of decimal places in the question, putting same number of decimal places in answer (e.g. 0.07x0.8=0.056 because 7x8=56 and there are 3 dp in Q, so 3dp in A).

- Decimal/fraction equivalents:

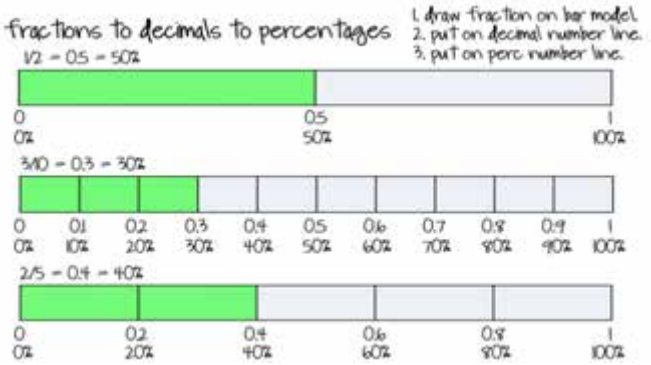
Learn by heart decimal equivalents by creating a chart: ½, ¼, ¾, 1/5, 1/10, 1/100, 1/1000
Use these to work out other fraction decimal equivalents. E.g. 1/5=0.2 so 2/5=0.4
PLUS:
Be able to work out fraction /decimal equivalent where 3 decimal places are involved. E.g 3/8=0.375
Work this out as 3÷8:

```
   0.  3 7 5
8 | 3. 30 60 40
```

- Decimal/fraction/percentage equivalents:

Teach children to make their fraction out of 100 wherever possible to give the percentage (how to make equivalent fractions taught in Y5), so 1/5=2/10=20/100=20%=0.2

Also use bar models to show pictorially:



- Use decimal place notation for measure/problem solving using up to 3 decimal place numbers. (build on from Y5 teaching)

E.g. 1.456kg=1456g kg → g x1000

765g=0.765kg g → kg ÷1000

Also show that whole kg/litres/km (the larger unit of measure) go on the left of the decimal point, whilst grams/ml/m (the smaller unit of measure) go to the right of the decimal point.

- Solve problems involving calculation of percentages and use percentage as a comparison.

See rules taught in Y5 PLUS:

Find 1% by dividing by 100 (so to find 11%, find 10%, find 1% then add)

Find 99% by finding 1% and deducting this amount from the total.

	Is the number!	
100%		
10%	÷ 10	
5%	÷ 10, then ½ it	
1%	÷ 10, ÷ 10 again	or ÷ 100
½%	÷ 10, ÷ 10, ½ it	or ÷ 100, ½ it
20%	÷ 10, x 2	or ÷ 5 (if easy)
25%	Find 20%, find 5%, add the two together	or ÷ 4, or ½, it ½

Comparison work on percentages through topic. E.g. pie chart of percentage of rainforest cover in different countries in South America. Also, percentages work interpreting pie charts. E.g. favourite breakfast of 60 Y6 pupils given in percentages on the pie chart/need to find these percentage amounts. Usually best to find 10% and work from there.