Ysgol Gyfun Garth Olwg

Numeracy Booklet

Contents

Introduction

The purpose of this Numeracy Booklet is to give teachers, parents and pupils something they can refer to, for support with their numeracy skills. Hopefully pupils will benefit from having a consistency in the methods which they use shown across the curriculum.

In each section there will be an indication of the difficulty of work, given as a National Curriculum KS3 level. The typical level for each year group is, as a general guideline:

Year 7 → levels 3 to 5
Year 8 → levels 4 to 6
Year 9 → levels 5 to 7

The support pack contains the basic mathematical concepts, and methods to consider when working with numeracy elements. If pupils are using a different method successfully they should continue to use that method. The methods in this support pack are there for pupils to refer to should they be in difficulty. This support pack will also show common mistakes and misinterpretations that pupils are prone to.

If you require any further information on any of the methods, the Mathematics department will be very pleased to liaise with you.

N.B Remember that there are pages in the Cynllun Gwaith Personol which support Numeracy. See Pages 44- 53.

	Number	Measure	Data
Less than 3	Understand symbols +/-/= =/- facts up 10	Measure to nearest cm Order months Read time to the hour and ½ hour	Record results in a simple list
Level 3	Memorise adding facts Read scale on map or plan up to 20 and count every 10 Read Numbers up to 100 Add and subtract using written method (no borrowing) Recall the 2,3,4,5 & 10 times tables Division facts which relate to table 3 &4 Round numbers to the nearest 10 & 100 Recognise negative numbers	Recognise measuring units Read the time Understand relationship between seconds, minutes and hours	Draw a bar chart and simple picto-gram (without having to group data) Create a results table
Level 4	Add and subtract using written method (inc. borrowing) Round to nearest whole number Recall tables up to 10 × 10 Multiply 2/3 digit number with whole number Find remainder whilst dividing Understand the meaning of percent Recognize fractions, percentages and simple decimals Multiply whole numbers by 10, 100 & 1000	Calculate perimeter Use formula for area of rectangle Read 12 and 24 hour clock Estimate size of an angle	Recognize the mode and median within a set of data. Interpret a frequency diagram
Level 5	Multiply and divide decimals by 10, 100 & 1000 Long Multiplication Multiply whole numbers with decimals Add & subtract negative numbers Calculate percentage of a value Express a number as a percentage of another number Calculate a fraction of a value	Convert between metric units Read scale on map or plan Perimeter and area of compound shapes Area of triangle and parallelogram Volume of cuboids Measure and draw angles	Draw frequency diagram Differentiate between continuous and discrete data Calculate mean and range Interpret Pie Chart Draw pie chart by colouring equal sectors
Level 6	Multiply decimals Convert between fractions, percentages and decimals Add and subtract fractions with different denom-inators Percentage increase and decrease Use ratios Indices rules	Area of a trapezium Area and circumference of circles Volume of prisms Draw nets of different prisms cor-rectly	Draw Pie Chart by calculating angles and using protractor Draw a scatter graph

Place Value

Vocabulary: Units, Tens, Hundreds etc. Place Value, Multiply, Divide

- Place value is very important when dealing with numbers. Most pupils will be comfortable with numbers in the thousands.
- Place value allows us to understand size and also helps when multiplying and dividing by 10, 100, 1000 etc.

Thousands	Hundreds	Tens	Units	Tenths	Hundredths	Thousandths

The way that people discuss dates has been a factor which has caused some pupils to find reading and writing large numbers difficult.

E.g. 2012 as a year would be said "twenty twelve" rather than "two thousand and twelve".

Common mistakes pupils make would be to

- Write the number two thousand and forty three as 200043
- Read the decimal 3.78 as "Three point seventy eight" rather than "Three point seven eight"
- Convert decimals into money incorrectly when using a calculator. For example when the calculator shows 4.3, pupils believe this means £4.03 rather than £4.30.

The way to tackle this problem is to write the numbers in the place value holder (like the diagram above).

Multiplying by 10, 100, 1000, …

Level 4

When pupils are asked to multiply by a power of 10 they are taught to move the digits in the place value holders by however many zeros are in the number that you are multiplying with.

e.g. What is 5.2 x 100?

Thousands	Hundreds	Tens	Units	Tenths	Hundredths	Thousandths
			5	2		
	5	2	0			

N.B. the zero is added to the unit's column as any blank column found to the left of the decimal point must always be filled to support the new place value.

Dividing by 10, 100, 1000, …

Level 4

When dividing by powers of 10, pupils use the same idea as above in multiplying, the only difference being that now the digits move to the opposite direction (to help this idea remind the pupils that when dividing one is generally making the numbers smaller).

e.g. What is 310 ÷ 1000?

Thousands	Hundreds	Tens	Units	Tenths	Hundredths	Thousandths
	3	1	0			
			0	3	1	0

Using the place value holders stops pupils getting confused when they use the *take off the noughts* method. As in the example above, with only one nought in 510, and the fact the pupils know they need to take off 3 noughts, they'll often make mistakes and come up with an incorrect answer.

Addition

Vocabulary: Add, Sum, Total, More,

Written Method

$$\begin{array}{r} 457 \\ +\ 86 \\ \hline 543 \\ \hline 1\ 1 \end{array} \leftarrow \text{Carried Values}$$

Level 3

Place Value is important when using numbers which contain decimal points or numbers with multiple zeros.

4500 + 83.51 →

$$\begin{array}{r} 4500 \\ +\ 83.51 \\ \hline \\ \hline \end{array}$$

X incorrect

instead

$$\begin{array}{r} 4500 \\ +\ 83.51 \\ \hline \\ \hline \end{array}$$

✓ correct

N.B. Pupils who have difficulty can use the place value holders to help them until they get used to the concept.

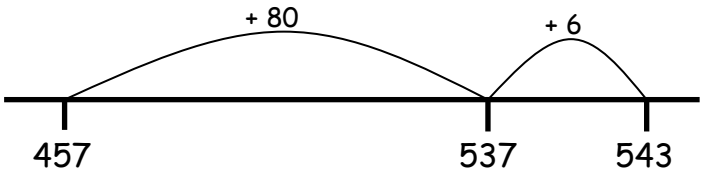
Thousands	Hundreds	Tens	Units	Tenths	Hundredths	Thousandths
4	5	0	0 •			
		8	3 •	5	1	

Alternative Methods

The question could be broken down to smaller ports, and use a number line to help.

e.g. 457 + 86 "What is 457 + 80 + 6 ?"

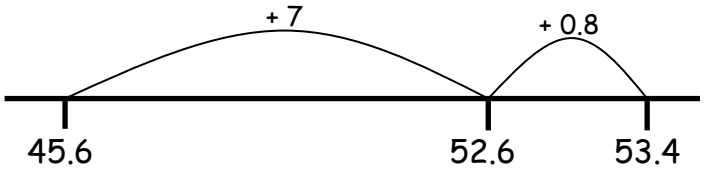
457 + 80 + 6 = 543



Level 3

e.g. What is 45.6 + 7.8 ?

45.6 + 7 + 0.8



Level 4

Hundred Square

Some pupils have difficulty counting up across the tens, encouraging them to use the hundred square when adding or subtracting 1 or 2 digit numbers can be helpful.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Subtraction

Vocabulary : subtract, less, difference, take away

Written Method

$$\begin{array}{r} 6\,^{3}\!\not{4}\,^{1}3 \\ -\ 3\ 1\ 7 \\ \hline 3\ 2\ 6 \\ \hline \end{array}$$

With this method pupils need to be confident with the concept of "borrowing".
A common mistake made by pupils is to subtract the smallest number in the column from the largest, rather than subtracting the bottom number from the top number every time

e.g.
$$\begin{array}{r} 6\ 4\ 3 \\ -\ 3\ 1\ 7 \\ \hline 3\ 3\ 4 \\ \hline \end{array}$$
X incorrect

Pupils often make mistakes when dealing with money.

e.g. £10 - £2.60 = £8.40 X incorrect

Pupils subtract the pounds and then find out the remaining pennies but add them rather than take them away.

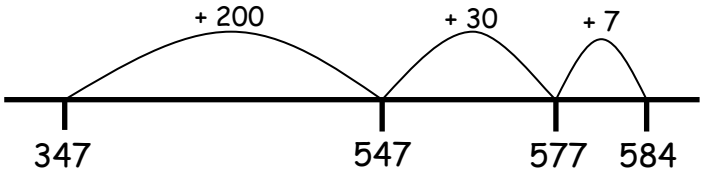
Alternative Method

You could subtract the number by place value.

e.g. 643 - 317 → 643 - 300 = 343
343 - 10 = 333
333 - 7 = 326

Some pupils find it easing to count up rather than subtracting. Using this method means we don't have to worry about "borrowing".

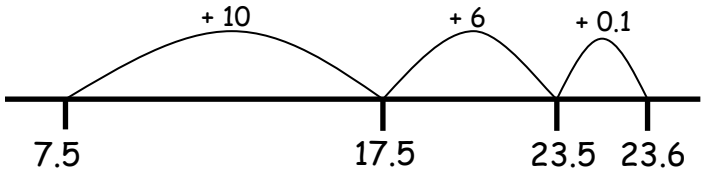
e.g. What is 584 - 347 ?



Level 3

200 + 30 + 7 = 237

e.g. What is 23.6 - 7.5 ?



Level 4

10 + 6 + 0.1 = 16.1

This method, once pupils are comfortable with numbers and place value, is easier when dealing with numbers conataing multiple noughts, once again because there's no need to worry about "borrowing".

e.g. 6000 - 2676

Here we count + 4 (to 2680) + 20 (to 2700) + 300 (to 3000) + 3000 (to 6000).
So final answer is 4 + 20 + 300 + 3000 = 3324

Multiplication

Vocabulary: product, multiply

The main reason that pupils have difficulty with long multiplication is because they do not know their times tables up to 10. The best thing to do is ensure that they remember them through repetition. A few things which can help them are

e.g. for 6 x 4 Ask the to count forward in fours by using their fingers
Use the 5 times table as a start point, therefore if 5 x 4 = 20, then 6 x 4 = ___
Direct them to the tables which are in their school planner.

x	1	2	3	4	5	6	7	8	9	10	11	12
1	1	2	3	4	5	6	7	8	9	10	11	12
2	2	4	6	8	10	12	14	16	18	20	22	24
3	3	6	9	12	15	18	21	24	27	30	33	36
4	4	8	12	16	20	24	28	32	36	40	44	48
5	5	10	15	20	25	30	35	40	45	50	55	60
6	6	12	18	24	30	36	42	48	54	60	66	72
7	7	14	21	28	35	42	49	56	63	70	77	84
8	8	16	24	32	40	48	56	64	72	80	88	96
9	9	18	27	36	45	54	63	72	81	90	99	108
10	10	20	30	40	50	60	70	80	90	100	110	120
11	11	22	33	44	55	66	77	88	99	110	121	132
12	12	24	36	48	60	72	84	96	108	120	132	144

Level 4

To ensure that pupils can do short and long multiplication it is vital that they understand place value. We will be breaking the numbers down regarding their place value.

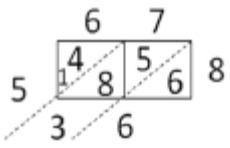
Mental Arithmetic

e.g. 36 x 7 30 x 7 = 210
6 x 7 = 42 so 36 x 7 = 210 + 42 = 252

Written Method

67 x 8

$$\begin{array}{r} 6\ 7 \\ \times\quad 8 \\ \hline 5\ 3\ 6 \\ {\scriptstyle 5} \end{array}$$



Level 4

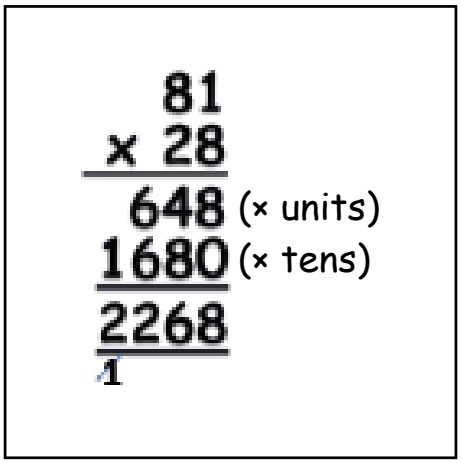
Long Multiplication

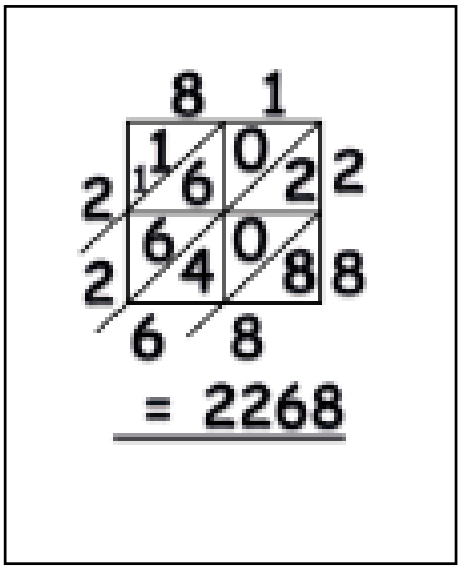
It is important that pupils pick a specific method for long multiplication and stick to it. Quite often pupils will try and to it in their heads using a similar method as on the previous page. However this does not give us the right answer.

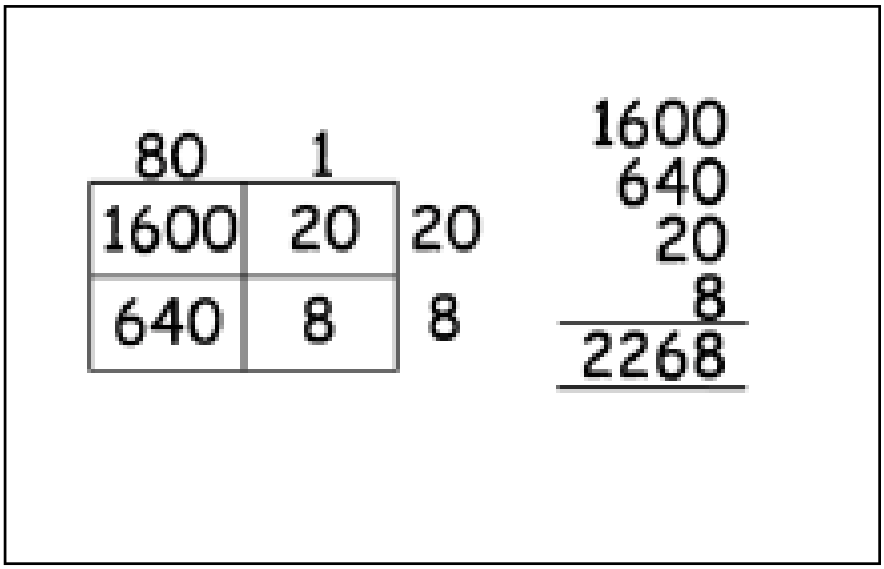
e.g. 45 x 26 40 x 20 = 800
5 x 6 = 30 felly 800 + 30 = 830 X incorrect

Ensure that they use one of the following methods.

e.g. 81 x 28







Level 5

Division

Vocabulary: divide, share

Many pupils prefer to think backwards when doing division. For example 32 ÷ 8, "8 multiply by what gives an answer of 32?"

Written Method

To solve every division question pupils are encouraged, if their numeracy skills are weak, to list the numbers in the table of the number they are dividing with.

e.g. 405 ÷ 15

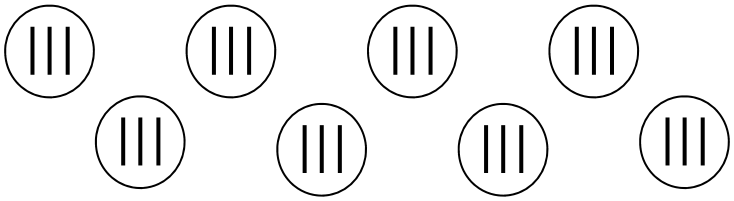
$$15 \overline{)\,4\,{}^{4}0\,{}^{10}5} \quad 0\;2\;7$$

15, 30, 45, 60, 75, 90, 105, …

Level 4

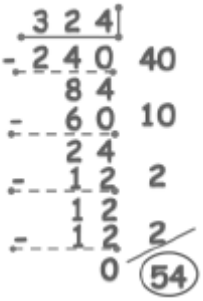
Alternative Methods

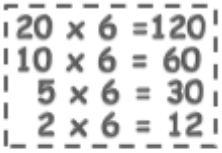
This next method is good for pupils who have difficulty with division, however it is only really practical when the numbers are relatively small.
e.g. 24 ÷ 8
The pupils with form 8 groups, then draw a line in each group, then repeat this process until they have drawn 24 lines. Answer is 3 because there's 3 lines in each group.



Level 3

Below there is another method for division, the pupils will calculate some of the easiest multiplication sums of the number which we are dividing with. Then by starting with taking away the largest values first, continue until we have reached zero.
e.g. for 324 ÷ 6





Rounding

Despite being quite a simple concept, rounding is something many pupils pick up bad habits with and make basic errors with.

Pupils need to be able to round to the nearest whole number, ten, hundred and thousand, as well as rounding to a number of decimal places correctly.

Many pupils like to use the idea of "if it's past half way we must round up, if not, we must round down".

Here is a Rounding Rhyme which could aid the pupils with memory.

Find the number look right next door,
Four or less, just ignore,
Five or more, add one more.

e.g. Round 2469 to nearest **thousand**

Find the number (in this case the thousand) look right next door (here the digit to the right is a 4). Four or less (which the digit is) just ignore (so we don't need to increase the 2 thousand to 3). Therefore, the answer is 2000

e.g. Round 2469 to nearest **hundred**

Find the number (in this case the hundred) look right next door (here the digit to the right is a 6). Four or less, just ignore (the digit isn't, as this time it is a 6). Five or more, (which it is) add one more (so the 6 makes the 4 hundred become 5 hundred). Therefore, the answer is 2500.

N.B. All other place value columns are now zeros.

Rounding to a number of decimal places

The same method as on the previous page can be used here.

e.g. Round 0.8375 to **one** decimal place

This means our answer can only have **one** digit after the decimal point.

Find the number (in this case the **1st** digit after the decimal point, the 8), look right next door (3 is the next digit)
Four or less (which the digit is), just ignore (so we don't need to increase the 8 to 9).
Therefore, the answer is 0.8

e.g. Round 0.8375 to **two** decimal place

This means our answer can only have **two** digits after the decimal point.

Find the number (in this case the **2nd** digit after the decimal point, the 3), look right next door (7 is the next digit)
Four or less (which the digit is not), just ignore,
Five or more (which it is, it's a 7) add one more (this means we need to increase the 3 to 4)
Therefore, the answer is 0.84

Decimals

Vocabulary; decimal, decimal point, ascending, descending

Pupils can have difficulty with indentifying the size of decimals, this can be because they read out the decimals incorrectly as we've mentioned on page 5 already.

e.g. 0.12 is meant to be read as "zero point one two" and not as "zero point twelve".

Why? It is simply understood as a way of emphasising a number's size.

e.g. reading 0.12 as "zero point twelve" would lead pupils to think that 0.12 is bigger than 0.8, because twelve is bigger than eight.

When we need to put decimals in ascending order (smallest → biggest) or in descending order (biggest → smallest) we must think about the place value holders. Adding *extra noughts* to some of the decimals, so that every decimal has the same number of digits after the decimal point, can aid their understanding,.

e.g. Put 0.4 0.39 0.41 0.409 in ascending order.

Thousands	Hundreds	Tens	Units	Tenths	Hundredths	Thousandths
			0 •	4	**0**	**0**
			0 •	3	9	**0**
			0 •	4	1	**0**
			0 •	4	0	9

As you can see above, the **bold** zeros have been added on to the end to ensure every decimal has the same number of digits after the decimal point. We can now compare the digits which are after the decimal points to determine the size of these decimals.
Therefore in ascending order 0.390 0.400 0.409 0.410
by using the original decimals we were given we get 0.39 0.4 0.409 0.41.

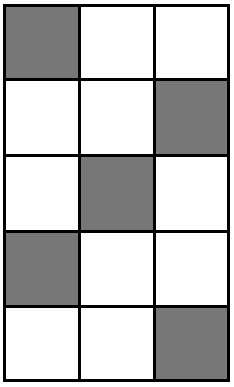
Level 4

Fractions

Vocabulary; fraction, denominator (bottom), numerator (top)

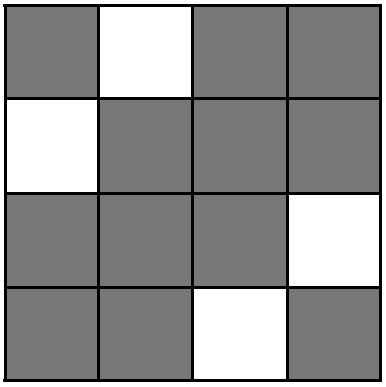
Most pupils are comfortable with writing what fraction of a shape has been shaded.

e.g. What fraction of the following shapes has been shaded?



15 parts to the shape
5 of them shaded

therefore $\frac{5}{15}$



16 parts to the shape
12 of them shaded

therefore $\frac{12}{16}$

Sometimes it is expected for us to write the fraction in its simplest form. This means writing an equivalent fraction but with the smallest numbers possible. The best way to do this is to think of the largest time table which contains the numbers in the fraction.

e.g. if we look at the above fractions

5 and 15 appear in the 5 time table,
therefore we divide the fraction by 5.

$$\frac{5}{15} \xrightarrow{\div 5} = \frac{1}{3}$$

12 and 16 appear in time tables 2 and 4,
therefore we divide the fraction by 4.
(4 because it is the largest of 2 and 4)

$$\frac{12}{16} \xrightarrow{\div 4} = \frac{3}{4}$$

Level 4

When simplifying fractions, many pupils like to use the method of halving the fractions over and over until we can no further.

e.g. $\frac{12}{16} \rightarrow \frac{6}{8} \rightarrow \frac{3}{4}$

We can do this until we get an odd number as the numerator or denominator.

N.B. It is important that pupils understand that if it is no longer possible to halve the fraction, that the fraction is not necessarily in it's simplest form.

Once they find that they can't halve the fractions anymore, they must ensure that the remaining fraction cannot be divided by 3, 5 or 7 etc. to ensure that the fraction is in its simplest form.

e.g. $\frac{72}{108}$ (÷2 →) $\frac{36}{54}$ (÷2 →) $\frac{18}{27}$ (÷3 →) $\frac{6}{9}$ (÷3 →) $\frac{2}{3}$

Level 4

<u>Calculating a fraction of a number</u>

To calculate a fraction of a number we must learn the following.

e.g. Calculate $\frac{3}{4}$ o 28

Step 1: Divide the number by the denominator (bottom)

28 ÷ 4 = 7 (This is equal to $\frac{1}{4}$ of the original value)

Step 2: Multiply your answer to Step 1 by the numerator (top)

7 × 3 = 21 (This is equal to $\frac{3}{4}$ of the original value as it is 3 times the value of a $\frac{1}{4}$)

e.g. Calculate $\frac{5}{8}$ o 56

Step 1: 56 ÷ 8 = 7

Step 2: 7 × 5 = 35

Divide by bottom
Multiply by top!

Answer = 35

Level 5

Ratios

For finding quantities within a ratio we must learn the following

e.g. Share £4000 to the ratio 5:2:1

Number of parts = 5 + 2 + 1 = 8
1 part is worth £4000 ÷ 8 = £500
1st → 5 × £500 = £2500
2nd → 2 × £500 = £1000
3rd → 1 × £500 = £500

Percentages

Vocabulary; percent, proportion

Percentages form a topic which many pupils seem to have difficulty in remembering. They need to be able to calculate a percentage of a value , with and without a calculator.

REMEMBER: All a percentage is, is a fraction of a hundred.
e.g. 34% means $\frac{34}{100}$

Calculator Method

We must convert the percentage to a **fraction** or a **decimal** then multiply by the value.

e.g. 21% converts to $\frac{21}{100}$ or 0.21

7% converts to $\frac{7}{100}$ or 0.07

e.g. Calculate 18% of 350

Method 1: $\frac{18}{100}$ × 350 = 63

(input into calculator as 18 ÷ 100 × 350)

Method 2: 0.18 × 350 = 63

Mental Calculation Method

- Show that whole value is 100%.
- Always start by finding 10%, by dividing by 10.
- Find 5% by halving the 10%.
- Find 1% by dividing the 10% by 10.

e.g. Calculate 16% of 140

100% = 140
10% = 140 ÷ 10 = 14
5% = 14 ÷ 2 = 7
1% = 14 ÷ 10 = 1.4

We can calculate 16% by doing
10% + 5% + 1%

Therefore 16% = 14 + 7 + 1.4
= 21 + 1.4
= 22.4

e.g. Calculate 23% of 320

100% = 320
10% = 320 ÷ 10 = 32
5% = 32÷ 2 = 16
1% = 32 ÷ 10 = 3.2

We can calculate 23% by doing
10% + 10% + 1% + 1% + 1%

Therefore 23% = 32 + 32 + 3.2 + 3.2 + 3.2
= 64 + 9.6
= 73.6

We can use a similar method to calculate V.A.T at 17.5%

- Show that whole value is 100%.
- Always start by finding 10%, by dividing by 10.
- Find 5% by halving the 10%.
- Find 2.5% by halving the 5%.

e.g. Calculate 17.5% o £160

100% = £160
10% = £160 ÷ 10 = £16
5% = £16 ÷ 2 = £8
2.5% = £8 ÷ 2 = £4

We can calculate 17.5% by doing
10% + 5% + 2.5%

Therefore 17.5% = £16 + £8 + £4
= £28

Level 5

BIDMAS

Level 5

Vocabulary; brackets, indices (powers), division, multiplication, addition, subtraction

Pupils are taught BIDMAS (some may know BODMAS - where the O represents the order of power (index) e.g. 3^2 the little 2 is the power) as a way to remind them which operations (+, -, × or ÷ etc.) takes preference when there are multiple parts within one calculation.
Pupils make the common mistake of calculating the answer by going from left to right, however this does not always give the correct answer.

To further support BIDMAS ordering it is actually written as

B
I
DM
AS

Complete in the order given

B - Brackets	M - Multiplication
I - Indices	A -Addition
D - Division	S - Subtraction

e.g. to calculate the following $5 + 2 \times 3$

Without using BIDMAS

$5 + 2 \times 3$
$= 7 \times 3$
$= 21$

✗ incorrect

By using BIDMAS

$5 + 2 \times 3$
$= 5 + 6$
$= 11$

✓ correct

e.g. to calculate the following $2^3 + 20 \div 4$

Without using BIDMAS

$2^3 + 20 \div 4$
$= 8 + 20 \div 4$
$= 28 \div 4$
$= 7$

✗ incorrect

By using BIDMAS

$2^3 + 20 \div 4$
$= 8 + 20 \div 4$
$= 8 + 5$
$= 13$

✓ correct

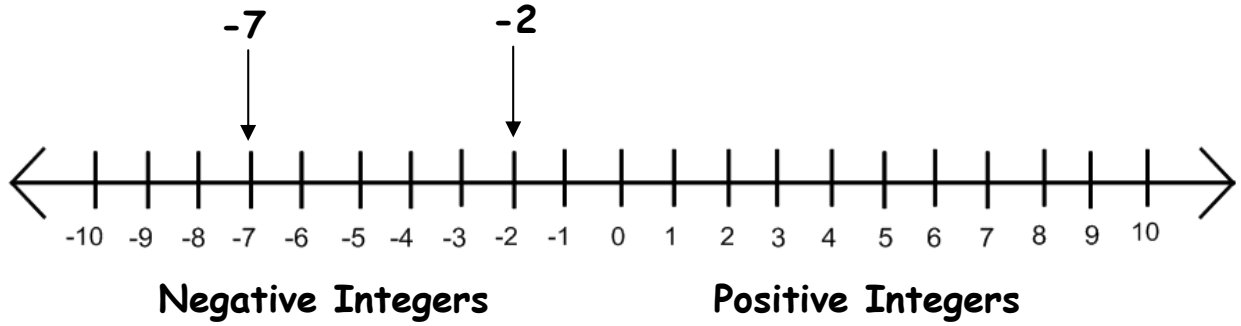
Negative Numbers

Vocabulary; minus, ascending, descending, integer (whole number)

The best way for pupils to understand the concept of negative numbers, is to use and refer to the number line.

Most subjects dealing with negatives will only need the pupils to be able to add and subtract negatives.

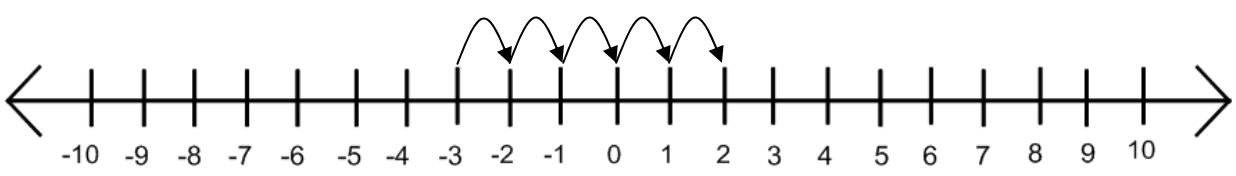
The number line helps pupils to realise that the furthest to the right the number is, the larger the number.



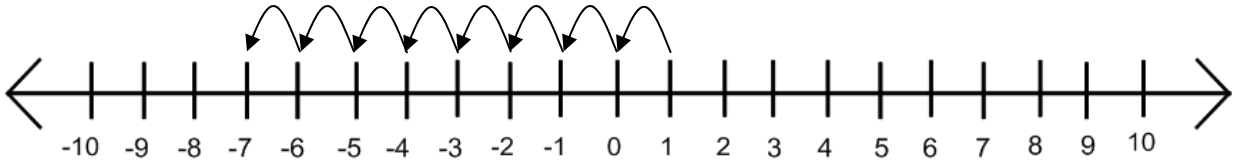
Despite 7 being bigger than 2, we see from the number line that -2 is **bigger** than -7.

When asked to add or subtract numbers which contain negative numbers we must remember that the first number tells us where we begin on the number line. If we are adding we move up the number line (to the right) and if we subtract we move down the number line (to the left).

e.g. **-3 + 5 = 2**



e.g. **1 - 8 = -7**



A common mistake with pupils is to take away the smallest number (ignoring where the - symbol is and the order of the numbers) away from the largest number, therefore read it from right to left to make it easier. Therefore they get the same answer for 2 different sums

7 - 2 = 5 and 2 - 7 = 5

✓ correct

✗ incorrect

Many pupils don't seem to understand that it's the symbol in front of the number (or term in algebra) which tells us if the number is positive or negative, not what symbol is after the number!

Double Symbols

Sometimes we come across two symbols right next to each other, without a number between them to separate them. When we come across these we must remember the rules below which allow us to **change the 2 symbols to 1 symbol**. If the symbols are the **same** then we change them to be a **plus**, if they are **different** we change them to be a **minus**.

Level 5

+ +	→ +
+ −	→ −
− +	→ −
− −	→ +

e.g. 3 + - 4 → 3 - 4 = -1

e.g. - 4 - - 7 → - 4 + 7 = 3

(notice how the minus in front of the 4 does not change because it's on its own)

"Mighty Minus" Always wins unless there's two!

Converting Units

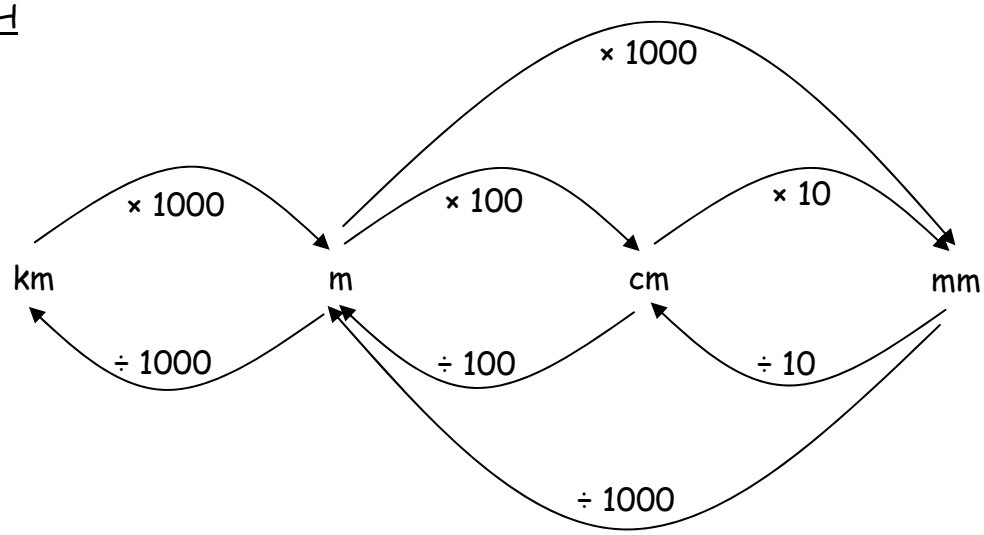
Level 5

Geirfa; kilo, centi, milli, metres, grams, litres, miles, inches, feet, pounds, ounces, stones, pints, gallons.

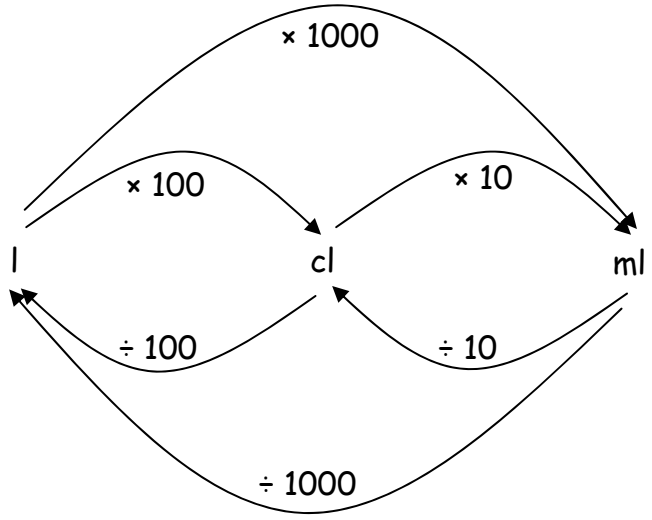
There are a variety of forms of measurements, imperial (old fashion) and metric (more common these days).

Converting the metric measurements are easy because all we must do is multiply or divide by powers of 10 e.g. 10, 100 a 1000, every time.

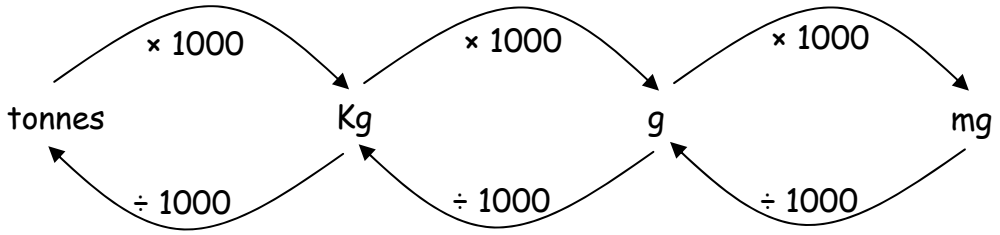
LENGTH



CAPACITY



Mass



Imperial Measurements

Unfortunately with imperial measurements we have to remember the relationship between them, this can be hard as there are so many.

Here's the main 4 we need to remember:

1 kg ~ 2.2 pounds
1 mile ~ 1.6 Km
1 litre ~ 1.75 pint
1 inch ~ 2.5 cm

Here are some other useful ones:

8Km ~ 5 miles	1 pound ~ 16 ounces	1 litre ~ 1.75 pint
1 foot ~ 30cm	1 stone ~ 14 pounds	1 gallon ~ 8 pint
1 yard ~ 90cm		1 gallon ~ 4.5 litre
		1 litre ~ 1000 cm^3

Calculating Averages

When dealing with data, more often than not , it is necessary for us to calculate averages and the range. These help us to compare two or more sets of data.
The averages are the **Mode**, **Median** and **Mean**.

Mode *(Modd)*

The most popular or common value or data.

e.g. Time it took Year 8 pupils to run the 100m (to the nearest second)

13 12 14 17 15 13 14 15 14 16 12 14

The modal value is **14** seconds (there are more 14's than any other number)

Median *(Canolrif)*

The middle value of a set of data after the data has been put in order.

Example 1

e.g. Number of hours of homework pupils have a week

5 4 8 4 6 5 8

Order data: 4 4 5 (5) 6 8 8

Median: **5** hours

Example 2

Sometimes we will get 2 values in the middle of the data (when there is an odd number of values in the data).

e.g. Number of hours of exercise the pupils do a week .

8 3 7 10 9 2 6 8

Order data: 2 3 6 (7 8) 8 9 10

The median is the value which is between these to values. We can calculate this by halving the sum of the 2 values e.g. $\frac{7 + 8}{2} = \frac{15}{2} = 7.5$

Median = **7.5** hours

Mean *(Cymedr)*

Mean = Total of the data values
Number of values in data

e.g. Year 9 Boys' shoe sizes

8 7 6 9 6 5 8 7 6 8

Total of the data values = 8 + 7 + 6 + 9 + 6 + 5 + 8 + 7 + 6 + 8
= 70

Number of values in data = 10

Mean = 70 ÷ 10 = **7**

Range *(Amrediad)*

Range = Largest Data Value - Smallest Data Value

Range is used to aid analysis of the *spread of data.*
Small Range - Consistent data
Large Range - Inconsistent data

e.g. Year 9 Boys' shoe sizes

8 7 6 9 6 5 8 7 6 8

Range = 9 - 5 = **4**

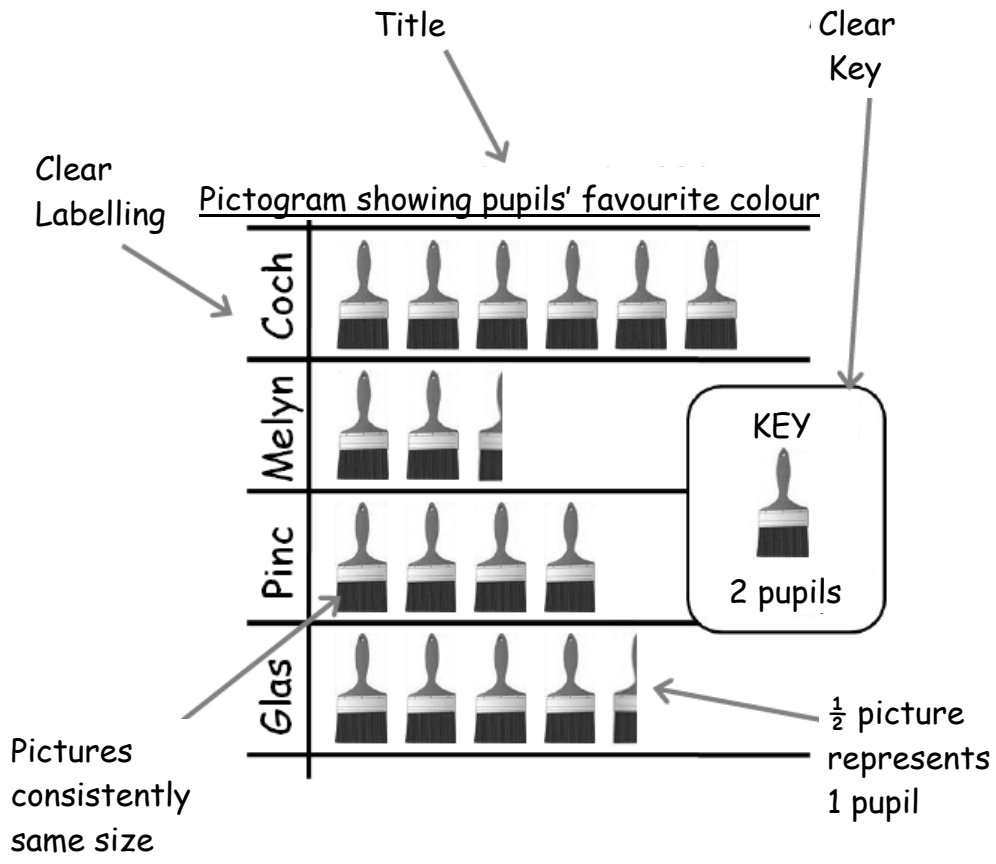
Handling Data

Pictogram

Level 3

To draw a correct Pictogram we must ensure that we

- contain a clear KEY which shows the value of each picture
- chose a relevant picture (a picture which is connected to the subject)
- only use this one picture
- keep the size of the picture consistent in the pictogram
- contain a title which describes the subject of the pictogram
- label each row clearly



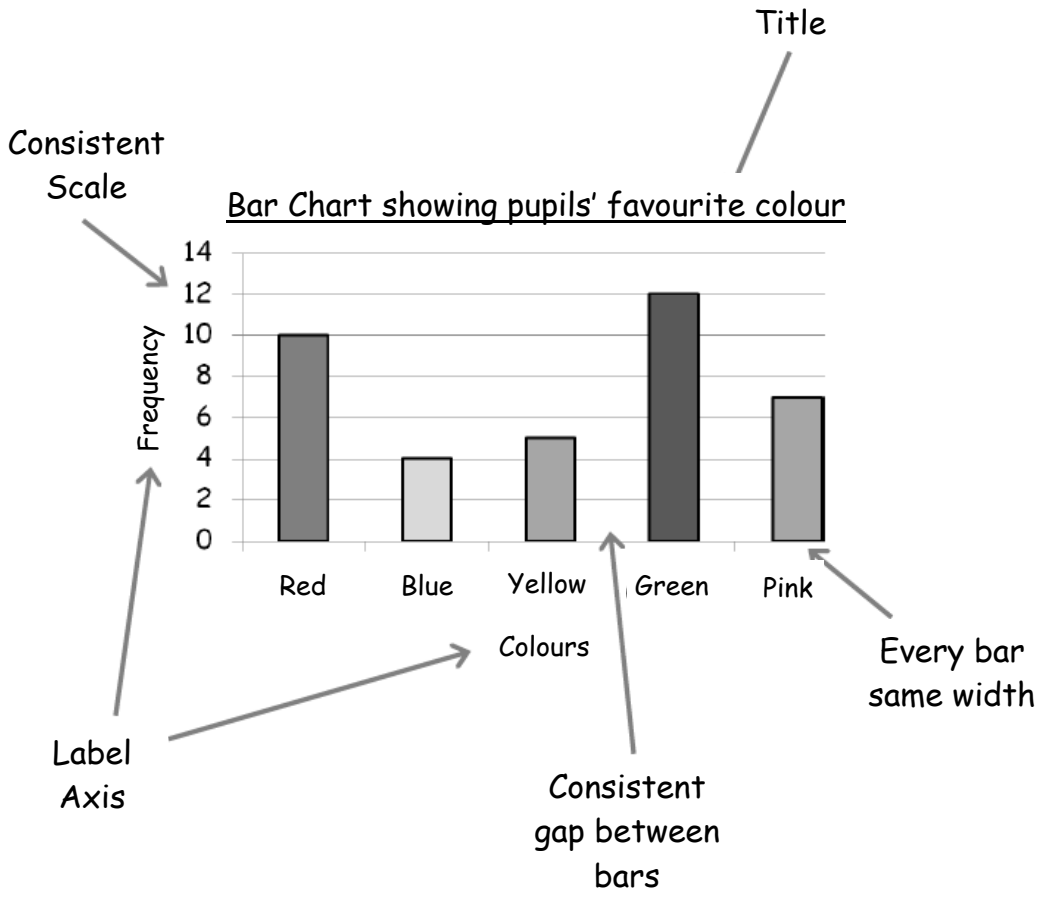
Bar Chart - Discrete Data

Level 3

To draw a correct bar chart for discrete data we must ensure that we

- use a pencil and ruler
- use squared or graph paper
- contain a title which describes the subject of the bar chart
- label the axis correctly
- keep the scale consistent (ensure one square represents same value every time)
- keep the width of every bar the same
- have a gap between every bar
- keep the size of the gaps between the bars the same
- note what each bar represents

FREQUENCY: Amount of pupils



Bar Chart - Continuous Data

Level 4

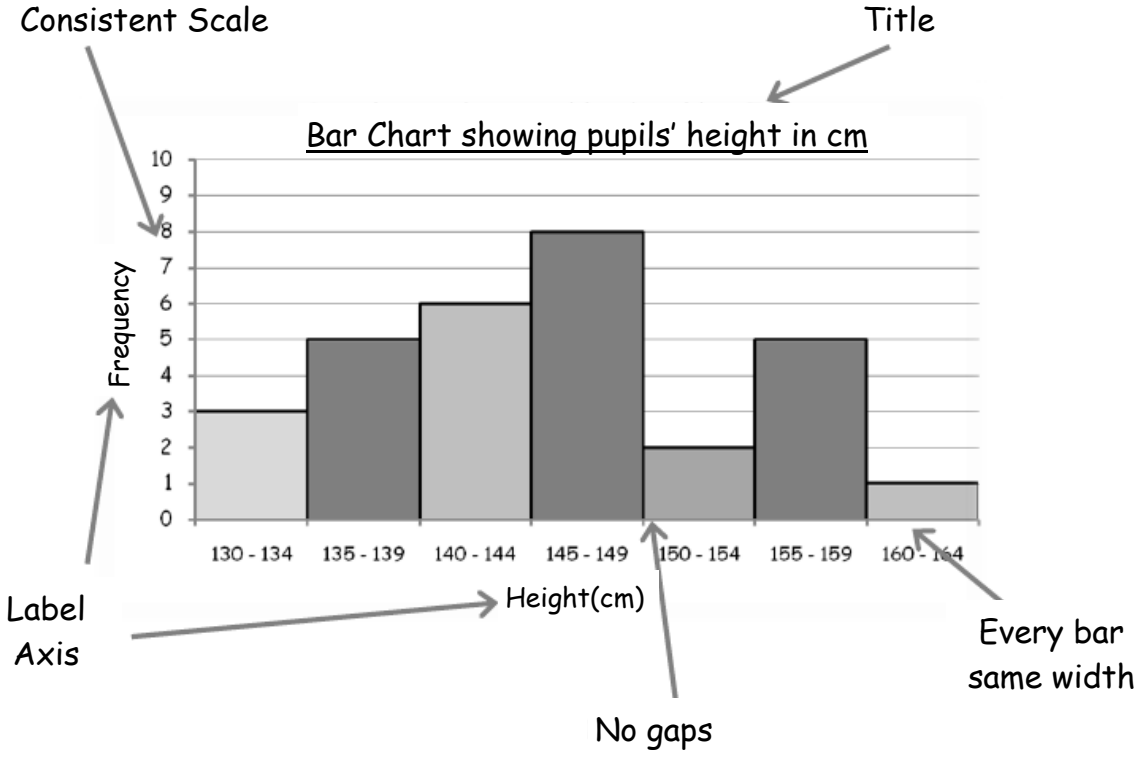
To draw a correct bar chart for continuous data we must ensure that we

- use a pencil and ruler
- use squared or graph paper
- contain a title which describes the subject of the bar chart
- keep the scale consistent (ensure one square represents same value every time)
- label the axis correctly
- keep the width of every bar the same
- **don't** put gaps between the bars
- keep every **class interval** equal in size
- note which group each bar represents

Every class interval is equal in size, all contain 5 values
130-134 (5 values)
135-139 (5 values) etc.

Result Table

Height (cm)	Frequency
130 - 134	3
135 - 139	5
140 - 144	6
145 - 149	8
150 - 154	2
155 - 159	5
160 - 164	1



Pie Chart

Level 6

To draw a correct pie chart we must ensure that we

- use a pencil and a ruler
- use a protractor
- contain a KEY
- contain a title which describes the subject of the pie chart

e.g. Frequency table showing how the pupils of 7 Iolo travel to school

Form of Transport	Frequency
Bus	25
Car	6
Walk	4
Train	1

Step 1: Count how many pupils took part in the survey
25 + 6 + 4 +1 = 36

Step 2: Calculate how many degrees represent 1 pupil.
Do this by dividing 360° by our answer to Step 1.
360° ÷ 36 = 10°

Step 3: Calculate the angle for each category

Bus: 25 × 10° = 100°
Walk: 6 × 10° = 60°
Car: 4 × 10° = 40 °
Train: 1 × 10° = 10°

} All angles add to 360°

Step 4: Draw the Pie Chart

Pie Chart which shows how the pupils of 7 Iolo travel to school