STUDLEY HIGH SCHOOL
AN ACADEMY TRUST SCHOOL – ALWAYS AIMING HIGHER

Numeracy Policy

Review Period: 2 yearly

Review By: Leadership Group & C&C

Contents:

Aim:

To enable teachers to have consistent expectations of pupils use and understanding of mathematics across the curriculum.

To promote the development of numeracy and more effective learning.

Purpose:

All staff to use the attached information to ensure that they have a shared expectation and pupils receive a consistent approach which enables them to use transferable knowledge, skills and understanding of numeracy in the areas of:

* graphical forms
* use of averages
* numerical methods, mental calculations and calculators
* algebra
* units of measure (including rate)

regardless of the curriculum area they are working in.

Guidelines

- All subjects will incorporate relevant aspects of the policy guidelines into schemes of work
- All subjects will use the agreed notation, formats and methods attached when relevant in their teaching.
- All teachers help to promote a positive attitude towards numeracy, by never saying "I'm no good at Maths", or similar, and having a logical "can-do" approach. Maths Staff will always be willing to support colleagues in an appropriate and timely manner.

Monitoring:

- Regular checks by the designated curriculum area numeracy representative that the formats and methods provided in the full numeracy policy are followed.

- Regular checks by the numeracy co-ordinator to ensure consistency in the implementation of the numeracy policy and to support curriculum areas to solve problems that arise.

- Numeracy Co-ordinator to monitor requests from staff for clarification of formats in order to identify any common CPD needs, discuss this with the Assistant Headteacher, Teaching and Learning and action appropriately.

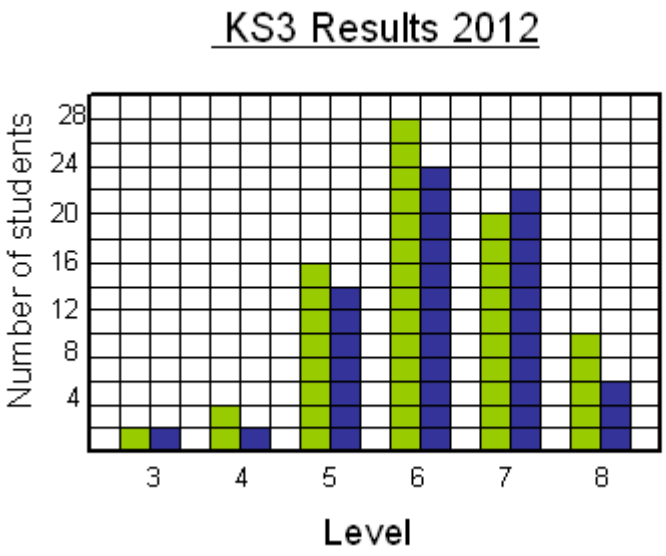
DISPLAYING INFORMATION IN GRAPHS AND CHARTS

All diagrams must have a title and be drawn using a pencil and ruler, unless IT is used.

Bar Charts

Key Features:

- Title
- Axes labelled, including units where appropriate.
- There should be gaps between bars when using discrete data (not length, time). On comparative charts it is more effective to have gaps between groups of bars so that the data can be more efficiently analysed.
- All bars are the same width
- Bars may be horizontal or vertical



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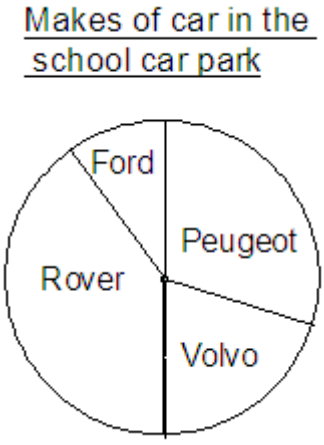

Pie Charts

Key Features:

- Title
- Sectors labelled
- Angle sizes not usually given but may be part of a calculation
- Small number of sectors (usually less than 8)

Line Graphs

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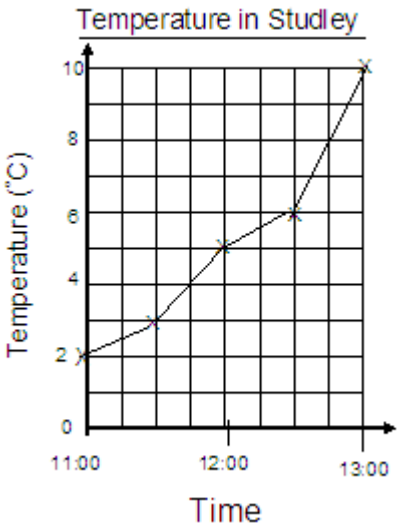
Key Features:

- Title
- Axes should be clearly numbered and labelled fully with units shown (e.g. time as horizontal axis for time graphs).
- Co-ordinates to be marked in pencil with a fine cross and joined using a ruler and pencil to 1 mm accuracy.

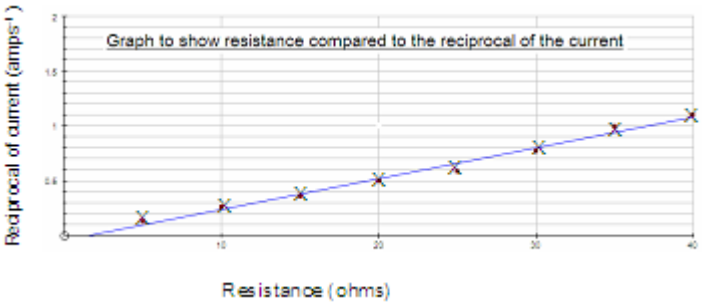


Scatter Graphs or Graphs for Experimental Data

Key Features:

The line of best fit rarely passes through the plotted points.

Maths draws a line of best fit. Science draws a line or curve depending on which is most appropriate.



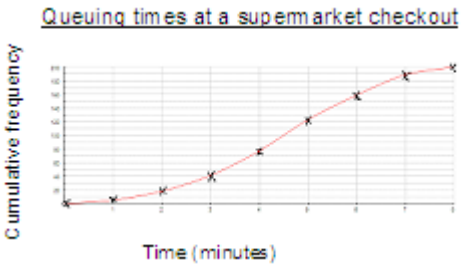
Curves

Key Features

Title

- Axes should be clearly numbered and labelled fully with units shown.

Co-ordinates to be marked in pencil with a fine cross and joined freehand with a single curve. A ruler must not be used to join crosses.



Averages

Students should be discouraged from using the word 'average' and should specify which average they are using.

In maths there are three measures of central tendency:

Mean – add the numbers up and divide by how many numbers there are
Median – the middle value in an *ordered* set of numbers
Mode – the most frequent number or item

Examples:

Mean is used when the data is numerical and the data is not too spread out.
Median is used when the data is fairly closely grouped but there are a few numbers that vary in size greatly from the majority of numbers.
Mode can be used when the data is non numeric as well as numeric.

Eg 1

Exam mark	15	16	17	18	19
Number of students	1	2	1	2	3

Individual results are 15 16 16 17 18 18 19 19 19
↑
Median = 18, Mode = 9,

Mean = $\frac{\text{Total of marks}}{\text{Total number of students}}$
= $\frac{157}{9}$
= 17.4

The mean would be the best average to represent this data as it uses every exam mark.

Eg 2 Value of houses in a street

£240 000 £240 000 £270 000 £300 000 £350 000 £2 200 000
↑
Median = $\frac{\text{£270 000 + £300 000}}{2}$
= £285 000

Mode = £240 000
Mean = $\frac{\text{Total value of houses}}{\text{Number of houses}}$
= $\frac{\text{£3 600 000}}{6}$
= £600 000

The median value of £285 000 would best represent this data as it is not affected by the extreme value of the most expensive house.

In Science it is standard procedure to remove anomalous results, those lying more than 2 standard deviations from the mean, from the data when calculating the mean.

NUMERICAL METHODS, MENTAL CALCULATIONS AND CALCULATORS

Numerical Methods:

Pupils should be discouraged from using the calculator for simple applications of the four rules of number + - x ÷. They should be encouraged to develop their own **mental calculations**, and pencil and paper methods. But in all written calculations involving **addition** and **subtraction** of number including easy decimals and money, digits

should be set out in columns according to place value. In long **multiplication**, multiplication by the units is carried out first or use grid method.

Examples: **addition and subtraction**

eg.1
34 + 123 + 5

```
  34
+ 123
+   5
 162
```

eg.2
23.06 - 2.15

```
 23.06
-  2.15
 20.91
```

multiplication

eg.3

```
  32
x 43
  96
1280
1376
```

eg.4

x	30	2	
40	1200	80	
3	90	6.	
	1290	+ 86	= 1376

Mental Calculations:

Main Uses:

Estimation, costs,

Key Features:

The use of mental calculations should be encouraged at all times.

For more demanding calculations a rough estimate should be made to determine the magnitude of the solution.

Examples:

Rounding of calculations such as 36÷ 4.8 to 40 ÷ 5, to get an approximate answer of 8
36÷ 4.8 ≈ 40 ÷ 5
8

USE OF CALCULATOR

Main Uses:

More complicated numerical calculations.

Key Features:

Use of the memory button or bracket buttons to limit effects of rounding on final answer.

To write down the method of calculation even when using a calculator to aid understanding of the process involved. Money answers are usually given to the nearest pence but where answers are found to be large or with a large number of decimal places they should be rounded to three significant figures at the end of the calculation unless it is clearly stated otherwise or depending on the accuracy of the data used.

Examples

1)

$$\frac{£127.36 \times 17}{19 - 2 \times 4} = \frac{2165.12}{11}$$

= 196.829
= £196.83

2)

$$\frac{12.86 \times 9.86}{5.47} = \frac{126.7996}{5.47}$$

= 23.180914
= 23.2

PERCENTAGES

Main Uses:

Mental calculations and writing one number as a percentage of another

Key Features:

All pupils are required to work out mentally at least simple percentages of numbers by the end of KS3

Examples:

For all pupils we use 10% and 50% as starting points.
For example 35% of 240: 10% of 240 = 24, 30% of 240 = 3 x 24 = 72 and 5% of 240 = 24 ÷2 = 12, so 35% of 240 = 72 + 12 = 84
We encourage pupils to estimate the answers first and check their answers against this.

2) The population of a village fell from 3170 to 2620 in 10 years. Calculate the percentage fall.
Actual fall = 3170 – 2620 = 550

$$\text{Percentage fall} = \frac{\text{actual fall}}{\text{Original population}} \times 100$$

$$= \frac{550}{3170} \times 100$$

= 17.35
= 17.4%

ALGEBRA

Main Uses:

Substitution into formulae.
BIDMAS (**B**rackets, **I**ndices, **D**ivide, **M**ultiply, **A**dd, **S**ubtract)
Rearranging formula

Key Features:

To encourage the writing out of the formula and to work down the page substituting in the numbers to the relevant places of the formula.
Encourage students to work out the calculation fully on paper, step by step, and remind them about the rules of BIDMAS

Examples:

1. v = u + at If u = 5, a = 10, t = 4, find v

v = u + at

v = 5 + 10 x 4

v = 5 + 40

v = 45

2. 16 + 2 x (3 + 7) – 3

16 + 2 x 10 – 3

16 + 20 – 3

33

3) v = u +at Make a the subject of the formula
Subtract u

v - u = at

Divide by t

$$\frac{v - u}{t} = a$$

UNITS OF MEASURE

Main Uses:

Distances on a map. Weighing of objects. Measuring of liquids. Use of time and lengths of time. Compound measures such as speed , forces and electricity. Metric/imperial conversions .

Key Features:

To always specify the unit of measure they are working in eg. inches, cm., m, km, etc.

To indicate the dimensions of their measure, cm, or cm^2 or cm^3.

To use approximate equivalents between imperial and metric units.

To use the notation km/h.

Examples:
How long is this line? Volume of liquid in a bottle is:

2.5 cm 300 ml or 300 cm^3

Speed of a train is 90 miles/h. (please note miles written as whole word so it doesn't get mixed up with metres)

Approximate conversions:

1m ≈ 3ft
1kg ≈ 2 lb not 1 kg = 2 lb

5miles ≈ 8km
1inch ≈ 2.5cm