WOODLANDS SCHOOL

NUMERACY ACROSS THE CURRICULUM POLICY

A whole school approach to mathematics

Procedure/Guidance
Policy Issued: February 2024
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Reviewed by: B Gandhi- Johnson
Date Reviewed: February 2024

Policies to be read in conjunction with this policy:

- Education – The Curriculum Policy
- Teaching and Learning
- Literacy Policy
- Digital Competency Policy

AIMS:

For each pupil to further develop mathematical skills through their application in all areas of the curriculum in order to promote better learning and to raise standards.

OBJECTIVES:

To promote a consistent and effective approach to supporting learning to allow all students to become:

Ambitious, capable learners - Ready to learn throughout their lives

Enterprising, creative contributors - Ready to play a full part in life and work

Healthy, confident individuals - Ready to lead fulfilling lives as valued members of society.

Ethical, informed citizens - Ready to be citizens of Wales and the world

IMPLEMENTATION:

This policy is a working document. It provides guidance to staff on the key areas identified in the objectives.

All staff are asked to support the development of numeracy skills by maximising opportunities for mathematics-related activities take place in *relevant* lessons. All staff are required to complete the 'Numeracy and Mathematics' curriculum map annually; indicating where their schemes of work and lessons cover numeracy skills across the curriculum.

Ninja Maths is also used alternate Tuesdays and Thursdays in assembly, with a visual assessment on the wall in the maths classroom. This is a 40 week programme with differentiated activities that get progressively harder as the programme develops.

Skillsheets are also differentiated and available for the less able students.

Cross- Curricular links prior to GCSEs

English:
Dates
Data Collection
Literacy incorporated in spellings of mathematical terms
Percentages of assessed work
Ordinal sequencing

Science:

Graphs
Data presentation
Formulae (e.g. Speed; Density; Force)
Reading scales
Units of measure
Negative numbers (temperature)
Averages

Humanities:
Dates/time
Chronological thinking
Number systems in different cultures
Co-ordinates
Scale drawing
Costings
Negative numbers (time lines with BC, sea level)
Data presentation, interpretation And collection
Populations
Direction

Catering:
Measures (units and conversions)
Reading scales
Proportion (ratio)
Time
Costing materials

Performance Arts and Music:
Rhythm
Money
Patterns
Sequences

P.E.
Distance (Units, estimation)
Time
Scoring

Art:
Scale drawing
Angles
2D and 3D shapes
Transformations (Reflection, symmetry, rotation, translation, enlargement)
Tessellations and similar shapes

ICT / Computer Science
Binary Code
Money
Percentages

SECTION A
Numeracy across the curriculum:

These are some of the transferable skills that are taught in maths, please read through and see how our maths teachers approach some of the things that you teach in your subject area. If there are other numeracy skills that you teach that are not included, please make us aware so this policy can be modified.

- **Basic Numeracy Skills**

As pupils work their way through the progression steps with at least some grounding in these areas, we do not try to teach new methods unless the pupil is having difficulties. We advocate using differentiated methods of calculations. This means that pupils may use a range of different methods to achieve the same solution. Here are some of the main examples you may see/ can remind pupils of:

Addition

- Mental methods: including counting on to the next ten, counting up in multiples of ten then adding any remaining units.

- Traditional algorithm: Numbers in correct place value columns added from right to left, "carrying" as they go.

E.g. 457 + 126 = 583 (1)

2.7 + 3.54 would give 2.7 + 3.54 = 6.24

Please note the extra zero may be added to prevent confusion

Subtraction

- Mental methods: including adding on to the target or pairs of number bonds

- Number lines: Pupils count on in jumps then add all the jumps together

E.g. 572 – 314

6 + 80 + 100 + 72 added = 258

- Traditional algorithm: Numbers in correct place value columns subtracted from right to left, "borrowing" if needed.

E.g.

$5\,\overset{6}{\cancel{7}}\,{}^{1}2$ take away 4 can't be done so borrow from the 7

$-\,3\;1\;4$ now we have 12 take away 4 which is 8. Next step

$2\;5\;8$ is 6 take away 1 which is 5.

Please note that for decimals, adding zeros is vital to prevent confusion. The biggest "number" goes on top, but we always subtract the bottom number from the top, even if the top digit is smaller.

Multiplication

- Mental methods: Involve strong number bonds, pupils split numbers into component parts, jottings may help.

E.g. 14 x 9 10 x 9 = 90 then 4 x 9 = 36. 90 + 36 = 126

- Breaking it down: This is just any formalised list of the above

E.g. 28 x 41 10 x 41 = 410 so 20 x 41 = 820.
8 x 41 is 8 x 40 (320) + 8. Total = 820+320+8 = 1148

- Box method: This is a more organised way of breaking down the sum into component parts

E.g.

	20	8
20	800	320 40
8	20	8 1

Add together to get 1148

Pupils fill in the grid then add down the diagonals, carrying as usual.
This works well with decimal multiplication.

- Traditional algorithm: Also known as “Long Multiplication”. Pupils often forget to put the automatic zero in so lose place value.

```
  2 8
x 4 1
  2 8      Multiply each part of the top row by 1, units first.
3 2 0      Multiply 40 by the units on the top (like 4 x 8 but add a 0)
8 0 0      Multiply 40 by tens on top (like 4 x 2 but add 2 0's)
1 1 4 8    Add to find the answer.
```

Division (for any of the division methods, pupils may be encouraged to write their tables to help them.)

- Long division: “bus stop”

E.g. 2 3 2 ÷ 8

```
      0 2 9
   ┌──────
8  │2 3 2
   1 6        How many 8's in 2? None, how many in 23?
   ─────      2 lots of 8 is 16.
   0 7 2      23 – 16 is 7, then bring down the 2
     7 2      How many 8's in 72? 9. Check.
   ─────
       0      Answer is 29.
```

- Short division: Similar to long division but uses carrying and remainders rather than writing out each row. With answers involving decimals, pupils must add extra zeros to the question, continuing to divide until it truncates or a pattern is spotted.

E.g. 2 3 2 ÷ 8

```
     0  2  9
   ┌──────
8  │ 2 ²3 ⁷2
```

E.g. 374 ÷ 6

```
     0  6  2 .3  3
   ┌──────
6  │ 3 ³7 ¹4 .²0 ²0
7
```

The pattern continues so the answer is 62.3 recurring.

- Chunking: This is like repeated subtraction. Pupils take out lumps they know and record how many lumps they have taken away. Harder to use with decimals.

E. g. 978 ÷ 6

```
  9 7 8
- 6 0 0        100 lots of 6
  3 7 8
- 3 0 0        50 lots of 6
    8 8
-   6 0       10 lots of 6
    1 8
  - 1 8        3 lots of 6
      0
```

How many lots of 6?
100+50+10+3 = 163

(ans)

SECTION B

- **Data Collection and Presentation (Humanities, science, PE etc)**

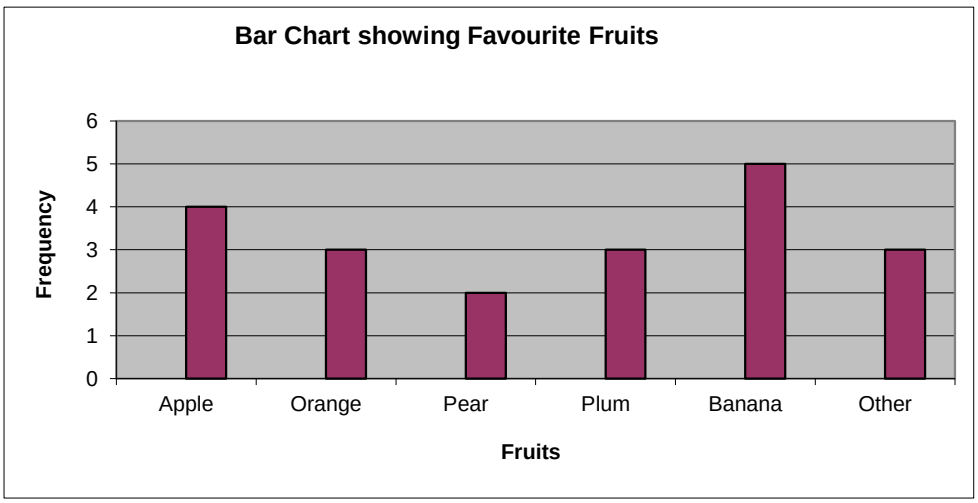
Frequency tables (tally charts):

	Tally	Frequency
	𝍸	5
	Total	

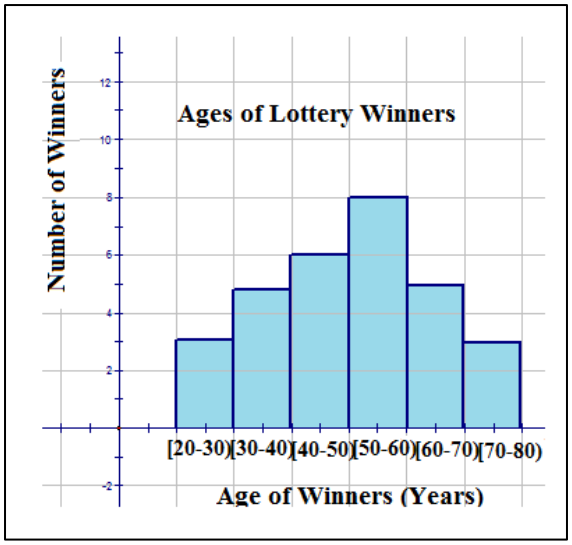
Please encourage the use of the word “Frequency” and the inclusion of a “Total” box.
We tally in-groups of 5.
We try to include a category for “other”

Bar Charts:

This is discrete data in this Bar Chart:



Please note pupils are asked to label axes and give titles.
Bar charts with continuous data must have bars touching.
Grouped data bar charts must have no gaps and no overlap.

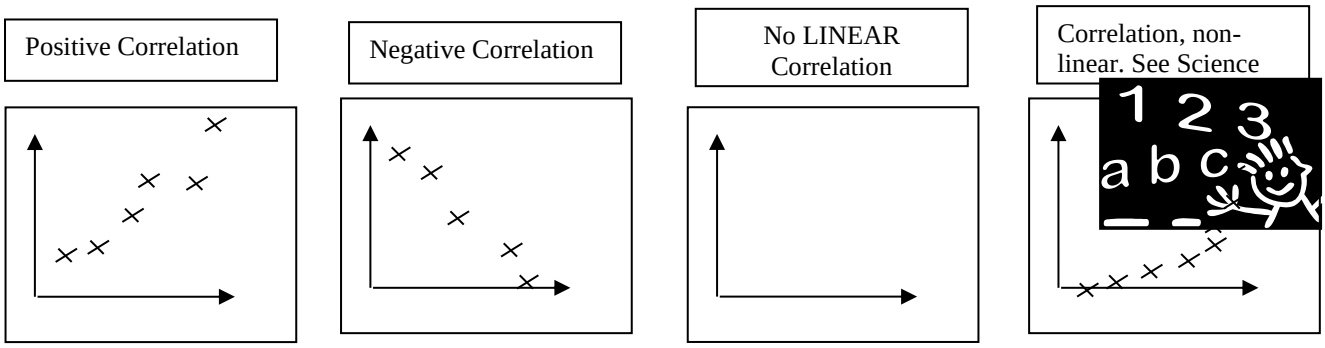


This is time continuous data

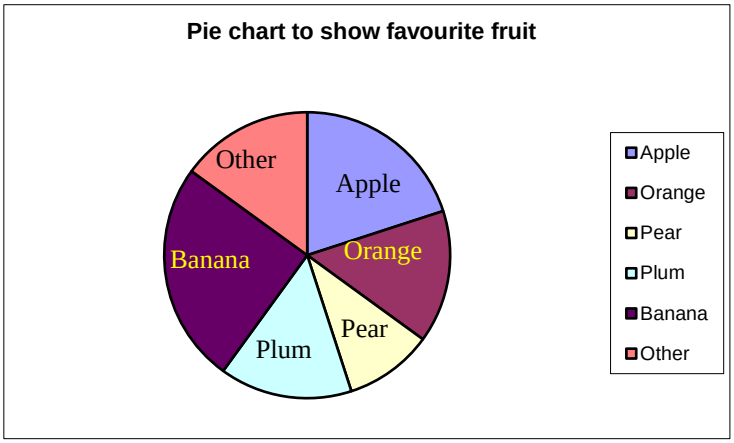
Scatter Diagrams:

Pupils are taught about positive, negative and no correlation.
Use of a line of best fit is introduced in year 8. In maths these lines tend to be straight be we do try to mention that this might not always be the case in science, as is normally a curve.

Dots should not be joined unless pupils are looking at frequency polygons but if that is the case then emphasise the mid values may not be relevant.



Pie Charts:



Again, please emphasise the title and labels. Sectors are usually labelled directly however they may be done in the form of a key if the pupil prefers.

However, we place great emphasis on the workings and most marks awarded in maths exams are not for the actual drawing (although that needs to be +/- 2 degrees).

Fruit	Frequency	Workings	Angle
Apple	4	4 x 18	72
Orange	3	3 x 18	54
Pear	2	2 x 18	36
Plum	3	3 x 18	54
Banana	5	5 x 18	90
Other	3	3 x 18	54
Total	20		360

360° ÷ 20 = 18° each

◊ **Units of Measure (Design, Science, PE, Art etc)**

In maths we teach pupils the following (Some are approx.):

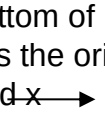
	Length	Mass	Capacity
Metric	10mm = 1cm 100cm = 1 metre 1000mm = 1 metre 1000m = 1 km	1000mg = 1 gram 1000g = 1kg 1000kg = 1 tonne	1000ml = 1 litre 100cl = 1 litre
Imperial	12 inches = 1 foot 3 feet = 1 yard 1760 yards = 1 mile	16 ounces = 1 pound 14 pounds = 1 stone	8 pints = 1 gallon
Metric/Imperial	2.5cm = 1 inch 30cm = 12 inches (foot). (long ruler) 1 yard = 0.9m 1 mile = 1.6km 5 miles = 8km	28 grams = 1 ounce 2.2 lb. = 1kg 1 ton = 1 tonne	“A litre of water be a pint and ¾” 4.5 litres = 1 gallon

- **Time (Science, PE, Art and Design etc)**

Pupils are taught:

- Reading time and filling in clock faces of given times, both traditional and digital.
  E.g. twenty to nine = eight forty
- Changing between am/pm and 24 hour clock is covered.
  E.g. 05:16 = 5.16am, 21:50 = 9.50pm (please note the use of 4 digits and a colon in 24-hour clock)
- Changes in time/ passage of time.
- The boys have been and are briefly introduced to decimal time
  E.g. 3.2 hours = 3hours and 12 mins **not** 3hours and 20mins.
- Reading timetables using both 12 and 24 hour times

- **Co-ordinates (Geography, Science etc)**

- Emphasis must be on labelling lines not spaces. This may confuse pupils when they are labelling the bottom of bar charts.
- The point (0,0) is referred to as the origin.
- Axes should always be labelled x  and y

- Helpful memory tricks include “x is a type of cross so goes across”, “The tail of the y goes down”
- Pupils should write co-ordinates with brackets and a comma e.g. (9, -3). The first co-ordinate is the x value, the second is the y value. Pupils may use things such as “along the corridor then up the stairs” or “x is first in the alphabet” to help them remember the order.

- **Negative Numbers (Science, Humanities etc)**

Pupils should be able to…
- Order numbers including negatives
- Use inequality symbols with negatives (< and >)
- Use negative numbers not only with temperature but also with money, sea levels and co-ordinates
- Draw and use number lines
- Find differences between numbers including negatives
- Rules of operations with negative numbers
- Using indices with negative numbers

- **Averages (Science, Humanities, PE etc)**

Mean, median and mode are formally taught, as is the range.
- Mean = Total of all values/ number of values

- Median (odd) = Middle value, when values are in order
- Median (even) = Half way between 2 middle values, when in order
- Mode = Most common value (Modal group)
- Range = Largest value – Smallest value. This is given as a single number, not a spread!

MODE
O
S
T

MEAN
V
E
R
A
G
E

E.g. 6, 2, 9, 3, 4, 2, 0, 2

Mean = $\frac{6+2+9+3+4+2+0+2}{8 \text{ values}} = \frac{28}{8} = 3.5$

Median = 0, 2, 2, 2, 3, 4, 6, 9 = between 2 and 3 = 2.5

Mode = 2 as there are 3 numbers with this value.

M
MEDIAN
D
D
L
E

- Pupils will calculate averages from frequency tables, this can be used to calculate average word length in given paragraphs.

E.g.

No. Letters per word	Frequency	Workings (total number of letters)
1	5	1 x 5 = 5
2	8	2 x 8 = 16
3	13	3 x 13 = 39
4	10	4 x 10 = 40
5	8	5 x 8 = 40
6	6	6 x 6 = 36
Total	50 words	176 letters

Mean = $\frac{\text{Total letters}}{\text{Total words}} = \frac{176}{50} = 3.52$

Mode = 3 letters as it has the greatest frequency

Median = Where is the middle word? Words 25 and 26 fall in the 3 letters category.

……

I can confirm that I have read and understood this policy.

Signed: Directors Date

Chair of Governors Date

Headteacher Date

I can confirm that I have read and understood this policy.

Name (print):	**Signature:**	**Date:**
M. Zawistowska		
Raseeta Williams		
Karen Harper		
Tanya Rose		
Chris Wharton		
Claire Walkden		
Steve Bloore		
Harry Bartlem		
James Hughes		
Mel Davies		
Caitlin Hughes		
Anthony Jackson		
Rob Campbell		
Sam Senior		
Vicky Jones		
Ian Smith		
Natalie Hughes-Evans		