Whole School Numeracy Policy

Accepted by: Board of Directors May 2013
Lead Reviewer: Head of Mathematics
Review Cycle: 1 Year
Last reviewed: September 2021
Date for next review: September 2022

Our Mission Statement

Hurworth School is committed to raising the standards of numeracy of all its students, so that they develop the ability to use numeracy skills effectively in all areas of the curriculum and the skills necessary to cope confidently with the demands of further education, employment and adult life. There has been a significant disruption to the learning during the academic years 19/20 and 20/21 and we have systems in place to combat this.

NUMERACY ACROSS THE CURRICULUM

Definition of Numeracy

Numeracy is a proficiency which is developed mainly in mathematics but also in other subjects. It is more than an ability to do basic arithmetic. It involves developing confidence and competence with numbers and measures. It requires understanding of the number system, a repertoire of mathematical techniques, and an inclination and ability to solve quantitative or spatial problems in a range of contexts. Numeracy also demands the understanding of the ways in which data are gathered by counting and measuring, and presented in graphs, diagrams, charts and tables.
(*Framework for Teaching Mathematics – Years 7 to 9 – DfES*)

Rationale

Hurworth School is committed to raising the standards of numeracy of all pupils so that they further develop the ability to use numeracy skills effectively in all areas of the curriculum.

We believe that staff and pupils appreciate consistency of approach and benefit from links being made across the curriculum.

Improved numeracy skills will benefit their learning in other subjects and they will become more confident using numbers in context and in handling data as well as describing, explaining and justifying their thinking.

Aims of a whole school numeracy policy

1. To ensure consistency of practice including methods, vocabulary, notation etc. within the mathematics department and across all other departments
2. To encourage the teaching of mathematics through relevant activities in a variety of curricular context.
3. To indicate areas for collaboration between subjects
4. To develop, maintain and improve the numeracy across the school
5. To assist the transfer of mathematical skills to other subjects and apply problem solving techniques.
6. To reduce the replication of work by teachers and pupils.
7. To improve teacher confidence

Teachers of Mathematics will:

1. Deliver the National Curriculum knowledge, skills and understanding through the Numeracy Strategy Framework
2. Ensure consistency in the Mathematics Department.
3. Provide advice to other subjects to develop and maintain a consistent approach across the curriculum.
4. Provide information and support to other subject teachers on expectations and difficulties likely at different stages of age and ability
5. Through liaison with other teachers attempt to ensure that pupils have appropriate numeracy skills by the time they are needed for work in other subject areas.
6. Incorporate examples from other subjects into mathematics scheme of work to help them to realise that the same skill is being used

Teachers of other subjects should:

1. Ensure they are familiar with correct numeracy language and notation, conventions and techniques relating to numeracy in their own subject.
2. Be aware that pupils may not have met skills earlier in their Mathematics lessons. If this is the case, consult with the maths department before teaching a new technique.
3. Be aware of appropriate expectations and difficulties that might be encountered with numeracy skills for the different abilities.
4. Provide up to date information on the stage at which specific numeracy skills are required.
5. Provide up to date examples of subject application of numeracy to the mathematics department for use in maths lessons

Pupils will:

1. Use correct mathematical vocabulary, notation and presentation in both oral/written work. Present and interpret appropriate graphs/tables/charts.
2. Be able to transfer their knowledge, skills and understanding between subjects.
3. Benefit from a consistency of approach.

Areas of collaboration

Mental arithmetic techniques
Written calculations
Use of calculators
Vocabulary
Measures
Handling data
Specifically, the use of Mathematics in Science.

KS3 Numeracy Catch Up
Year 7 students, medium/lower attainers in Year 8 and Year 9 have an additional Maths lesson every fortnight where they focus on key numeracy skills. Our lowest attainers in Year 7 and Y8 follow an amended curriculum.

The Numeracy Handbook will contain

Whole school Numeracy policy
Topics requiring numeracy skills
Guidance to include approach, method, vocabulary and presentation.
Examples from other curriculum areas to be included in the Mathematics Scheme of Work

Examples of standard written methods and notation for number and algebra.

Number & Algebra

Pupils entering at level 4 and above should know their tables up to 10 x 10.
A variety of formal and informal methods of calculation may be used as appropriate.
At both KS3 and KS4 pupils will be expected to use calculator and non-calculator methods.
Any non-calculator method is acceptable but estimation (to one significant figure) is a prerequisite.

Addition:

Maths SOW Y7(Transition Unit and a skill revisited throughout the curriculum)

324 + 49
= 364 + 9
= 373

```
 324
  49 +
 373
  1
```

Subtraction:

Use decomposition for formal method.

Maths SOW Y7(Transition Unit and a skill revisited throughout the curriculum)

324 – 49
= 324 – 50 + 1
= 374 + 1
= 375

```
  5  1  7  1
  6  4  8  2
  7  6  5  -
-------------
  5  7  1  7
```

Multiplication:

2 grid methods use if difficulty with formal method

Maths SOW Y7(Transition Unit and a skill revisited throughout the curriculum)

654 x 27

	600	50	4	
20	12000	1000	80	→ 13080
7	4200	350	28	→ 4578
				17658

	6	5	4	
	1	1	0	2
1	2	0	8	
	4	3	2	
7	2	5	8	7
	6	5	8	

Answer = 17658

```
  6 5 4
    2 7 x
-----------
1 3 0 8 0    (654 x 20)
  4 5 3 7 2  (654 x 7)
-----------
1 7 6 5 8
```

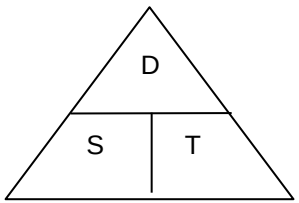
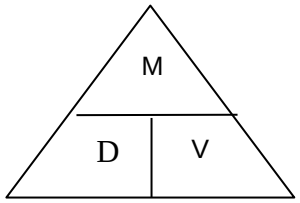
Division: Primary strategy uses chunking – (Repeated subtraction) **Maths SOW Y7(Transition Unit and a skill revisited throughout the curriculum)**	**Short Division** 4 5 r 4 7) 3 1 3 9 **Chunking** 7) 319 280 – 40 x 7 39 35 5 x 7 4 Answer 45r4 **Long Division** 36 17 | 6 1 2 5 1 (3 x 17) 1 0 2 1 0 2 (6 x 17) 0
Decimals: Apply + extend rules for whole numbers **Maths SOW Y7 (unit 6), SOW Y9 (unit 1 / 5)**	23.4 x 4.5= 234 x 45 ÷ 100 For + and – keep figures in correct columns with decimal points underneath each other.
Fractions: Non Calculator **Maths SOW Y7 (unit 3), SOW Y9 (unit 1 / 8)** Calculator	To work out ¾ of 240 ¼ of 240 = 240 ÷ 4 = 60 ¾ of 240 = 3 x 60 = 180 To find one quantity as a fraction of another What fraction of the class is left handed? e.g. 5 - number who are left handed. 28 - total number of children Fraction key on scientific calculator $a\frac{b}{c}$ or $\square\!\!\square$ To key $3\frac{4}{5}$ **Press** 3 $a\frac{b}{c}$ 4 $a\frac{b}{c}$ 5 screen reads 3⌋4⌋5
Percentage: **Maths SOW Y7 (unit 8), SOW Y9 (unit 5H) / Y10 (unit 1F)**	All non-calculator methods based on 50%, 10%, 1% **Non-calculator method** To find: 61% of £64 50% of £64 = £32.00 10% of £64 = £ 6.40 1% of £64 = £ 0.64 61% of £64 = £39.04 **Calculator method** To find: 61% of £64 = 0.61 x £64 = £39.04

Ratio: **Maths SOW Y8 (unit 9), SOW Y10 (unit 1H or 6F)**	2m is to 50cm = 200:50 = 4 : 1 Map Scale 1:100 000 Ratio 1:m or m:1
Large numbers: **Maths SOW Y8 (unit 10), SOW Y9 (unit 8H)/SOW Y10 (unit 10F)**	Use spaces to emphasise place value of large numbers. Do not use commas 4 525 000 **not** 4,525,000 **Calculator** A calculator may convert a large number to standard form. 4 525 000 x 3 450 may produce $1.561\ 125^{10}$ or 1.561125. 10 which means $= 1.561\ 125 \times 10^{10}$ = 15 611 250 000
Estimation and approximation: **Maths SOW Y7 (unit 6), SOW Y9 (unit 1/5)**	Rounding – Need to consider appropriate accuracy for the context. Rounding to nearest pence for money (2 decimal places) Centimetre – 3.6cm (1 decimal place) etc For all estimation round to 1 SF before calculating e.g 39.5 x 2.31 ÷ 0.17 ≈40 x 2 ÷ 0.2 $= \frac{80}{0.2} = \frac{800}{2} = 400$
Money: **Maths SOW Y7 (unit 6), SOW Y8 (unit 8/1)**	225p = £2.25 Not £2.25p £3.50 Not £3.5
Order of operations: **Always used.** **Maths SOW Y7(Transition Unit and a skill revisited throughout the curriculum)**	Brackets → indices → ÷ & x → + & - Abbreviated to: B I D M A S 8 – 3 x 2 = 8 – 6 = 2 **NOT** 8 – 3 x 2 = 5 x 2 = 10. This is incorrect
Formula: **Maths SOW Y7 (unit 2,5 and 8), SOW Y10 (3H or 4F)**	A formula must have 2 sides ? = ? Write formula v = u + at Show values to be substituted u=6.8m/s, a=14m/s², t=25s Substitute terms for values v=6.8+14x25 Calculate v=356.8 Round to appropriate accuracy Include units v=357m/s Use estimation to check if answer is sensible v=7+10x30 v ≈ 307

Shape, space and measure

Examples of standard written methods and notation for measure		**Other subjects**
Measures: Length **Maths SOW Y7 (unit 5). SOW Y8 (unit 8)**	mm, cm, m, km, microns	**DT**: All length measurements in mm **DT:** Resistant materials – measuring area & volume
Area **Maths SOW Y7 (unit 5), SOW Y9 (unit 6)**	mm^2, cm^2, m^2 (square metres) hectare (ha) 10 000m^2 ▪ for 3cm^2 accept 3 square cm or 3 cm squares, ▪ but <u>not</u> 3cm squared	
Volume **SOW Y8 (unit 8), SOW Y10 (unit 6H or 3F)**	▪ mm^3, cm^3, m^3 (cubic metres) ▪ for 3cm^3 accept 3 cubic cm or 3 cm cubes, ▪ but <u>not</u> 3cm cubed	**PE**: Health related fitness (VO2 Max) GCSE / BTEC Respiratory system
Mass **SOW Y8 (unit 11), SOW Y10 (unit 8F)**	mg, g – gram, kg – kilogram, t – tonne	**DT**: grams for weight **MFL:** shopping in kg/½kg **PE**: Body Mass Index, weight of shots etc.
Capacity **SOW Y8 (unit 11), SOW Y10 (unit 8F)**		

	ml, cl – centilitre, l – litre	**DT**: ml for liquid **DT:** Interpolating a scale **PE**: Respiratory system, Circulatory system
Imperial units **SOW Y8 (unit 11), SOW Y10 (unit 8F)**	pounds – lb, ounce – oz, foot – ft, mile, pint, gallon *no plural for abbreviated units	
Metric / Imperial conversions **SOW Y8 (unit 11), SOW Y10 (unit 8F)** Currency conversion – different ones	Pupils at L5+ in maths should know common equivalent units 2.54 cm ˜ 1 inch 8 km ˜ 5 mile 1 gal ˜ 4.5 litres 1 kg ˜ 2.2 lb	**DT:** 25.4mm = 1inch 1.0936yd = 1metre 0.6214km = 1mile 4.546lites = 1 gallon 28.4125ml = 1fl oz 28.35g = 1oz 2.20462lb = 1kg $((^0C/5)*9) + 32 = {}^0F$ **MFL:** Currency conversion i.e. Euro/sterling
Standard notation for time	12 – hour clocks need am and pm. e.g. 5.30pm, 2.15am	**MFL:**Both analogue & digital taught in French & German

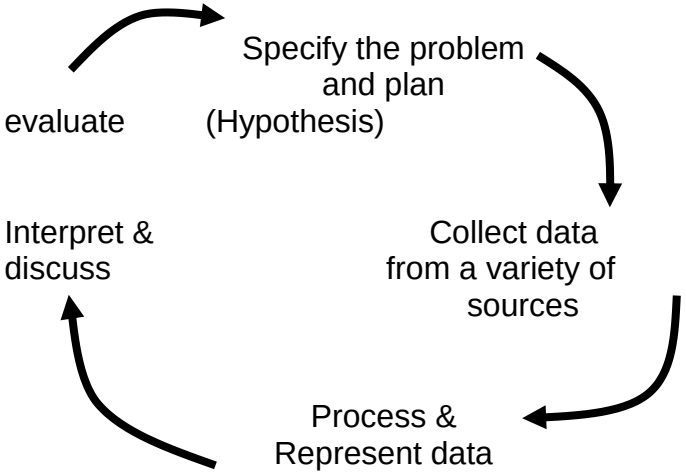
SOW Y8 (unit 11), SOW Y10 (unit 8F)	24 hour clocks e.g. 17:30 , 02:15 Abbreviations: seconds (s), minute (min), hour(h) Many pupils treat time as a decimal quantity e.g. wrongly assuming that 2h 30min is the same as 2.3 hours no plural for abbreviated units	*In German – half past is half to i.e. halb eins is actually half to one so in effect half past 12 **PE:** Timing of games / tasks / matches Track Athletics Taking Pulse
Compound measures **SOW Y8 (unit 11), SOW Y9 (unit 8)** **Kinematics** **SOW Y10 (unit 3H) or SOW Y10 (unit 4F)**	Average speed 12 mph or 15m/s Density g/cm³ or kg/m³ ▪ use 'p' for 'per' or use / meaning 'for every'   D = S×T D = $\frac{M}{V}$ Kinematics equations v = u + at	**PE:** Heart rate (in beats per minute) **DT:** gsm paper **Science:** Used frequently and need to be rearranged depending on what calculations are required. **Science (Physics):** These equations are used to calculate the time, velocity,

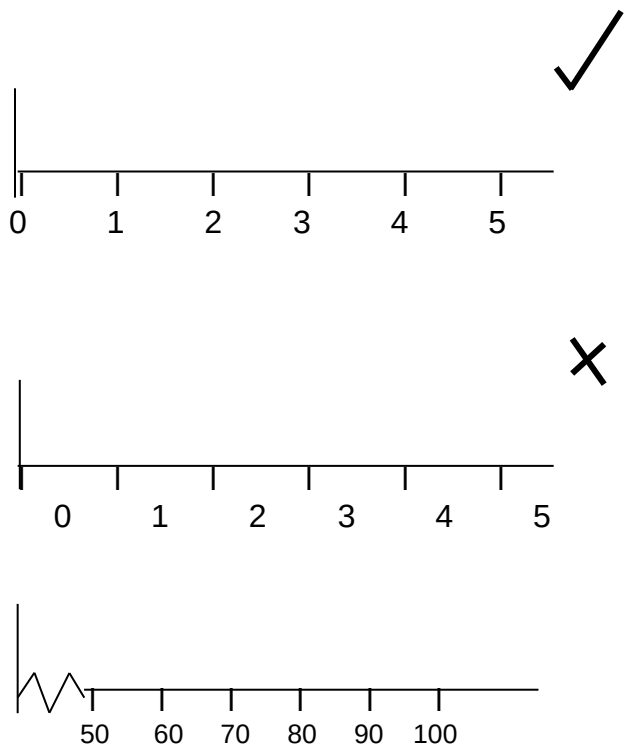
	$s = ut + \frac{1}{2} at^2$ $v^2 = u^2 + 2as$	displacement or acceleration of an object moving uniformly.
Degree of accuracy **SOW Y7 (unit 6)**	Draw lines to ± 1mm Draw lines to ± 1^o	**PE:** Measuring in athletic field events
Ratio & Proportion **SOW Y8 (unit 9), SOW Y10 (unit 1H or 6F)** **SOW Y10 (unit 9H)**	Ratio Proportion Map scales	**DT**: Changing a recipe E.g. for 4 people to 10 people (a) Reduce to 1 person by dividing (b) Multiply by the amount needed (c) Rounding off acceptable **Geog:** Map scales and ratio

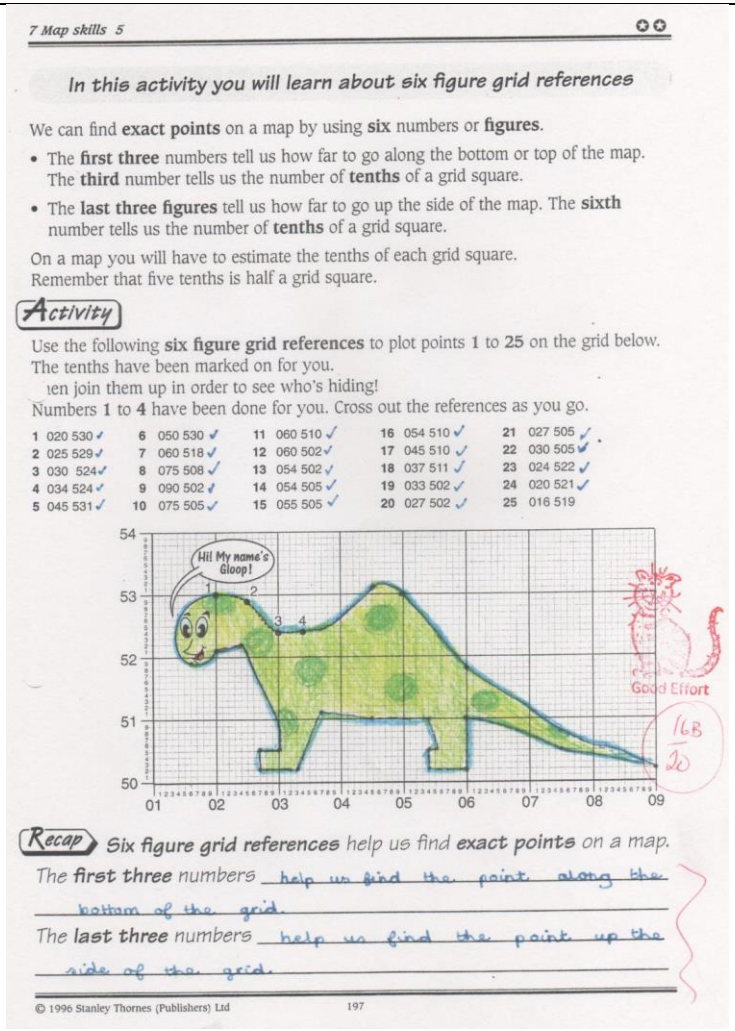
Shape **Maths SOW Y7 (unit 5), SOW Y9 (unit 6)** **SOW Y8 (unit 8), SOW Y10 (unit 6H or 3F)**	Encourage correct use of vocabulary for 2D and 3D shapes (see appendix) e.g. Rhombus NOT diamond Rectangle NOT oblong Distinguish between cube and cuboid	**PE:** Shapes of grids, pitches etc. Formation in dance / gym **DT:** Pizza boxes, Money boxes
Standard formulae **Maths SOW Y7 (unit 5), SOW Y9 (unit 6)**	Circumference = π x diameter Area rectangle = l x w Area circle = πr^2 Volume = area of cross section × height	**PE:** Calculating maximum heart rate and BMI **DT:** Circumference, length and area of various shapes. **Science:** Use several and need to rearrange them.

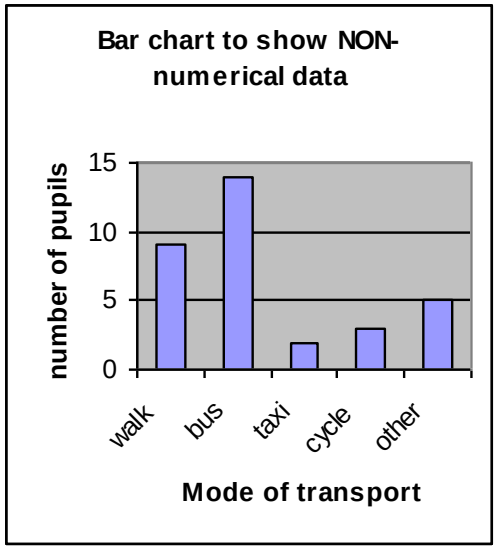
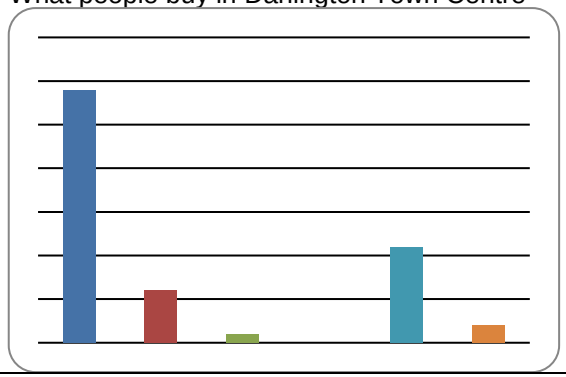
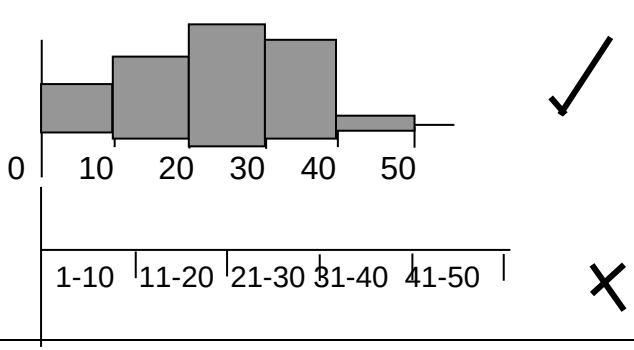
Transformation of shape **Maths SOW Y8 (unit 4), SOW Y9 (unit 9)**	ENLARGEMENT Described by scale factor which can be: • Positive • Negative • Fraction TRANSLATION, REFLECTION, ROTATION	**DT**: scale factor is an amount by which something is enlarged. Scale factor 4- 4 x longer, wider, heavier **ART:** Link perspective to development of enlargement & scale factor **ART:** Tessellations of Escher linked to transformations
Drawing shapes **Maths SOW Y7 (unit 5), SOW Y9 (unit 6)** **SOW Y8 (unit 8), SOW Y10 (unit 6H or 3F)**	2D representations of 3D drawings	**DT:** Isometric drawings, plan & elevation to scale
Angles **Maths SOW Y8 (unit 1), SOW Y9 (unit 3)**	Calculating & measuring Bearings – compass & 3-figure	**PE:** compass bearing and orienteering **DT:** measuring 90 and some calculations at KS4

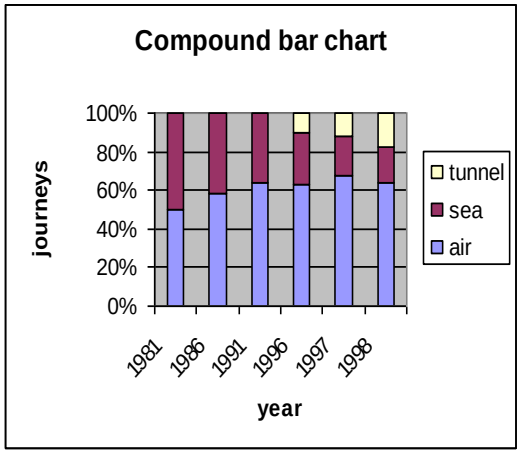
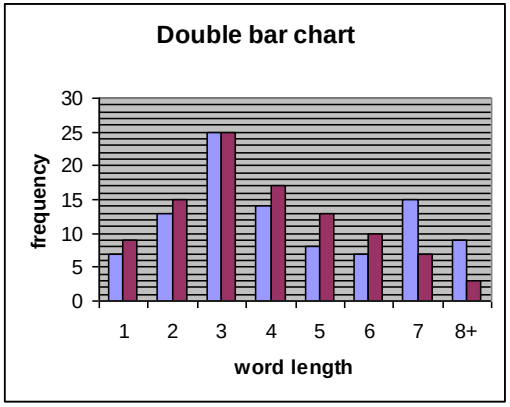
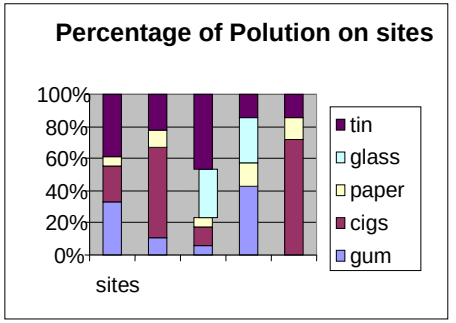
Data Handling

A STATISTICAL PROBLEM	Graph/Diagram/Example	Other subject example
Discussion of problem ↓ Identify related questions to explore ↓ Frame questions & raise conjectures ↓ Decide on relevant data and sources inc. primary/secondary ↓ Decide on size of sample e.g. at least 30 ↓ Decide how to collect data e.g. collection sheet questionnaire, two way table, group data ↓ Calculate statistics & draw relevant graphs & diagrams on paper & using ICT ↓ Interpret/draw inferences ↓ Examine results critically	**THE CYCLE**  	**Geography:** • use primary data only • Big emphasis on examining results critically and evaluating how the survey could have been improved **Science:** Throughout coursework / experiment tasks **BIS:** Questionnaire: Marketing Strategy for new product Price's Snacks **RS:** Ethical and moral issues leading to use of primary data, collected using questionnaires or use of secondary data. Interpretation of findings **DT:** Questionnaires Maths SOW INDIVIDUAL ASPECTS TAUGHT AT VARIOUS STAGES BUT NOT AS A SINGLE PROJECT CONCEPT

Recognise limitations of assumptions		
AXES & PLOTTING POINTS	Graph/Diagram/Example– Grade 1	Other subject example
On a diagram where points are plotted, numbers written on the axes must be: ***on the lines like this:*** ***NOT*** ***in the spaces like this:*** When axis does not start at zero, a break represented by a zig-zag line should be shown To draw graphs to represent experimental data the horizontal axis is used for: *regular class intervals *time We plot points with 'x' not ●		**Geography**

Maths SOW Y8 (unit 3)		 7 Map skills 5 **In this activity you will learn about six figure grid references** We can find **exact points** on a map by using **six** numbers or **figures**. • The **first three** numbers tell us how far to go along the bottom or top of the map. The **third** number tells us the number of **tenths** of a grid square. • The **last three figures** tell us how far to go up the side of the map. The **sixth** number tells us the number of **tenths** of a grid square. On a map you will have to estimate the tenths of each grid square. Remember that five tenths is half a grid square. **Activity** Use the following **six figure grid references** to plot points **1** to **25** on the grid below. The tenths have been marked on for you. …en join them up in order to see who's hiding! Numbers **1** to **4** have been done for you. Cross out the references as you go. 1 020 530 ✓ 2 025 529 ✓ 3 030 524 ✓ 4 034 524 ✓ 5 045 531 ✓ 6 050 530 ✓ 7 060 518 ✓ 8 075 508 ✓ 9 090 502 ✓ 10 075 505 ✓ 11 060 510 ✓ 12 060 502 ✓ 13 054 502 ✓ 14 054 505 ✓ 15 055 505 ✓ 16 054 510 ✓ 17 045 510 ✓ 18 037 511 ✓ 19 033 502 ✓ 20 027 502 ✓ 21 027 505 ✓ 22 030 505 ✓ 23 024 522 ✓ 24 020 521 ✓ 25 016 519 Hi! My name's Gloop! Good Effort 16B 2D **Recap** *Six figure grid references help us find exact points on a map.* *The **first three** numbers* help us find the point along the bottom of the grid. *The **last three** numbers* help us find the point up the side of the grid. © 1996 Stanley Thornes (Publishers) Ltd 197 **History:** Time line BC – negative; AD - positive **Science:** Frequently used

BAR GRAPHS	Graph/Diagram/Example- – Grade 1	Other subject example
GAPS between bars for Discrete data NON- numerical data OR If the data is numeric but can only take a particular value e.g. shoe size. **Maths SOW Y7 (unit 1), SOW Y9 (unit 1/5)**		**Geography** - commuter study • Where dads work • Where people shop • Where people go for entertainment • Type of accommodation when on holiday • Where people went last year on holiday • Population **Science:** Frequently used. Variation/inheritance e.g. discrete data - eye colour **DT:** Transferring data into graphs **BIS:** What people buy in Darlington Town Centre 
NO gaps between bars for continuous data eg lengths Horizontal scale should be as shown NOT like this		**Science:** Use line graphs for continuous data **BIS:** Amount of money spent on refreshments in Darlington **Geog :** sometimes use this labelling method & also with unequal widths **Maths SOW Year 7 (Unit 6)**

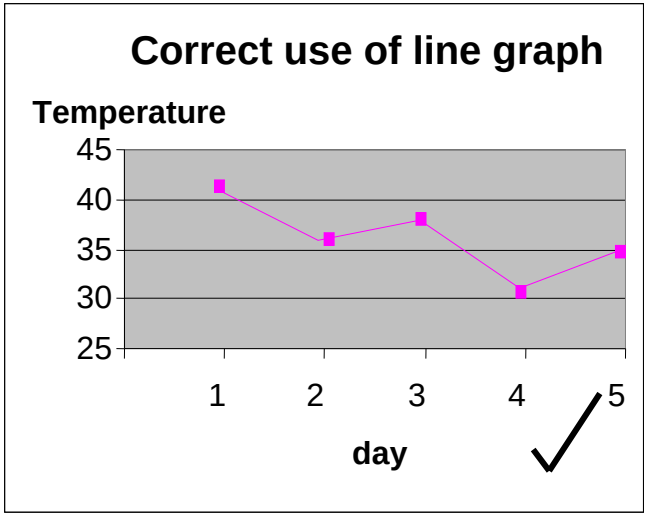
BAR GRAPHS	Graph/Diagram/Example — Grade 2	Other subject example
Compound bar chart Could be: • Horizontal • Vertical e.g. to compare air, sea and channel tunnel **Double bar chart** Could be: • Horizontal • Vertical e.g. compare lengths of words in tabloid and broadsheet travel **Maths SOW Y7 (unit 1), SOW Y9 (unit 1/5)**	 	**Geog:** call these divided bar charts • Types of pollution on different sites Single percentage bar chart • Country where people take holiday • Who owns National Parks  **Geog:** • Transport used by mums and dads to get to work • Time taken for mums and dads to get to work Population pyramid • UK – males and females • France 200 – male & female age groups Double bar chart: Compare population e.g. 1801 & 1911

		
LINE GRAPHS	Graph/Diagram/Example- – Grade 2	Other subject example

Use these only if the ***order*** in which the categories are written is ***significant***
e.g. Taking temperatures over a period of time

Points are joined to determine ***a trend***

OR if the readings between the points are valid
Maths SOW Y7 (unit 1), SOW Y9 (unit 1/5)



Geog

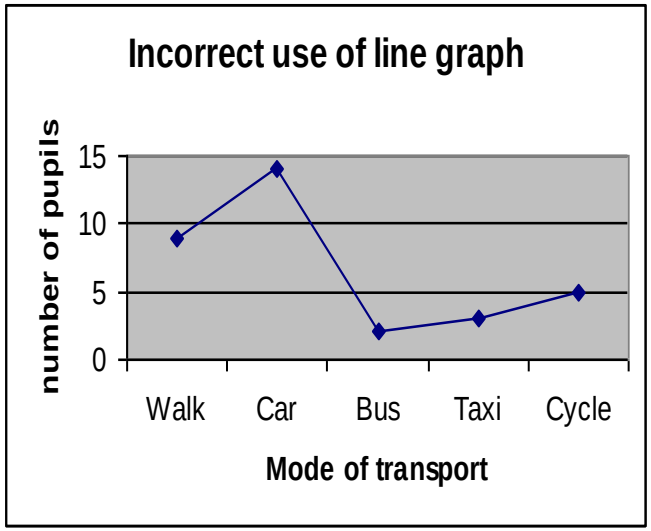
- How world's population has grown in 2000 years
- Population growth of Darlington

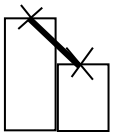
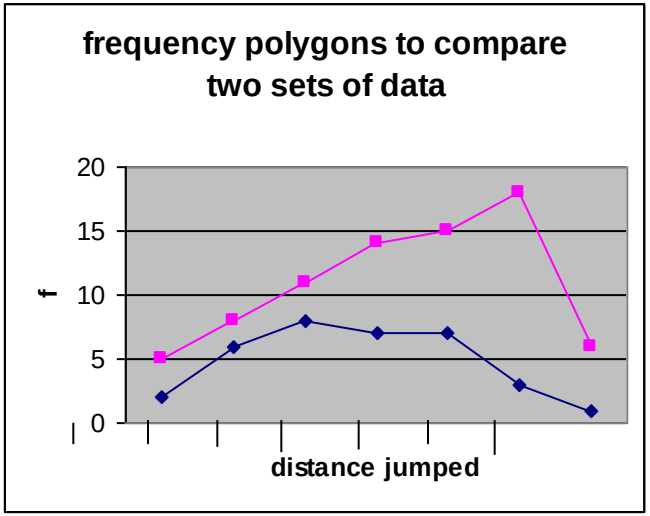
History

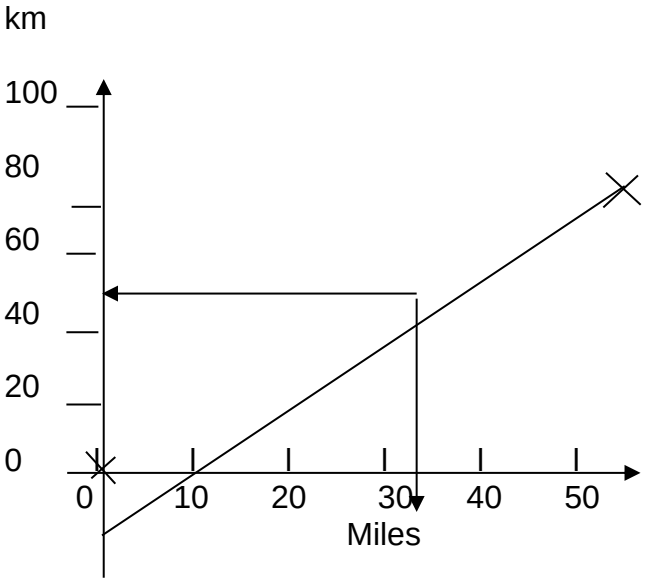
- Compare unemployment figures
- Seats gained in different parties in Germany

Science

- Used Frequently (use term line graph for scatter diagrams)

Incorrect use of line graph	 X	

FREQUENCY POLYGON	Graph/Diagram/Example – Grade 3	Other subject example
The points for a frequency polygon are plotted at the mid-point of a bar chart & joined  Superimposed frequency polygons rather than bar charts are used to compare results 		**Geog;** Rainfall/Temp Climate Graph - Bar/ Line **Maths SOW Year 7 (Unit 6)**

CONVERSION GRAPH	Graph/Diagram/Example - Grade 2	Other subject example
Use to convert: • Metric/imperial units • Currency Only TWO points required e.g. 0 miles = 0 km 50 miles = 80 km Guide lines to take readings		**MFL:** Currency conversion **Maths SOW Y8 (Unit 10)**

PIE CHARTS

One method which can be used to find the angles for ALL pie charts is:

Find the share of 360^0 to be allocated to ONE item

If necessary the angles in the 'Angles column' should be rounded to the nearest degree

See e.g. →

Graph/Diagram/Example – Grade 2

Transport	Frequency	Angle
Walk	9	$9x12 = 108^0$
Bus	14	$14x12 = 168^0$
Taxi	2	$2x12 = 24^0$
Cycle	4	$4x12 = 48^0$
Other	1	$1x12 = 12^0$
Total	30	360^0

1 item = 360^0 ÷ 30 = 12^0

Transport	f	Angle
Walk	19	$19x\mathbf{2.950819672} = 56^0$
Bus	41	$41x\mathbf{2.950819672} = 121^0$
Taxi	35	$35x\mathbf{2.950819672} = 103^0$
Cycle	7	$7x\mathbf{2.950819672} = 21^0$
Other	20	$20x\mathbf{2.950819672} = 59^0$
Total	122	360^0

1 item = 360^0 ÷ 122 =2.950819672 ^{0}

Other subject example

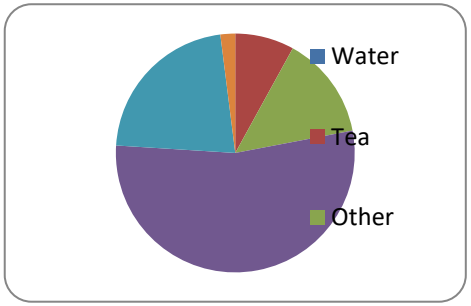
Geog:

- Always % pie charts
- use a template showing %

Types of accommodation in the Lake District

BIS:

Drinks people buy in Darlington town centre



PE

Diet – pie chart drawn by hand

Science

Interpret ONLY simple pie charts

Maths SOW Y7 (Unit 6)

SCATTER GRAPH

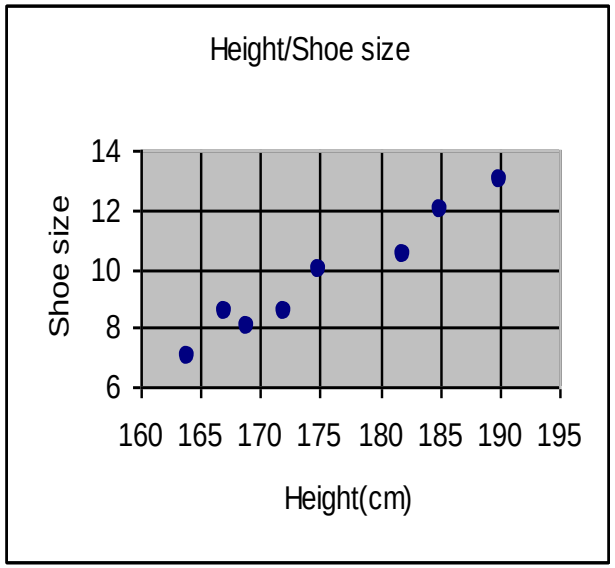
Graph/Diagram/Example – Grade 3

Other subject example

These are used to compare two sets of numerical data
Maths SOW Y7 (unit 1), SOW Y9 (unit 1/5)

If possible line of best fit should be drawn ***by eye***

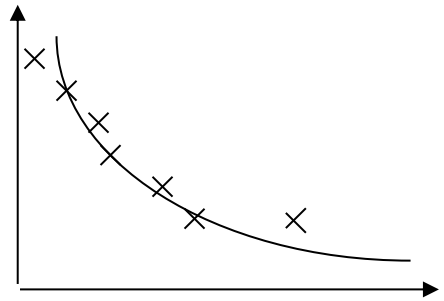
The degree of correlation between the two sets of data is determined by how close the points are to the 'line of best fit'
Readings are taken by drawing on guide lines
See example →



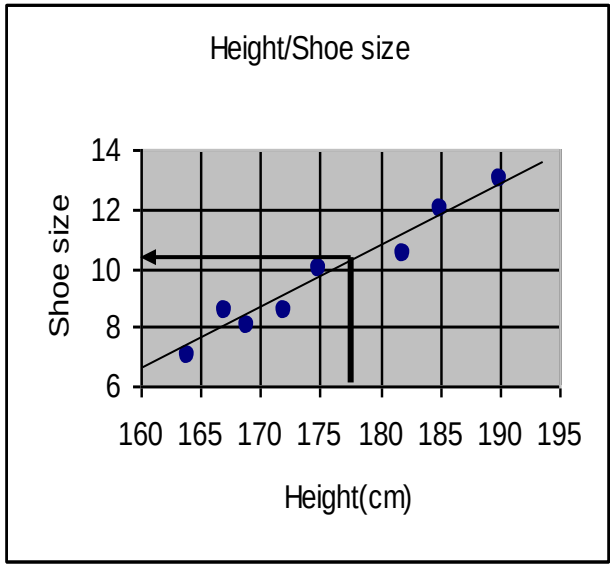
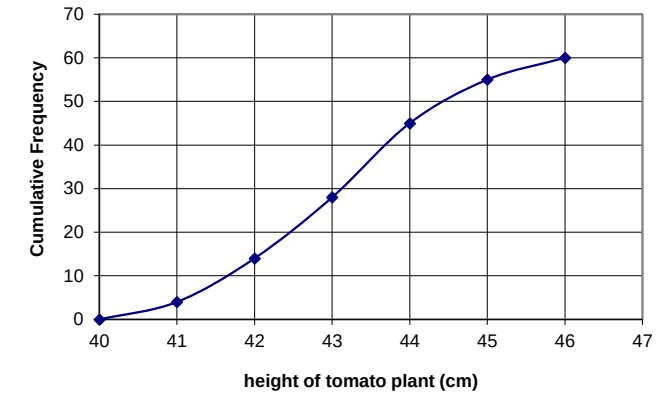
Geog:
Population/year – Darlington

Science
Used frequently (call line graphs), Comments on anomalous results and outliers in detail. Correlation also used to describe relationships between two factors

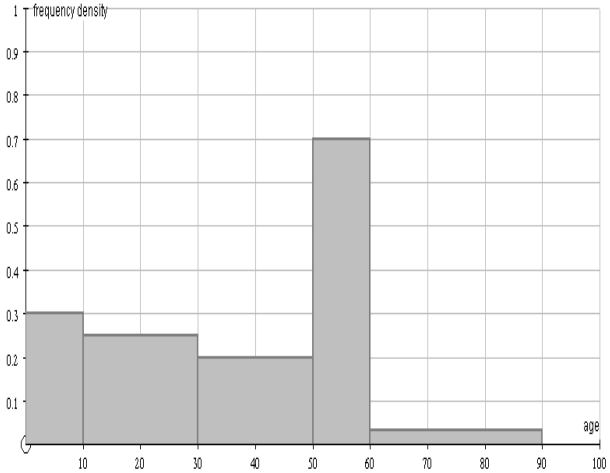
Science
Line of best fit can be a curve



PE
Average height & weight
Check own

		
CUMULATIVE FREQUENCY	Graph/Diagram/Example - **Grade 6**	Other subject example
Used to determine the number of values above/ below a specified point and identifying the median, quartiles and percentiles. **Maths SOW Y7 (unit 1), SOW Y9 (unit 1/5)**		**Geog:** Sediment Data

<table>
<tr><th>HISTOGRAM</th><td>Graph/Diagram/Example - Grade 7</td><td>Other subject example</td></tr>
<tr><td>Used to show data in grouped frequencies when the class intervals are not all the same.

The areas of the columns represent the frequencies.
Maths SOW Y7 (unit 1), SOW Y9 (unit 1/5)</td><td> 
</td><td>Geog:
Distribution of population</td></tr>
<tr><th>CALCULATING MODE</th><td>Graph/Diagram/Example – Grade 2</td><td>Other subject example</td></tr>
<tr><td>MODE – most common value

Mode is the <u>only</u> statistic appropriate for non-numeric data
Maths SOW Y7 (unit 1), SOW Y9 (unit 1/5)</td><td>To find the mode of:
3 7 7 7 8 9
Mode = 7

To find the mode of:
3 7 7 7 8 8 8 9
Mode = 7 & 8</td><td>PSHCE:
Surveys / Data Collection</td></tr>
<tr><th>MODE CLASS/GROUP</th><td>Graph/Diagram/Example – Grade 2</td><td>Other subject example</td></tr>
<tr><td>is used for grouped data

e.g. modal class is:
20 ‹ time ≤ 30
Maths SOW Y7 (unit 1), SOW Y9 (unit 1/5)</td><td><table><tr><th>Measure
e.g. time in min</th><th>f</th></tr><tr><td>0 ‹ time ≤ 10</td><td>5</td></tr></table></td><td>PSHCE:
Surveys / Data Collection</td></tr>
</table>

	10 ‹ time ≤ 20	17	
	20 ‹ time ≤ 30	28	
	30 ‹ time ≤ 10	12	

MEAN	Graph/Diagram/Example – Grade 2	Other subject example
Mean = $\frac{\text{sum of the measures}}{\text{number of measures}}$ It is often referred to as the AVERAGE **Maths SOW Y7 (unit 1), SOW Y9 (unit 1/5)**	To find the mean of: **2 6 8 9 12** $= \frac{2+6+8+9+12}{5} = \frac{37}{5} = 7.4$	**Geog:** Always known as average eg monthly average temperature Science: Repeat experiment 3 times – take mean e.g. swing of pendulum/length of string **P.E.** Used to find average performance/pulse rate

MEAN FROM A TABLE	Graph/Diagram/Example – Grade 4	Other subject example
Mean = $\frac{\sum fx}{\sum f}$ $= \frac{1400}{62}$ =22.6 (1dp)		**PSHCE:** Surveys / Data Collection

Time(x)	f	M.I.V.(x)	fx
0 ‹ time ≤ 10	5	5	25
10 ‹ time ≤ 20	17	15	255
20 ‹ time ≤ 30	28	25	700

Maths SOW Y7 (unit 1), SOW Y9 (unit 1/5)	30 ‹ time ≤ 40 | 12 | 35 | 4 0 ∑f= | 62 | ∑fx= | 1400	
MEDIAN	Graph/Diagram/Example – Level 5 – Grade F	Other subject example
is the value of the middle number when arranged in ascending order **Maths SOW Y7 (unit 1), SOW Y9 (unit 1/5)**	e.g. **1 2 3 5 6 7 8** Median = 5 e.g. **1 5 7 8 9 10** Median = (7 + 8) /2 = 7.5	**PSHCE:** Surveys / Data Collection
RANGE	Graph/Diagram/Example – Level 3	Other subject example
is the difference between the highest and lowest numbers in a set **Maths SOW Y7 (unit 1), SOW Y9 (unit 1/5)**	e.g. **2 3 4 7 9 10 15** Range = 15 – 2 = 13	**Geog:** Annual range of average temp **Science:** Used in setting experimental/investigative parameters but only quoted not calculated e.g. 5^0C – 50^0C every 5^0C
STEM & LEAF DIAGRAM	Graph/Diagram/Example – Grade 3	Other subject example

Used to find the MODE & MEDIAN & RANGE Mode = 3.0 hours Median = (45+1)/2 = 23rd number = 4.6hours Range = (8.0 – 0.6) h = 7.4 hours **Maths SOW Y7 (unit 1), SOW Y9 (unit 1/5))**	**Hours of sunshine in UK weather stations 10/05/00** 0 | 6 9 1 | 6 9 2 | 2 2 5 6 6 7 5 3 | 0 0 0 0 1 2 9 4 | 0 1 5 5 6 6 5 | 0 1 5 5 3 8 6 | 1 2 2 2 5 6 8 7 | 0 0 1 6 7 8 8 | 0 0 stem leaf e.g. KEY: 1 | 6 = 1.6 stem = hours leaf = tenths	**PSHCE:** Surveys / Data Collection
ICT IN HANDLING DATA	Graph/Diagram/Example	Other subject example
Maths SOW Y7 (unit 1), SOW Y9 (unit 1/5)	Excel Mathswatch.vle (login: …@hurworth (password: circle) for demonstrations and examples of: Averages Charts Graphs sampling	**Business Studies:** Excel Balance Sheet

Numeracy –what is it?

Appendix 1. At the start of Year 7 Pupils should:

- have a sense of the size of a number and where it fits in the number system;
- know number bonds by heart e.g. tables, doubles and halves;
- use what they know by heart to work out numbers mentally;
- calculate accurately and efficiently using a variety of strategies, both written and mental;
- recognise when AND when not to use a calculator; using it efficiently if needs be;
- make sense of number problems, including non-routine problems, and recognise the operations to solve them;
- explain their methods and reasoning using correct mathematical terms;
- judge whether their answers are reasonable, and have strategies for checking;
- suggest suitable units for measuring;
- make sensible estimates for measurements;
- explain and interpret graphs, diagrams, charts and tables;
- use the numbers in graphs, diagrams, charts and tables to predict.

Appendix 2. Year 9 pupils should:

- have a sense of the size of a number and where it fits into the number system;
- recall mathematical facts confidently;
- calculate accurately and efficiently, both mentally and with pencil and paper, drawing on a range of calculation strategies;
- use proportional reasoning to simplify and solve problems;
- use calculators and other ICT resources appropriately and effectively to solve mathematical problems, and select from the display the number of figures appropriate to the context of the calculation;
- use simple formulae and substitute numbers in them;
- measure and estimate measurements, choosing suitable units and reading numbers correctly from a range of metres, dials and scales;
- calculate simple perimeters, areas and volumes, recognising the degree of accuracy that can be achieved;
- understand and use measures of time and speed, and rates such as £ per hour or miles per litre;
- draw plane figures to given specifications and appreciate the concept of scale in geometrical drawings and maps;
- understand the difference between the mean, median and mode and the purpose for which each is used;
- collect data, discrete and continuous, and draw, interpret and predict from graphs, diagrams, charts and tables;
- have some understanding of the measurement of probability and risk;
- explain their methods, reasoning and conclusions, using correct mathematical terms;
- judge the reasonableness of solutions and check them where necessary;
- give their results to a degree of accuracy appropriate to the context.

APPENDIX 3: CALCULATOR POLICY

Rationale

Calculator skills expected by the end of Year 6:

- Use a calculator to perform a one-step calculation and interpret the result
- Key in and interpret money and measurement calculations
- Extend to calculations with more than one step, e.g. 18 x (137 + 258)
- Recognise rounding errors, e.g. recognise 2.99999999 as 3
- Recognise negative numbers and use the sign change key if appropriate
- Find decimals equivalent to fractions
- Recognise recurring decimals, e.g. 0.3333333
- Start to use memory keys and perform more complex calculations, such as (234 + 739) ÷ (145 - 89)
- Have a feel for the size of an answer and check it appropriately

Pupils need to feel comfortable to use a calculator when appropriate and not spend too long on a calculation that requires a calculator. Through experience and teacher support, pupils should recognise where a calculator is required. The GCSE involves the correct use of brackets and so on in reasonably efficient calculations. i.e. when you a pupil is required to square a negative number on a calculator.

We also recognise that the calculator can provide access to areas of the curriculum that might otherwise have been barred to pupils. We require all pupils to bring a scientific calculator with them to all of their Maths lessons and recommend the most suitable one.

Scientific calculators are provided to students for free if they are a LAC, PLAC or have an SEND.

Aims of the Policy

Calculator skills that pupils need to develop:

- Selecting from the display the number of figures appropriate to the context of the calculation
- Entering numbers and interpreting the display when the numbers represent money, metric measurements, units of time or fractions
- Knowing the order in which to use the keys for calculations involving more than one step
- Using facilities such as the memory, brackets, the square root, cube root, sign change and fraction keys, and the constant facility
- Judging whether an answer is reasonable

The Policy

Particular calculator skills that we aim to develop:

1. Understand the four arithmetical operations and recognise which one to use in relation to a 'wordy' or 'real world' context or problem. Be able to correctly key in a complicated calculation.
2. Understand the place value notation on the display, e.g. 5.3 in the context of money is likely to be £5.30. Half is entered as .5. Modify an answer by rounding appropriately, e.g. 7.3685 is £7.37.
3. Adopt some checking procedure, e.g. do the calculation again and in a different order if possible. Have some idea about the sizes of numbers involved and what a reasonable answer might be.
4. If a result is important, appreciate the need to check the sense of an answer by approximating, e.g one significant figure (the calculator could be used to approximate). Is the decimal point in the right sort of place? Appreciate when an approximate answer is sufficient or preferable, e.g. to aid clarity.
5. Appreciate that the calculator has a fixed way of working out calculations, e.g. BIDMAS, and that brackets or an interim use of the equals sign may be necessary, e.g. calculating the mean average on a basic calculator.
6. Appreciate the need for a reasonable degree of accuracy, e.g. 5.476329 cm is a daft final answer, as, probably, is 3.954 coaches.
7. Rather than using a calculator when simple calculations are involved the person ought really to carry them out in their head, e.g. do +8 instead of doing +5 and then +3, and work out 300 x 20.
8. Use a calculator to change fractions into decimals. Know which way round to divide. Know how to use ($a^b/_c$) or ($\frac{\square}{\square}$) button for fractions including mixed numbers.
9. Appreciate the standard form display of some calculators, e.g. 7 E 3 or 7 ^{03} and to understand and be able to use the (EXP) button.
10. Understand and be able to use, efficiently, the square root ($\sqrt{}$), cube root ($\sqrt[3]{}$), square (x^2) and power (y^x) of (^) buttons.
11. Use the pi (π) button when appropriate.

THE CALCULATOR

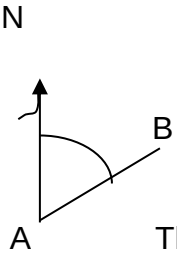
The calculator has now become one of the most significant tools which we use in the teaching of Mathematics. It must, however, be emphasised that the calculator must not take over the need for teaching computational skills and must not remove the need for pupils to have a good knowledge and recall of number facts. The National Curriculum underlines and endorses the policy which we continue to follow.

The calculator has an important place in the teaching of numeracy, but outside the simple numerical use, it is exceptionally helpful when pupils are faced with 'real-life' problems when they understand the mathematics of a situation but would find the computation of the possibly awkward numbers difficult. From the teaching point of view this would detract from the potential of the learning situation.

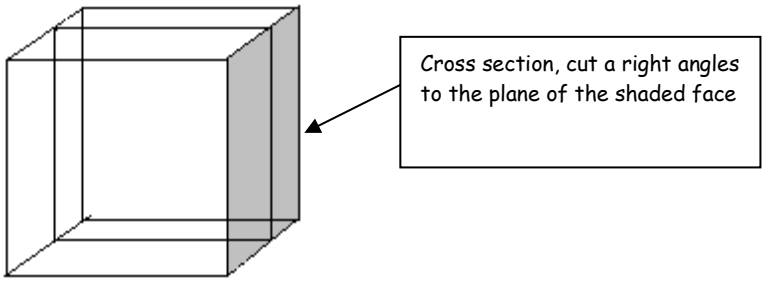
It is important that pupils are shown the various functions of the calculator at the appropriate time. It is useful for pupils to check their answers which they have obtained through non-calculator methods.

The calculator has obvious benefits in the teaching situation, from teaching odd and even numbers to low attaining pupils to allowing investigations in 'trial and improvement' situations. It encourages estimation of the size of answers and can allow pupils their first entry to the world of Mathematics even if they are of poor arithmetic ability.

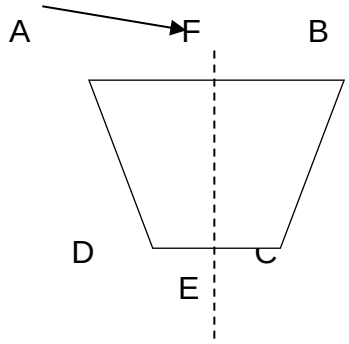
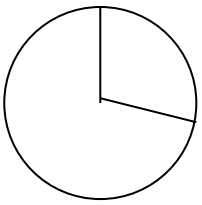
Appendix 4: Glossary of Terms/Mathematical Terms
(Taken From the QCA Glossary)

Analogue clock	A clock usually with 12 equal divisions labelled 1 to 12 represent hours.
Approximation	A number or result that is not exact. When two values are approximately equal, the sign ≈ is used.
Area	A measure of surface. Area is usually measured in square units e.g. square centimetres (cm^2), square metres (m^2).
Average	At an secondary level, used synonymously with 'arithmetic mean'.
Axis	A fixed, reference line along which or from which distances or angles are taken
Axis of symmetry	See reflection symmetry.
Bar chart	A format for representing statistical information. Bars, of equal width, represent frequencies and the lengths of the bars are proportional to the frequencies.
Bar line chart	Similar to a bar chart, the width of bars is reduced so that they appear as lines. The lengths of the bar lines are proportional to the frequencies.
Bearing	The direction of a line specified by the angle it makes with a North- South line. The angle is measured in degrees from north on a clockwise direction. Example:  The bearing of B from A Bearings are usually given in a three- figure format.
Bisect	In geometry, to divide into two equal parts.
Bisector	A point, line or plane that divides (a line, an angle or a solid shape) into two equal parts. A perpendicular bisector is a line at right angles to a line segment that divides it into two equal parts.
Capacity	Volume, i.e. a measure of three-dimensional space, applied to liquids, materials that can be poured or the space within

	containers. Units include cubic centimetres (cm^3) and cubic metres (m^3). A litre is equivalent to 1000 cm^3.
Carroll diagram (2 way table)	A sorting diagram named after Lewis Carroll, author and mathematician. Example: Even / Not even Multiple of three Not multiple of three
Centi -	Prefix meaning one-hundredth (of)
Coefficient	Often used for the numerical coefficient. More generally, a factor of an algebraic term. Example: in the term 4xy, 4 is the numerical coefficient of xy but x is also the coefficient of 4y and y is the coefficient of 4x.
Compensation (in calculation)	A mental or written calculation strategy. One number is rounded to make the calculation easier. The calculator is then adjusted by an appropriate compensatory addition or subtraction. Examples: • 56 ÷ 38 is treated as 56 ÷ 40 and then 2 is subtracted to compensate. • 27 x 19 is treated as 27 x 20 and then 27 (i.e. 27 x 1) is subtracted to compensate. • 67 – 39 is treated as 67 – 40 and then 1 is added to compensate.
Compound measures	Measures with two dimensions and requiring calculation. Examples: speed calculated as distance ÷ time; and density calculated as mass ÷ volume.
Congruent (figures)	Adjective. Describing two or more geometric figures that are the same in every way except their positioning space.
Constant	At a secondary level, a number or quantity that does not vary. Example: in the equation $y = 3x + 6$, the 3 and 6 are constants, where x and y are variables.
Continuous data	Data arising form measurements taken on a continuous variable (examples: lengths of caterpillars; weight of crisp packets). Continuous data may be grouped into touching but non-overlapping categories. (Example height of pupils [x cm] can be grouped into $130 \leq x < 140$ etc) Compare with discrete data.

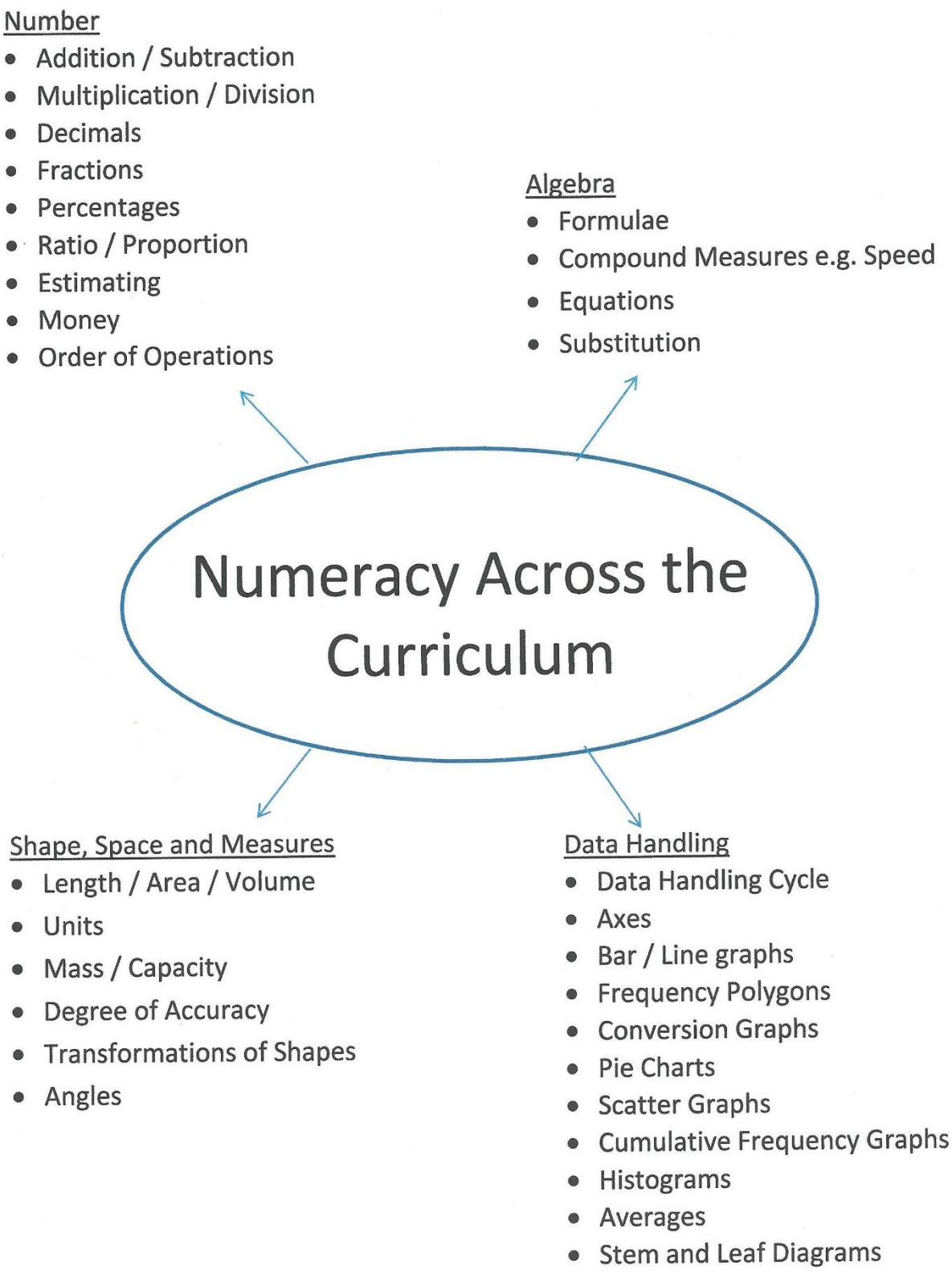
Correlation	A measure of the strength of the association between two variables. The term zero correlation does not necessarily imply 'no relationship' but merely 'no linear relationship'
Counter example	Where a hypothesis or general statement is offered, an example that clearly disproves it.
Cross-section	In geometry, a section in which the plane that cuts a figure is at right angles to an axis of the figure. Example: in a cube, a square revealed when a plane cuts at right angles to a face. 
Cuboid	A three-dimensional figure with six rectangular faces.
Decimal	Relating to the base ten.
Digit	Examples: the number 29 is a 2-digit number.
Digital clock	A clock that displays the time as hours and minutes passed, usually since midnight. Example: four thirty in the afternoon is displayed as 16:30.
Dimension	At a secondary level, a property relating to geometrical figures, their length, breadth etc. A point is treated as having no dimensions, a line as having one dimension, its length, a plane shape as having two dimensions, its length and breadth, and a solid as having three dimensions, its length, breadth and height.
Discrete data	Data resulting from measurements taken on a discrete variable (examples: value of coins in pupils' pockets; number of peas in a pod). Discrete data may be grouped. Example: Having collected the shoe sizes of pupils in the school, the data might be grouped into 'number of pupils with shoe sizes 3 – 5, 6 – 8, 9 – 11' etc.
Equal class interval	See grouped (discrete data)
Evaluate	Find the value of a numerical or an algebraic expression.
Face	At secondary level, one of the flat surfaces of a solid shape. Example: a cube has six faces.

Frequency table	A table for a set of observations showing how frequently each event or quantity occurs.
Grouped (discrete data)	Observed data arising from counts and grouped into non-overlapping intervals. Example: score in test/number of children obtaining the scores 11 –10, 11 – 20, 21 –30, 34 – 40, 41 – 50, etc. In this example there are equal class intervals.
Index notation	The notation in which a product such as a x a x a x a is recorded as a^4. In this example the number 4 is the index (plural indices) See also standard index form.
Inequality	Statements such as $a \neq b$, $a \leq b$ or $a > b$ are inequalities.
Kilo-	Prefix donating one thousand
Mass	A characteristic of a body, relating to the amount of matter within it. Mass differs from weight, the force with which a body is attracted towards the earth's centre. Whereas, under certain conditions, a body can become weightless, mass is constant. In a constant gravitational field weight is proportional to mass.
Milli-	Prefix. One-thousandth.
Ordinal number	A term that describes a position within an ordered set. Example: first, second, third, fourth … twentieth etc.
Origin	A fixed point from which measurements are taken. See also Cartesian coordinate system.
Plan	A 2-dimensional diagram of a 3-dimensional object, usually the view from directly above.
Prism	A solid bounded by two congruent polygons that are parallel (the bases) and parallelograms (lateral faces) formed by joining the corresponding vertices of the polygons. Prisms are named according to the base e.g. triangular prism, quadrangular prism, pentagonal prism, etc. If the lateral faces are rectangular and perpendicular to the bases, the prism is a right prism.
Random sample	In statistics, a selection from a population where each sample of this size has an equal chance of being selected.

Raw data	Data as they are collected, unprocessed.
Reflection symmetry	At a secondary level, a 2-D shape has reflection symmetry about a line if an identical-looking object in the same position is produced by reflection in that line. Example: Mirror line  In the shape AFBCED, the mirror line runs through F and E. The part shape FBCE is a reflection of FADE. Point A reflects onto B and D onto C. The mirror line is the perpendicular bisector of AB and DC.
Regular	1. Describe a polygon, having all sides equal and all internal angles equal. 2. Describing a tessellation, using only one kind of regular polygon. Examples: squares, equilateral triangles and regular hexagons all produce regular tessellations.
Sample	A subset of a population. In handling data, a sample of observations may be made from which to draw inferences about a larger population.
Sector	The region within a circle bounded by two radii and one of the arcs they cut off. Example:  The smaller of the two sectors, is the minor sector and the large is the major sector.
Significant figures	The run of digits in a number that are needed to specify the number to a required degree of accuracy. Additional zero digits may also be needed to indicate the number's magnitude.

	Examples: To the nearest thousand, the numbers 125 000, 2 376 000 and 22 000 have 3, 4 and 2 significant figures respectively; to 3 significant figures 98.765 is written 98.8
Similar	A geometric figure is similar to another if it is congruent to an enlargement of the other. Any two squares are similar, as are any two circles.
Standard index form	A form in which numbers are recorded as a number between 1 and 10 multiplied by a power of ten. Example: 193 in standard index form is recorded as 1.93×10^2.
Standard unit	Uniform units that are agreed throughout a community. Example: the metre is a standard unit of length. Non-standard units such as the handspan are not widely agreed.
Volume	A measure of three-dimensional space. Usually measured in cubes, units include cubic centimetres (cm^3) and cubic metres (m^3).
Weight	The force exerted on an object possessing mass by the gravity of the earth, or any other gravitational body.

Appendix 5 – Overview of the different areas of numeracy



Appendix 6 - Five Year Learning Journeys