Numeracy Policy

EBN Trust

Created:	**Sept 2015**	
Reviewed:		
Ratified:		**Signed:**

Minimum Entitlement for Numeracy

Our aim is to raise the achievement of all pupils and students by seeking to develop their numeracy skills by consistent and accurate application across the curriculum.

Numeracy is a key skill in students' learning and all students are entitled to quality experiences in this area. The teaching of numeracy is the responsibility of all staff and the academy's approaches should be as consistent as possible across the curriculum.

We need to:
1. Raise the profile of numeracy within the academy
2. Raise standards of numeracy
3. Make numeracy teaching an overt part of every curriculum area

The academy will:
- Create a positive and attractive environment which celebrates numeracy
- Provide role models through celebrating the successes of older students
- Ensure that there are planned activities in the curriculum to allow pupils to learn and practice their range of numeracy skills
- Display examples of high quality examples of numeracy being applied across the curriculum
- Promote Key Skills and recognise pupil achievement
- Ensure that faculties/departments are adhering to the numeracy policy support document - Numeracy across the curriculum
- Provide INSET on teaching numeracy

Each Faculty/Department will:
Contribute to the raising of numeracy standards within their curriculum area by:

- The provision of high quality exemplar materials
- The use of ICT
- Displaying examples of numeracy within curriculum based contexts
- Highlighting opportunities for the use of numeracy within their subject area
- Endeavouring to ensure that materials presented to students will match their capability both in subject content and in numerical demands
- Ensuring that all staff are familiar with the 'Numeracy Across The Curriculum' document which supports this policy

MINIMUM ENTITLEMENT FOR NUMERACY

The outcome of minimum entitlement should be numerate pupils who are confident enough to tackle mathematical problems without going immediately to teachers or friends for help. The common features of effective numeracy teaching and learning according to the Ofsted report April 2011 includes:

1. Raising the profile of numeracy within all lessons especially the practical and vocational subjects.

2. Discouraging students from writing down answers only and encourage students to show their numerical working out within the main body of their work.

3. Encouraging opportunities for students to work out the most appropriate approaches to problems individually and with other students.

4. Encouraging students to analyse incorrect answers to help tackle their misconceptions.

5. Recognising that there is never only one correct method and students will be encouraged to develop their own correct methods where appropriate rather than be taught 'set' ways.

6. Allowing and encouraging students to 'vocalise' their maths – a stage where they can explain why a specific method worked

7. Helping students to make connections between what they have learnt and solving realistic problems by setting them in purposeful contexts.

8. Encouraging students to use non-calculator methods whenever possible.

9. Encouraging students to use the correct language e.g. use the word mean rather than average.

10. Using ICT to develop and advance learners in the practical application of numeracy skills

11. Sharing good practice with colleagues to allow subject specific continuing professional development.

12. Following the guidelines in the 'Numeracy across the Curriculum' document (appendix one) and for EBN pupils the Edexcel award in number and measure (appendix two)

Num3r4cy
Across the curriculum

National Documentation

Key Stage 3 *National Strategy - Numeracy across the curriculum objectives*

The next 3 sides contain the National Strategy objectives.

It is also useful to adapt and amend for each subject so that ONLY the relevant objectives are available for teacher reference. This cuts down on paperwork and allows teachers to focus on specific concepts and skills when appropriate and not drag in every tenuous link to their subject.

As a personal foible the Using & Applying objective that appears last in the original document has been placed first in this exemplar and indeed all other versions produced by MP for the numeracy team – it is the most important aspect of children transferring confidence and competence in order to use Mathematics in all areas of study.

Numeracy across the curriculum	Start of Year 7	Year 7	Year 8	Year 9 (including *extension objectives*)
Have a sense of the size of a number and where it fits into the number system	Place value, ordering and rounding • Recognise and extend number sequences. • Estimate by approximating (round to nearest 10, 100 or 1000).	Place value, ordering and rounding • Compare and order decimals; know that when comparing measurements they must be in the same units. • Round positive whole numbers to the nearest 10, 100 or 1000 and decimals to the nearest whole number or one decimal place.	Place value, ordering and rounding • Round decimals to the nearest whole number or to one or two decimal places. Integers, powers and roots • Use squares, positive and negative square roots, cubes and cube roots, and index notation for small positive integer powers.	Place value, ordering and rounding • Multiply and divide by any integer power of 10. • *Understand upper and lower bounds; round numbers to three decimal places and a given number of significant figures.* • *Begin to write numbers in standard form.* Integers, powers and roots • Use simple instances of the index laws.
Recall mathematical facts confidently Calculate accurately and efficiently, both mentally and with pencil and paper, drawing on a range of calculation strategies	Calculations with whole numbers and decimals • Understand and use the relationships between the four operations, and the principles of the arithmetic laws. • Use brackets. • Add and subtract two two-digit numbers mentally. • Use column addition and subtraction of numbers involving decimals. • Know multiplication facts to 10×10, and quickly derive associated division facts. • Multiply a two-digit number by a single-digit number mentally.	Calculations with whole numbers and decimals • Know and use the order of operations, including brackets. • Use standard column procedures to add and subtract whole numbers and decimals with up to two places. • Multiply and divide three-digit by two-digit whole numbers; extend to multiplying and dividing decimals with one or two places by single-digit whole numbers.	Calculations with whole numbers and decimals • Use the order of operations, including brackets, with more complex calculations. • Use standard column procedures for multiplication and division of integers and decimals; understand where to position the decimal point by considering equivalent calculations.	Calculations with whole numbers and decimals • Understand the effects of multiplying and dividing by numbers between 0 and 1.
Calculate using fractions, decimals and percentages and use proportional reasoning to simplify and solve problems	Fractions, decimals, percentages, ratio and proportion • Reduce a fraction to its simplest form by cancelling common factors. • Use a fraction as an 'operator' to find fractions of numbers or quantities. • Order a mixed set of numbers or measurements with up to three decimal places. • Understand percentage as the number of parts in every 100. • Find simple percentages of small whole-number quantities.	Fractions, decimals, percentages, ratio and proportion • Simplify fractions by cancelling all common factors. • Recognise the equivalence of percentages, fractions and decimals. • Calculate simple percentages and fractions of quantities. • Use ratio notation, reduce a ratio to its simplest form, and divide a quantity into two parts in a given ratio. • Solve simple problems about ratio and proportion using informal strategies.	Fractions, decimals, percentages, ratio and proportion • Add and subtract fractions by writing them with a common denominator; calculate fractions of quantities. • Calculate percentages and find the outcome of a given percentage increase or decrease. • Reduce a ratio expressed in different units to its simplest form; divide a quantity into two or more parts in a given ratio. • Use the unitary method to solve simple word problems involving ratio and direct proportion.	Fractions, decimals, percentages, ratio and proportion • Add, subtract, multiply and divide fractions; cancel common factors before multiplying or dividing. • Compare two ratios; interpret and use ratio in a range of contexts. • Use proportional reasoning to solve a problem, choosing the correct numbers to take as 100%, or as a whole.
Use calculators appropriately and efficiently, and select from the display the number of figures appropriate to the context of a calculation	Calculator methods • Develop calculator skills and use a calculator effectively.	Calculator methods • Carry out calculations with more than one step using brackets and the memory; use the square root and sign change keys. • Enter numbers and interpret the display in different contexts (decimals, percentages, money, metric measures).	Calculator methods • Carry out more difficult calculations effectively and efficiently using the function keys for sign change, powers, roots and fractions; use brackets and the memory. • Enter numbers and interpret the display (negative numbers, fractions, decimals, percentages, money, metric measures,	Calculator methods • Use a calculator efficiently and appropriately to perform complex calculations with numbers of any size, knowing not to round during intermediate steps of a calculation. • Use the constant, π and sign change keys, function keys for powers, roots and fractions, brackets and the memory.

Numeracy across the curriculum	Start of Year 7	Year 7	Year 8	Year 9 (including *extension objectives*)
			time).	

Numeracy across the curriculum	Start of Year 7	Year 7	Year 8	Year 9 (including *extension objectives*)
Use simple formulae and substitute numbers in them	Reasoning and generalising • Develop from explaining a generalised relationship in words to expressing it in a formula, using letters as symbols.	Equations, formulae and identities • Use simple formulae; substitute positive integers into simple linear expressions and formulae and, in simple cases, derive a formula.	Equations, formulae and identities • Use formulae; substitute integers into simple formulae, including examples that lead to an equation to solve.	Equations, formulae and identities • Use more complex formulae; substitute numbers into expressions and formulae; derive a formula and, in simple cases, change its subject.
Measure and estimate measurements, choosing suitable units and reading numbers correctly from a range of meters, dials and scales	Measures • Use, read and write standard metric units. • Convert smaller to larger units, and vice versa. • Know rough equivalents between common metric and imperial units. • Record estimates and readings from scales to a suitable degree of accuracy.	Measures and mensuration • Measure, estimate, calculate and solve problems involving length, area, mass, capacity and angle. • Read and interpret scales on a range of measuring instruments. • Convert one metric unit to another (e.g. g to kg).	Measures and mensuration • Measure, estimate, calculate and solve problems involving length, area, volume, capacity, mass, angle and bearings. • Know rough metric equivalents of imperial measures in daily use (feet, miles, pounds, pints, gallons).	Measures and mensuration • Measure, estimate, calculate and solve problems in a variety of contexts. • Convert between area measures (mm^2 to cm^2, cm^2 to m^2, and vice versa). • *Recognise that measurements given to the nearest whole unit may be inaccurate by up to one half of the unit in either direction.*
Calculate simple perimeters, areas and volumes, recognising the degree of accuracy that can be achieved	Measures • Calculate the perimeter and area of simple compound shapes that can be split into rectangles.	Measures and mensuration • Use the formula for the area of a rectangle; calculate the perimeter and area of shapes made from rectangles. • Calculate the surface area of cubes and cuboids.	Measures and mensuration • Use formulae for the area of a triangle, parallelogram and trapezium. • Use the formula for the volume of a cuboid.	Measures and mensuration • Use the formulae for the circumference and area of a circle. • Calculate the surface area and volume of right prisms.
Understand and use measures of time and speed, and rates such as £ per hour or miles per litre	Measures • Appreciate different times around the world. • Solve problems using time.	Measures and mensuration • Measure, estimate, calculate and solve problems involving time. Sequences, functions and graphs • Begin to plot and interpret the graphs of simple linear functions arising from real-life situations.	Measures and mensuration • Measure, estimate, calculate and solve problems involving time. Sequences, functions and graphs • Plot the graphs of linear functions arising from real-life problems; discuss and interpret graphs arising from real situations.	Measures and mensuration • *Understand and use measures of speed, and other compound measures such as density and pressure.* • *Solve problems involving constant or average rates of change.* Sequences, functions and graphs • Plot graphs of functions arising from real-life problems; interpret graphs arising from real situations, including distance–time graphs.
Understand the difference between the mean, median and mode and the purpose for which each is used	Handling data • Begin to find the median and mean of a set of data. • Find the mode and range of a set of data.	Handling data • For small sets of discrete data: find the mode, median and range, and the modal class for grouped data; calculate the mean, using a calculator for a larger number of items. • Compare two simple distributions using the range and one of the mode, median or mean.	Handling data • Calculate statistics, including with a calculator; recognise when it is appropriate to use the range, mean, median and mode and, for grouped data, the modal class; calculate a mean using an assumed mean; construct and use stem-and-leaf diagrams. • Compare two distributions using the range and one or more of the mode, median and mean.	Handling data • *Find the median and quartiles for large datasets.* • Compare two or more distributions and make inferences, using the shape of the distributions, the range of data and appropriate statistics.
Collect data, discrete and continuous, and draw, interpret and predict from graphs, diagrams, charts and tables	Handling data • Solve a problem by representing, extracting and interpreting data in tables, graphs, charts and diagrams.	Handling data • Collect small sets of data from surveys and experiments. • Construct, on paper and using ICT: bar-line graphs; frequency diagrams for grouped discrete data; pie charts.	Handling data • Collect data by observation, controlled experiment (including data logging), or questionnaire. • Construct, on paper and using ICT: pie charts for categorical data; bar charts	Handling data • Gather data from specified secondary sources, including printed tables and lists from ICT-based sources; determine sample size; design data collection sheets.

Numeracy across the curriculum	Start of Year 7	Year 7	Year 8	Year 9 (including *extension objectives*)
		• Interpret diagrams and graphs, and draw simple conclusions.	and frequency diagrams for discrete and continuous data; simple line graphs for time series; simple scatter graphs. • Interpret tables, graphs and diagrams for both discrete and continuous data.	• Construct, on paper and using ICT: scatter graphs; line graphs for time series; *lines of best fit*. • Have a basic understanding of correlation.
Have some understanding of the measurement of probability and risk	Probability • Use the language associated with probability to discuss events, including those with equally likely outcomes.	Probability • Use the vocabulary and ideas of probability, drawing on experience. • Use the probability scale from 0 to 1.	Probability • Use the vocabulary of probability when interpreting the results of an experiment; appreciate that random processes are unpredictable. • Know that if the probability of an event occurring is p, then the probability of it not occurring is $1 - p$. • Estimate probabilities from experimental data.	Probability • Use the vocabulary of probability in interpreting results involving uncertainty and prediction. • *Understand relative frequency as an estimate of probability and use this to compare outcomes of experiments.*
Use and apply mathematics to solve problems Explain methods and justify reasoning and conclusions, using correct mathematical terms Judge the reasonableness of solutions and check them when necessary Give results to an appropriate degree of accuracy	Applying mathematics • Identify and use appropriate operations (including combinations of operations) to solve word problems involving numbers and quantities. • Explain methods and reasoning. Checking results • Check the results of calculations.	Applying mathematics • Solve word problems and investigate in a range of contexts. • Break a complex calculation into simpler steps, choosing and using appropriate and efficient operations, methods and resources. • Explain and justify methods and conclusions, orally and in writing. Checking results • Check a result by considering whether it is of the right order of magnitude and by working the problem backwards.	Applying mathematics • Use logical argument to establish the truth of a statement. • Represent problems and interpret solutions in algebraic, geometric or graphical form, using correct notation and appropriate diagrams. • Give solutions to an appropriate degree of accuracy in the context of the problem. Checking results • Check a result by considering whether it is of the right order of magnitude and by working the problem backwards.	Applying mathematics • Solve substantial problems by breaking them into simpler tasks, using a range of efficient techniques, methods and resources, including ICT. • Give solutions to an appropriate degree of accuracy, *recognising limitations on the accuracy of data and measurements*. Checking results • Check results using appropriate methods.

Appendix Two – Edexcel Award in Number and Measure

Level 1 and 2

Level 1 content is shown in *italics.*
Level 2 content is shown in **bold**.

What students need to learn:

Topic Concepts and skills

A) Integers

1. Read, write, order and compare positive integers up to 1000
2. Add and subtract positive integers
3. Multiply and divide positive integers by 10, 100, 1000
4. Multiply and divide positive integers (single digit multiplier and divisor for non-calculator section)
5. Know multiplication and division facts up to 10 × 10
6. Round positive integers to the nearest 10, 100 and 1000
7. Understand and use multiples, factors, common factors and prime numbers
8. Understand negative numbers and use a number line to order, add and subtract negative numbers
9. Read, write, order and compare positive and negative integers of any size
10. Add, subtract, multiply and divide integers of any size
11. Multiply and divide using negative integers
12. Find the Highest Common Factor and Lowest Common Multiple of any two positive integers
13. Read, write and use squares, cubes and square roots
14. Read, write and use index notation for small positive integer powers

B) Decimals

1. Read, write, order and compare decimals up to two decimal places and understand place value
2. Add and subtract decimals up to two decimal places
3. Multiply decimals with up to two decimal places (single digit whole number multiplier for non-calculator section)
4. Divide decimals with up to two decimal places, using a calculator
5. Multiply decimals with up to two decimal places (two digit multiplier and divisor for non-calculator section)
6. Round decimals to two decimal places
7. Add and subtract any decimal

C) Approximation

1. Check solutions to questions and problems by considering whether the answer is sensible
2. Check solutions to questions and problems by using suitable approximations

D) Fractions

1. Read, write, order and compare fractions and mixed numbers
2. Use equivalent fractions
3. Write fractions in their simplest form
4. Convert simple fractions to decimals (up to 2 decimal places) and vice versa e.g. ½, ¼, 1/5, 1/10 and multiples of these fractions
5. Add and subtract simple fractions with the same denominator, excluding mixed numbers
6. Multiply a fraction by a positive integer, and find a fraction of a whole number quantity (positive integers only)
7. Multiply fractions, including mixed numbers
8. Divide fractions, including mixed numbers, using a calculator
9. Add and subtract fractions with different denominators and mixed numbers
10. Use fractions to compare quantities
11. Express one number as a fraction of another

E) Percentages

1. Read, write, order and compare simple percentages

2. Use equivalencies between decimals (up to 2 decimal places) fractions and percentages
E.g. 25% = ¼ = 0.25
3. Work out percentages of quantities, including VAT
4. Find percentages of quantities of any value
5. Calculate percentage increase and decrease
6. Express one number as a percentage of another

F) Ratio & Proportion

1. Use direct proportion in simple problems
2. Use ratio notation
3. Divide a quantity into 2 or 3 parts in a given ratio

G) Money

1. Read, write, order and compare money
2. Round money in calculations to the nearest penny
3. Add, subtract, multiply and divide quantities of money, household finance, utility bills, shopping bills, interest (for 1 year)
4. Convert between currencies
5. Calculate simple interest
6. Calculate wages and salaries, including national insurance and tax deductions

H) Time

1. Read, measure and record time using digital and analogue clocks in 12-hour and 24-hour format
2. Convert units of time including seconds, minutes, hours, days, weeks, months and years
3. Work out intervals of time
4. Read, measure and record events on calendars

I) Measures

1. Know and use units of measure for length, weight, angles, capacity, temperature, including metric and imperial units and degrees e.g. imperial units include miles, inches, feet, pounds, gallons and pints
2. Add and subtract measures
3. Convert units of measure in its same systems
4. Read integer scales
5. Draw lines and angles, accurate to the nearest cm and degree
6. Read decimal scales
7. Convert between metric and imperial units e.g. 5 miles = 8 km 12 inches= 1 foot = 30 cm 2.2 pounds = 1 kg 8 pints = 1 gallon = 4.5 litres

J) Area & Perimeter

1. Work out the perimeter of rectangles and shapes made from rectangles
2. Work out the area of rectangles and shapes made from rectangles
3. Work out the area and perimeter of rectangles, triangles, circles and semi-circles
4. Work out areas of composite shapes made from of rectangles, triangles, circles and/or semi-circles
11. Volume 1. Volumes of prisms and cylinders

K) Tables & Charts

1. Read, write and use everyday tables, charts e.g. mileage charts, bar charts, line graphs, currency conversion tables and timetables (bus, train and airlines).
2. Draw and interpret pie charts and frequency tables