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**GUIDANCE on: Numeracy across Learning in the Secondary**

**Produced: August 2017**

**Due for Review: December 2017**

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**Introduction: Numeracy Experiences and outcomes: Responsibility for all**

Numeracy provides essential analytic, problem-solving and decision-making skills, including financial awareness. Being numerate helps us to function responsibly in everyday life and contribute effectively to society. It increases our opportunities within the world of work and establishes foundations which can be built upon through lifelong learning. Numeracy is not only a subset of mathematics; it is also a life skill which permeates and supports all areas of learning, allowing young people access to the wider curriculum. Numeracy is at the heart of Curriculum for Excellence. Curriculum national guidance makes it explicit that every teacher/practitioner should look for opportunities to develop young people's numeracy skills across all areas and at all levels of learning. This reflects the importance that the Scottish Government places on these crucial skills, which unlock learning in other areas of the curriculum and are therefore vital for success in learning, life and work in the modern world and workplace.

Numeracy contributes to and draws from many subjects and aspects of the curriculum. Pupils can be helped to appreciate the importance of numeracy in their lives by making these links explicit. For example, if it is known how numeracy is applied in other subjects and colleagues are asked to exemplify applications for use in mathematics lessons, it will be possible to provide examples and contexts which pupils know and understand. As such, numeracy becomes an essential-skill in the curriculum and also a life skill.

All areas of the curriculum can provide an engaging and motivating context for developing and applying numeracy skills. Focusing on numeracy in a range of contexts can give learners the opportunity to:

* Interpret numerical information appropriately and use it to draw conclusions, assess risk, make reasoned evaluations and informed decisions;
* Apply numeracy skills and understanding creatively and logically to solve problems, within a variety of practical activities;
* Apply mental agility skills through the development of efficient mental strategies.

This guidance has been produced to support staff as they develop their understanding of Numeracy across the Curriculum. It illustrates how staff can make connections in their planning through exploring clear and relevant links across the curriculum. It also shows the progression of skills in the upper levels of Curriculum for Excellence, from 2nd to 4th Level. It is important that staff select the most relevant numeracy experiences and outcomes for each curricular area to ensure that both the numeracy and curricular outcomes provide sufficient challenge for all learners.

It is important to provide a consistency of approach, methodologies used and language when delivering numeracy across the school. This may involve creating specific professional development for staff. It is recommended that a Numeracy Team is established within your school, with representatives from all departments. Initially, a whole school audit could take place, where departments can highlight the numeracy experiences and outcomes that they are covering through their current programmes of study, a link to an exemplar is provided in appendix. Staff also have to agree on shared standards, so moderation and assessment will be an important area to focus on. It is also important to consider how a pupil’s learning experience in Numeracy across Learning is going to be tracked and monitored – could a numeracy log be developed where pupils can record the skills they have been working on, and the subject area it connects to? A link to an example of a tracker and a pupil’s log is in the appendix.

Interdisciplinary Learning can also help to exemplify and contextualise Numeracy across Learning. Some examples of this, in the secondary school context, could include Eco Schools, The Stock Market Challenge, Financial Education Week or Health week. Some specific examples have been included in the guidance.

**Aims of this Guidance**

**This guidance has been produced to support schools to:**

* enhance standards in mathematics across the curriculum;
* ensure that numeracy is listed as a teaching theme;
* identify schemes of work and topics which involve the use of numerical skills;
* ensure that numeracy is embedded in plans where appropriate;
* enhance standards in aspects of subjects where mathematics is a major contributor;
* enable students to transfer mathematics skills across subject areas;
* ensure an agreed consistency of approach, planning, holistic assessment and progression in the teaching, use and application of numerical concepts and mathematics across the curriculum;
* increase awareness amongst teachers of the contribution that mathematics can make to each curriculum area and vice versa;
* help pupils appreciate the importance of mathematics in their lives;
* enable pupils to understand and apply mathematics in the context of other subjects that they study;
* monitor consistency in the delivery of numeracy within the classroom.



Every subject makes a contribution to mathematics across the curriculum because they all use some aspects of mathematics. However, certain subjects use mathematics on a day-to-day basis more than others. These subjects are design and technology, geography, information technology and science, which align closely with many aspects of numeracy throughout their programmes of study.

The table below identifies the common areas shared by CDT, Geography, IT, Science and Numeracy - these are indicated in bold.

|  |  |
| --- | --- |
| * **Averages, measures of spread,** * Area and volume * Calculation techniques * Co-ordinates * **Estimation.** * **Formulae:**   **√ triangle representation;**  **√ use of words and symbols**   * **Graphs:**   **√ bar graphs;**  **√ pie charts;**  **√ pictograms;**  **√ scatter graphs;**  **√ histograms;**  **√ line graphs;**  **√ algebraic graphs.**   * **Measuring:**   **√ units;**  **√ prefixes (e.g. pico, nano, etc.)** | * Negative numbers * **Proportions:**   **√ fractions;**  **√ percentages;**  **√ decimals;**  **√ ratio and scales.**   * Shape and space:   √ nets;  √ symmetry;  √ tessellation;  √ transformations.   * **Surveys and data capture.** * **Tables of data:**   **√ constructing;**  **√ reading;**  **√interpretation.**   * Trial and improvement |

The numerical aspects in the above table will have specific terminology, vocabulary and conventions attached to them. A link to numeracy posters is in the appendix to ensure a shared approach to teaching conventions.

Schools should work towards an agreed approach and understanding between the main subject area (as indicated above) and the mathematics department on:

* use of units;
* mathematical notation and terminology to be used;
* algebraic and other mathematical techniques. For example, how to simplify algebraic expressions or solve equations;
* how graphs are to be presented and used;
* how and when ICT resources, such as graph plotters or graphical calculators, will be used to support mathematics;
* effective use of holistic assessments to provide evidence of learning.

Organisation of Experiences and Outcomes

The guidance has been split into the numeracy areas which are the **Responsibility for All**, with the Significant Aspect of Learning for that area at the top of the page. It has been arranged as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| **Experiences & Outcomes for planning** | | | |
| **Experiences and Outcomes** | **2nd Level Summary of Core Skills assessed in Benchmarks** | **3rd Level Summary of Core Skills assessed in Benchmarks** | **4th Level Summary of Core Skills assessed in Benchmarks** |
| *Numeracy Es and Os are listed here* | *Shows the progression of skills from 2nd to 4th Level* |  |  |
| **Suitable Activities** | | | |
| What type of activity might pupils work on? | *Suggestions for activities to promote discussion amongst staff, again showing a progression from 2nd to 4th Level* |  |  |

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| --- | --- | --- | --- |
| **Example Tasks & Activities** | | | |
| **Subjects**  **(and relevant Es & Os)** | **Level 2** | **Level 3** | **Level 4** |
| *Es and Os from specific curricular areas* | *Suggestions for tasks which can be linked to Numeracy, showing a progression from 2nd to 4th Level* |  |  |

**The sections, which are the responsibility for all, have been organised in the following order:**

**Using Knowledge and Understanding of the number system, patterns and** **relationships**  Estimating and Rounding

Number and Number Processes

Fractions, decimal fractions and percentages

Money

**Using Knowledge and Understanding of Measurement and its Application** Time

Measurement

**Numeracy Progressions: Researching and evaluating data to assess risks and make informed choices** Data and Analysis and Ideas of Chance and Uncertainty

**Explanations of specific experiences and outcomes – *from Education Scotland’s document ‘Numeracy across Learning’***

**MNU 1-10a**

Developing a child’s understanding of 12 hour time in depth takes place through first level. Young learners will become familiar with 24 hour notation in their surroundings through TV listings, computers, cookers, DVD players and videos. They will naturally make links with 24 hour notation and the routines in their day. The next stage of development, the formal manipulation of 24 hour time, is included in MNU 2-10a – understanding and using timetables.

**MNU 4-03a**

The ability to apply and transfer familiar concepts to solve problems is fundamental for mathematical developments. As one example, young people will be familiar with the fact that 2.5 is a quarter of 10 and will know how to find 10% of a quantity. When asked to consider a less familiar calculation e.g. 2.5% of £840 the combination of these previously-acquired skills could lead them to suggest 1/4 of £84 to be a possible solution.

**MNU 3-07a, MNU 4-07a**

MNU 3-07a develops skills that allow learners to carry out calculations involving fractions, decimal fractions and percentages and then make decisions and choices. For example: which is the better buy, 3 for the price of 2 or a 30% discount?

**MNU 4-07a** develops the skills that allow learners to use their knowledge of interrelationships between fractions, decimal fractions and percentages to choose an elegant route to the solution. As an example, when asked to evaluate a discount of 12.5% on an item costing £800, an elegant solution would involve the understanding that 12.5% is 1/8, and that calculating 1/8 of £800 will provide the answer to the size of the discount.

**MNU 4-10a**

Using time efficiently is necessary in the workplace, in lifelong learning, leisure time and all other aspects of daily life. The ability to estimate how long different tasks take and then build a programme of sequential tasks is a critical numeracy skill which is fundamental to effective time management.

**MNU 4-01a, MNU 4-11a**

MNU 4-01a and MNU 4-11a are closely related. MNU 4-01a develops the concept of tolerance within estimating and rounding whereas MNU 4-11a is the practical application within measurement. The ability to work to the appropriate degree of accuracy is an essential numeracy skill. The degree of accuracy demanded varies of course according to the task. For example, the degrees of accuracy needed for measuring the dimensions of a room before buying a new carpet, measuring the opening when fitting a new door or machining a moving part within a combustion engine will be quite different. Or again, when a 4 metre length of wood is cut into 7 equal pieces, should each length be 0.57142 metres or will 0.57 metres be acceptable? The ability to handle spurious precision and report using an appropriate degree of accuracy should always be encouraged.

**MNU 4-20a**

This experience and outcome relates to a learner's developing skills in interpreting a data set or the information contained in, for example, box plots, stem and leaf diagrams, line graphs, bar graphs, histograms and pie charts. Having considered this information it is important for learners to understand key features of these different ways of presenting information in order to be able to select appropriate forms and communicate findings to others.

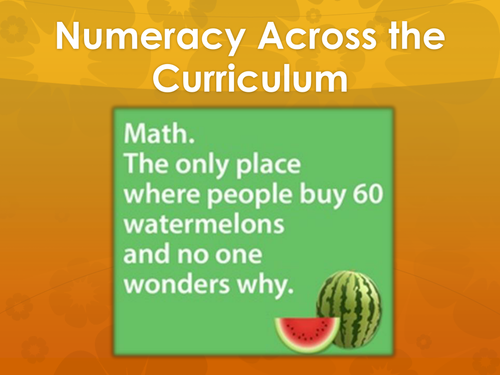
**MNU 4-22a**

MNU 4-22a is intended to develop the link between simple probability and expected frequency. Having gained an understanding of these two concepts, the ability to assess the impact of a particular course of action based on risks and benefits is a very important skill for life.

**Using Knowledge and Understanding of the number system, patterns and relationships**

|  |  |  |  |
| --- | --- | --- | --- |
| **Experiences & Outcomes for planning in Estimation and Rounding** | | | |
| **Experiences and Outcomes** | **2nd Level Summary of Core Skills assessed in Benchmarks** | **3rd Level Summary of Core Skills assessed in Benchmarks** | **4th Level Summary of Core Skills assessed in Benchmarks** |
| **MNU 2-01a/3-01a/4-01a**  *I can use my knowledge of rounding to routinely estimate the answer to a problem then, after calculating, decide if my answer is reasonable, sharing my solution with others.*  *I can round a number using an appropriate degree of accuracy, having taken into account the context of the problem.*  *Having investigated the practical impact of inaccuracy and error, I can use my knowledge of tolerance when choosing the required degree of accuracy to make real-life calculations.* | Rounds whole numbers to the nearest 1000, 10 000 and 100 000.  Rounds decimal fractions to the nearest whole number, to one decimal place  and two decimal places.  Applies knowledge of rounding to give an estimate to a calculation appropriate  to the context. | Rounds decimal fractions to three decimal places.  Uses rounding to routinely estimate the answers to calculations. | Rounds answers to a specified significant figure.  Demonstrates that the context of the question needs to be considered when rounding.  Demonstrates the impact of inaccuracy and error, for example, the impact of rounding an answer before the final step in a multi-step calculation.  Uses a given tolerance to decide if there is an allowable amount of variation of a specified quantity, for example, dimensions of a machine part, 235 mm ± 1 mm. |
| **Suitable Activities** | | | |
| What type of activity might pupils work on? | Tasks which ask pupils to:   |  | | --- | | * Round whole numbers to the nearest 1000, 10,000 and 100,000. * Round decimal fractions to the nearest whole number, to one decimal place and to two decimal places. * Apply knowledge of rounding to give an estimate to a calculation appropriate to the context, and use it to check the reasonableness of the solution. | | Tasks which ask pupils to:   * Round decimal fractions to three decimal places. * Use rounding to routinely estimate the answers to calculations. | Tasks which ask pupils to:   * Round answers to a specified significant figure. * Demonstrate that the context of the question needs to be considered when rounding. * Demonstrate the impact of inaccuracy and error, for example, the impact of rounding an answer before the final step in a multi-step calculation. * Use a given tolerance to decide if there is an allowable amount of variation of a specified quantity, for example, dimensions of a machine part, 235mm ± 1mm. |

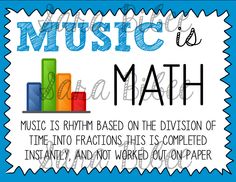
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| **Example Tasks & Activities** | | | |
| **Subjects**  **(and relevant Es & Os)** | **Level 2** | **Level 3** | **Level 4** |
| **Art and Design**  EXA 2-04a/3-04a/4-04a | Drawing faces and figure drawing showing my awareness and recognition of detail.  Scale drawing  Fibonacci sequence. | Still life - observing and recording, creating material that shows accuracy of representation.  Human face and Golden Ratio.  Figure drawings. | Through creating a range of reference material, demonstrate skills of observing and recording and apply them to work in other areas of the curriculum.  Using trigonometric functions sine and cosine for art. |
| **Technology**  **Application of Engineering**  TCH 2-12a/3.12a/4-12a | Use accurate estimation to create solutions in 3D and 2D and justify the construction/graphic methods and the design features of engineering disciplines to create solution.  Estimating lengths and width and calculate usage of materials. | Apply knowledge and understanding of engineering disciplines to develop/build solutions to given tasks.  Producing an appropriate graph to represent statistics. | Solve problems through the application of engineering principles and can discuss the impact engineering has on the world around me.  Understand and explain tolerance, including simple calculations regarding largest and smallest acceptable size.  The use of equality and inequality signs through databases with queries. |
| **Social Studies**  SOC 2–13a  SOC 3-14a | Using data to compare countries to each other for topics such as population. Understanding that data can rounded and the implications for accuracy.  Evaluate a range of data and use it to research a social, political, environmental or economic issue. | Interpreting data from graphs where data is estimated, for example opinion polls.  Consider the accuracy and use of that information, for example the makeup and size of the sample.  Working out height from contour maps.  Evaluate a range of data and use it to research a social, political, environmental or economic issue. |  |



**Using Knowledge and Understanding of the number system, patterns and relationships**

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| **Experiences & Outcomes for planning in Number and Number Processes** | | | |
| **Experiences and Outcomes** | **2nd Level Summary of Core Skills assessed in Benchmarks** | **3rd Level Summary of Core Skills assessed in Benchmarks** | **4th Level Summary of Core Skills assessed in Benchmarks** |
| **MNU 2-02a**  *I have extended the range of whole numbers I can work with and having explore how decimal fractions are constructed, can explain the link between a digit, its place and its value*  **MNU 2-03a/3-03a/4-03a**  *Having determined which calculations are needed, I can solve problems involving whole numbers using a range of methods, sharing my approaches and solutions with others.*  *I can use a variety of methods to solve number problems in familiar contexts clearly communicating my processes and solutions.*  *Having recognised similarities between new problems and problems I have solved before, I can carry out the necessary calculations to solve problems set in unfamiliar contexts.*  **MNU 2-03b/3-03b**  *I have explored the contexts in which problems involving decimal fractions occur and can solve related problems using a variety of methods.*  *I can continue to recall number facts quickly and use them accurately when making calculations.*  **MNU 2-04a/3-04a**  *I can show my understanding of how the number line extends to include numbers less than zero and have investigated how these numbers occur and are used.*  *I can use my understanding of numbers less than zero to solve simple problems in context.* | Reads, writes and orders whole numbers to  1 000 000, starting from any number in the sequence.  Explains the link between a digit, its place and its value for whole numbers to 1 000 000.  Reads, writes and orders sets of decimal fractions to three decimal places.  Explains the link between a digit, its place and its value for numbers to three decimal places.  Partitions a wide range of whole numbers and decimal fractions to three decimal places, for example, 3∙6 = 3 ones and 6 tenths = 36 tenths.  Adds and subtracts multiples of 10, 100 and 1000 to and from whole numbers and decimal fractions to two decimal places.  Adds and subtracts whole numbers and decimal fractions to two decimal places, within the number range 0 to 1 000 000.  Uses multiplication and division facts to the 10th multiplication table.  Multiplies and divides whole numbers by multiples of 10, 100 and 1000.  Multiplies and divides decimal fractions to two decimal places by 10, 100 and 1000.  Multiplies whole numbers by two digit numbers.  Multiplies decimal fractions to two decimal places by a single digit.  Divides whole numbers and decimal fractions to two decimal places, by a single digit, including answers expressed as decimal fractions, for example, 43 ÷ 5 = 8∙6.  Applies the correct order of operations in number calculations when solving multi-step problems.  Identifies familiar contexts in which negative numbers are used.  Orders numbers less than zero and locates them on a number line. | Recalls quickly multiplication and division facts to the 10th multiplication table.  Uses multiplication and division facts to the 12th multiplication table.  Solves addition and subtraction problems working with whole numbers and decimal fractions to three decimal places.  Solves addition and subtraction problems working with integers.    Solves multiplication and division problems working with whole numbers and decimal fractions to three decimal places.  Solves multiplication and division problems working with integers. | Interprets and solves multi-step problems using the four operations. |
| **Suitable Activities** | | | |
| What type of activity might pupils work on? | Tasks which ask pupils to work using:   |  |  |  | | --- | --- | --- | | * thousands, ten thousands, hundred thousands, millions, * nearest hundred, thousand, nearest tenth, hundredth, thousandth, * one/two/three decimal places, * integer, positive, negative, * above/below, zero, minus, * greater than, less than, equal to, * ascending/descending order, * approximately equal to.  |  | | --- | | Pupils are given the opportunity to  explore the contexts in which  problems involving decimal fractions  occur and to demonstrate they can solve  related problems in context using a variety  of methods.  Uses relevant numeracy and ICT skills to  interpret data from maps and other sources  and create simple graphs | |  | | | Tasks which ask pupils to work using:   * nearest thousandth, * three decimal places * Relevant numeracy and ICT skills to interpret data from maps and other sources and create simple graphs. * Use negative numbers in measurement of unbalanced forces. | Tasks which ask pupils to:   * Use mass and weight in open ended calculations, * Use negative numbers in real life problems. |

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| **Example Tasks & Activities** | | | |
| **Subjects**  **(and relevant Es & Os)** | **Level 2** | **Level 3** | **Level 4** |
| **Science**  Energy, sources and sustainability  SNC 2-04b, 3-04b  SNC – 3-08a | Produce a report based on given data as to which type of renewable energy would be most suitable to various areas of an island    . | Present research findings, the advantages and disadvantages associated with the use of renewable energy sources and their impact  on society, demonstrating an informed view based on evidence and data which has been collected and analysed.  Investigation on the effects of gravity on planets and its relationship with mass.  Knows that weight is a force caused by the Earth’s (or other planet’s) gravitational pull on an object, measured in newtons (N), and uses the formula *W = mg* to calculate weight.  Predicts the effects on the weight of an object due to the gravitational  field strength in different positions in the universe, for example,  at different altitudes on Earth, on different planets and in deep space. |  |
| **Health and Wellbeing**  HWB 3-31a,3-32a |  | Energy needs relating to occupation, age, gender etc.Pupils will measure body mass, calculate energy and protein needs using formulae. This could be followed by a whole-class discussion, including the following –   * Identification of nutrient sources and their functions, including, fat, carbohydrate, vitamins, calcium, iron, dietary fibre. * Considering a range of dishes and identifying the main nutrients percentages they contain. * Identifying the factors which may contribute to an energy imbalance, for example, portion sizes, sedentary lifestyles and the resultant consequences. * Consideration of nutritional requirements of specified individuals/groups, for example, pregnant women, diabetics. |  |
| **Social Studies**  SOC 2-12a  SOC 3-12a  SOC 3-20a  SOC 3 -20b  SOC 3-21a | Ability to read climate graphs, showing rainfall and temperature, including negative temperatures.  Tourism – looking at the changes in the number and destinations of tourists over time. | |  | | --- | | Drawing climate graphs including the use of negative numbers.  Compare the economy of the UK and Scotland in the pre and post was eras.  Understand the definitions of LEDC and MEDCs and how the statistical measures contribute to these definitions.  Comparison activities about the industrial output of a country.    Impact of economy on society e.g. GNP and GDP – discussion about these measures and how they are constructed. | |  |
| **Technologies**  TCH 3-11a |  | Analysis and interpretation of information presented in various formats for evidence gathering/research.  Pupils regularly make cutting lists and interpret engineering drawings.  Use of formulae for addition, subtraction, multiplication, maximum, minimum in spreadsheets. |  |



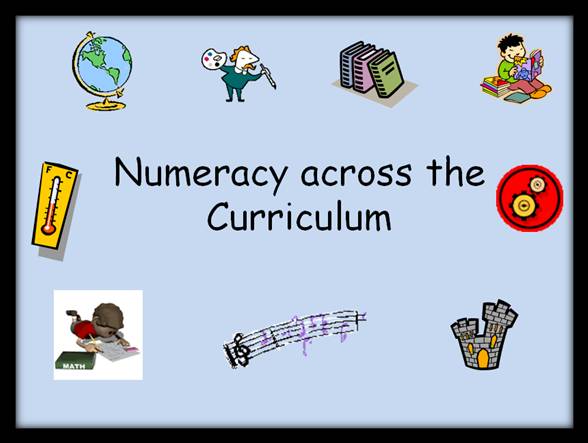
**Using Knowledge and Understanding of the number system, patterns and relationships**

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| --- | --- | --- | --- |
| **Experiences & Outcomes for planning in Fractions, decimal fractions and percentages** | | | |
| **Experiences and Outcomes** | **2nd Level Summary of Core Skills assessed in Benchmarks** | **3rd Level Summary of Core Skills assessed in Benchmarks** | **4th Level Summary of Core Skills assessed in Benchmarks** |
| **MNU 2-07a/3-07a/4-07a**  *I have investigated the everyday contexts in which simple fractions, percentages or decimal fractions are used and can carry out the necessary calculations to solve related problems.*  *I can solve problems by carrying out calculations with a wide range of fractions, decimal fractions and percentages, using my answers to make comparisons and informed choices for real-life situations.*  *I can choose the most appropriate form of fractions, decimal fractions and percentages to use when making calculations mentally, in written form or using technology, then use my solutions to make comparisons, decisions and choices.*  **MNU 2-07b**  *I can show the equivalent forms of simple fractions, decimal fractions and percentages, and can choose my preferred form when solving a problem, explaining my choice of method.*  **MNU 3-08a/4-08a**  *I can show how quantities that are related can be increased or decreased proportionally and apply this to solve problems in everyday contexts.*  *Using proportion, I can calculate the change in one quantity caused by a change in a related quantity and solve real-life problems.* | Uses knowledge of equivalent forms of common fractions, decimal fractions and percentages, for example, = 0.75 = 75%, to solve problems.  Calculates simple percentages of a quantity, and uses this knowledge to solve problems in everyday contexts, for example, calculates the sale price of an item with a discount of 15%.  Calculates simple fractions of a quantity and uses this knowledge to solve problems, for example, find of 60. | Converts fractions, decimal fractions or percentages into equivalent fractions, decimal fractions or percentages.  Uses knowledge of fractions, decimal fractions and percentages to carry out calculations with and without a calculator.  Solves problems in which related quantities are increased or decreased proportionally.  Expresses quantities as a ratio and where appropriate simplifies, for example, ‘if there are 6 teachers and 60 children in a school find the ratio of the number of teachers to the total amount of teachers and children’. | Chooses the most efficient form of fractions, decimal fractions or percentages when making calculations.  Uses calculations to support comparisons, decisions and choices.  Calculates the percentage increase or decrease of a value.  Uses knowledge of proportion to solve problems in real-life which involve changes in related quantities. |
| **Suitable Activities** | | | |
| What type of activity might pupils work on? | Tasks which ask pupils to:   * Work with decimal fractions to 3 decimal places (tenths, hundredths and thousandths). * Add/subtract decimal fractions with 3 decimal places. * Multiply/divide decimal fractions with 2 decimal places by a whole number. * Multiply/divide decimal fractions by 1000. * Find the fraction of an amount by using multiplication and division e.g. of 15. * Convert between mixed numbers and improper fractions e.g. =1. * Carry out calculations with any percentage. * Use relevant numeracy and ICT skills to interpret data from maps and other sources and create simple graphs. * Work with pattern. | Tasks which ask pupils to:   * Convert any fraction, decimal fraction or percentage into an equivalent fraction, decimal fraction or percentage. * Add and subtract simple fractions and mixed numbers e.g. including when changing a denominator. * Solve problems in which related quantities are increased or decreased proportionally. * Express quantities as a ratio and simplify where appropriate e.g. if there are 6 teachers and 60 children in a school find the ratio of the numbers of teachers to the total amount of people. * Use relevant numeracy and ICT skills to interpret data from maps and other sources and create graphs. * Work with patterns, including coding | Tasks which ask pupils to:   * Apply addition, subtraction and multiplication skills to solve problems involving fractions and mixed numbers. * Choose the most efficient form of fractions, decimal fractions or percentages when making calculations and justify the methods used. * Increase and decrease quantities proportionally to solve problems in everyday contexts. * Calculate the % increase/decrease of a value. * Express one value as a % of another. * Use relevant numeracy and ICT skills to interpret data from maps and other sources and create graphs. * Work with more complex patterns. |

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| **Example Tasks & Activities** | | | |
| **Subjects**  **(and relevant Es & Os)** | **Level 2** | **Level 3** | **Level 4** |
| **Technologies**  **Designing, building and testing computational solutions**  **TCH 2-15a,3-15a, 4-15a** | Creates programs in a visual programming language including variables and conditional repetition.  Identifies patterns in problem solving and reuses aspects of previous solutions appropriately for example, reuse code for a timer, score counter or controlling arrow keys. | Designs and builds a program using a visual language combining constructs  and using multiple variables.  Represents and manipulates structured information in programs, or databases  for example, works with a list data structure in a visual language, or a flat file database.  Interprets a problem statement, and identifies processes and information to create a physical computing and/or software solution.  Groups related instructions into named subprograms (in a visual language).  Writes code in which there is communication between parallel processes (in a visual language).  Writes code which receives and responds to real world inputs (in a visual language). | Analyses problem specifications across a range of contexts, identifying key requirements.  Writes a program in a textual language which uses variables and constructs such as sequence, selection and repetition.  Creates a design using accepted design notations for example, pseudocode storyboarding, structure diagram, data flow diagram, flow chart.  Debugs code and can distinguish between the nature of identified errors e.g. syntax and logic.  Writes a program in a textual language which uses variables within instructions instead of specific values where appropriate.  Selects an appropriate platform on which to develop a physical and/or software solution  from a requirements specification.  Compares common algorithms for example, those for sorting and searching, and justify  which would be most appropriate for a given problem. |
| Social Studies  SOC 3-12a SOC 3-20a  SOC 3 -20b SOC 3-21a |  | |  | | --- | | Compare the economy of the UK and Scotland in the pre and post was eras.  Understand the definitions of LEDC and MEDCs and how the statistical measures contribute to these definitions.  Comparison activities about the industrial output of a country.  Drawing climate graphs including the use of negative numbers. | |  |
| **Technologies**  **TCH3-13b** |  | Breaking down cutting lists of timber to usable lengths for model building to a drawing specification.  Problem solving calculations involving fractions. |  |
| **Music**  **EXA 2-16a, 2-17a**  **EXA 3-16a, 3-17a**  **EXA 4-16a, 4.17a, 4-17b** | Performs songs in unison and in parts, individually or as part of a group, using appropriate performance directions, for example, gradually getting louder/quieter, and/or musical notation.  Uses voice, instruments and technology to create music, experimenting with timbre, for example, uses tuned/un-tuned percussion instruments to create simple melodies and rhythms. | Performs music individually, with accuracy, from at least two contrasting styles, using two instruments or one instrument and voice.  Plays by ear or uses appropriate music notation, for example, treble clef notation, tablature, graphic scores or chord symbols, to give a group or individual performance.  Uses voice, instruments and technology to create music, showing understanding of musical structure, for example, creates in simple verse chorus form, creates short sequenced pieces using technology, and creates short 16 bar music in binary form, experiments with voices/instruments to create sound effects. | Performs music individually, with accuracy and assurance, from at least  two contrasting styles, using two instruments or one instrument and voice.  Plays by ear or uses appropriate music notation such as treble clef notation, tablature, graphic scores, chord symbols, to give an individual performance.  Uses appropriate music notation, for example, treble clef notation or tablature.  Uses technology to develop and structure short melodic ideas into original music, for example, uses software with midi input to create a minimalist style composition using short, repeated ostinato/cells of music.  Applies knowledge of music concepts to develop original ideas, for example, takes a 2-bar melodic phrase and creates a sequence passage which can be imitated in a different part. |

**Using Knowledge and Understanding of the number system, patterns and relationships**

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| **Experiences & Outcomes for planning in Money** | | | |
| **Experiences and Outcomes** | **2nd Level Summary of Core Skills assessed in Benchmarks** | **3rd Level Summary of Core Skills assessed in Benchmarks** | **4th Level Summary of Core Skills assessed in Benchmarks** |
| **MNU 2-09a/3-09a/4-09a**  *I can manage money, compare costs from different retailers, and determine what I can afford to buy.*  *When considering how to spend my money, I can source, compare and contrast different contracts and services, discuss their advantages and disadvantages, and explain which offer best value to me.*  *I can discuss and illustrate the facts I need to consider when determining what I can afford, in order to manage credit and debt and lead a responsible lifestyle.*  **MNU 2-09b/2-09c/3-09b/4-09b/4-09c**  *I understand the costs, benefits and risks of using bank cards to purchase goods or obtain cash and realise that budgeting is important;* | Carries out money calculations involving the four operations.  Compares costs and determines affordability within a given budget.  Demonstrates understanding of the benefits and risks of using bank cards and digital technologies.    Calculates profit and loss accurately, for example, when working with a budget for an enterprise activity. | Demonstrates understanding of best value in relation to contracts and services when comparing products.  Chooses the best value for their personal situation and justifies choices.  Budgets effectively, using digital technology where appropriate, showing development of financial capability.  Demonstrates knowledge of financial terms, for example, debit/credit, APR, pa, direct debit/standing order and interest rate.    Converts between different currencies. | Applies understanding of credit and debit in relation to earnings and deductions.  Uses budgeting skills to manage income effectively and justifies spending and saving choices.  Calculates net income by selecting appropriate information.  Compares a range of personal finance products.  Communicates the impact of financial decisions.  Applies knowledge of currency conversion to determine best value. |
| **Suitable Activities** | | | |
| What type of activity might pupils work on? | Real life tasks which ask pupils to:   * Work within a budget, calculate spending, include discounts, find best value and justify choices; * Keeping a simple profit and loss journal | Tasks which ask pupils to:   * Demonstrate understanding of best value in relation to contracts and services when comparing products; * Choose best value for a personal solution and justify their choice; * Budget effectively, using technology, showing development of increased financial capability. | Tasks which ask pupils to:   * Apply understanding of credit and debit in relation to earnings and deductions; * Use budgeting skills to manage income effectively and can justify spending and saving choices; * Calculating net income by selecting appropriate information; * Compare a range of financial products; * Communicate the impact of financial decisions. |
| **Example Tasks & Activities** | | | |
| **Subjects** | **Level 2** | **Level 3** | **Level 4** |
| **English**  Tools for listening and talking:  LIT 3-02a, 4-02a, LIT 3-10a, 4-10a  **Drama**  EXA 3-14a, 4-14a |  | Skint! – [www.scottishbooktrust.com/learning/adult-learners/skint](http://www.scottishbooktrust.com/learning/adult-learners/skint)  An adult learner’s resource developed by Scottish Book Trust, which is fully interactive and specifically created for adult literacy and numeracy support groups. | Skint! – [www.scottishbooktrust.com/learning/adult-learners/skint](http://www.scottishbooktrust.com/learning/adult-learners/skint)  An adult learner’s resource developed by Scottish Book Trust, which is fully interactive and specifically created for adult literacy and numeracy support groups. |
| **Modern Languages**  Listening and Talking with others:  MLAN 2-05a, 3-05a, 4-05a  Organising and using information:  MLAN 2-12a, 3-12a, 4-12a | Students can look at the use of the Euro in Modern Foreign Languages – working with exchange rates etc. This can also link to the activities developed within Time to be part of a presentation on a trip to part of Europe. Reign LanguagesCar on a slope  -  testing th  e effect of different surfaces, heights  of a ramp and weight of a ca | Students can look at the use of the Euro in Modern Foreign Languages – working with exchange rates etc. This can also link to the activities developed within Time to be part of a presentation on a trip to part of Europe. Reign | Students can look at the use of the Euro in Modern Foreign Languages – working with exchange rates etc. This can also link to the activities developed within Time to be part of a presentation on a trip to part of Europe. Reign |
| **Social Studies**  People in society, economy and business   |  | | --- | | SOC 2-20a  SOC 2-21a  SOC 2 22a | | |  |  |  |  | | --- | --- | --- | --- | | Use Fair Trade as a theme to explore  ethical trading and the consequences  of unethical trading and consumerism  on the economies and living conditions of  other countries.  Partnership with local banks and  credit unions to explore the pros and  cons of different payments methods  and practical activities related to  budgeting and paying for goods and  services with different methods.  Experience different skills,  responsibilities and challenges of  working with money through a variety  of enterprise activities.  Consider the profit, loss, and risk and  start-up costs of a project. Research  and write business plans to support  an Enterprise project.  Create links with local businesses to  provide expert support, and provide  opportunities for work placement. | • learns how to identify different types of enterprise activity  • understands that there are different ways to pay for essential goods and services such as cash, cheques, credit and can explain briefly the advantages and disadvantages of each | | SAL 8  SAL 9 | |  | | MNU 0-10a SOC 0-02a SOC 0-04a SOC 0-12a | | |  |  |
| **Whole School Events** | Stock Market Challenge – <http://www.stockmarketchallenge.co.uk/>  Use it in the classroom to support Maths, Business Studies and Economics. Use it with all students to develop Skills, Financial Capability and Work-related Learning. A competitive, team-based game ideal for enterprise and enrichments activities.  Financial Education Week – 20th to 24th March 2017  Held for the first times this year, Financial Education Week aimed to raise awareness about the importance of financial education and the organisations involved in making a difference. Consider creating an event within your own school, involving DYW. Can it be linked with pupils’ work experience placements? | | |
| **Health and wellbeing** | Mr Collins – <http://mrcollinsmaths.blogspot.co.uk/2013/11/numeracy-across-curriculum-ittnqt.html>  ‘*The idea is that, perhaps as part of a behaviour management strategy, at the start of a lesson you give all students a certain amount of 'money'. I have some fake £10 notes printed out that I use with ratio activities, or you could use money from board games, print your own etc. Then, throughout the lesson, perhaps when giving out reward points or warnings (in line with your school's behaviour policy), you then issue a reward cash value or 'tax' to the students. This tax could be 10%/25% of the money they have at that time in the lesson, or could just be a determined amount, say £20; a discussion here about which would be the greater amount would be lovely! The students at the end of the lesson with the most money could then 'trade' them in for a small prize or even receive an additional reward point.  I have used raffle tickets in the past in this manner (give them out for good behaviour/work, take them away for poor behaviour) and then draw a ticket at the end of the lesson and that person wins a prize. Here you can discuss the probability of them winning, based on the number of raffle tickets they have!’* | | |

[](http://www.google.co.uk/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&ved=0ahUKEwj6-oXxnM_VAhVCuhoKHYAoBTUQjRwIBw&url=http://bridgeofdon.aberdeen.sch.uk/wp/?p%3D3665&psig=AFQjCNHe012TtIKe-HO3NHxT5FLDEWobyA&ust=1502542321601109)

**Using Knowledge and Understanding of Measurement and its Application**

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| **Experiences & Outcomes for planning in Time** | | | |
| **Experiences and Outcomes** | **2nd Level Summary of Core Skills assessed in Benchmarks** | **3rd Level Summary of Core Skills assessed in Benchmarks** | **4th Level Summary of Core Skills assessed in Benchmarks** |
| **MNU 2-10a/3-10a/4-10a**  *I can use and interpret electronic and paper-based timetables and schedules to plan events and activities, and make time calculations as part of my planning.*  *Using simple time periods, I can work out how long a journey will take, the speed travelled at or distance covered, using my knowledge of the link between time, speed and distance.*  *I can research, compare and contrast aspects of time and time management as they impact on me*  **MNU 2-10b/4-10b**  *I can carry out practical tasks and investigations involving timed events and can explain which unit of time would be most appropriate to use.*  *I can use the link between time, speed and distance to carry out related calculations.*  **MNU 2-10c**  *Using simple time periods, I can give a good estimate of how long a journey should take, based on my knowledge of the link between time, speed and distance.* | |  | | --- | | Reads and records time in both 12 hour and  24 hour notation and converts between the  two.  Knows the relationships between commonly  used units of time and carries out simple  conversion calculations, for example,  changes 1 hours into minutes.  Uses and interprets a range of electronic and  paper-based timetables and calendars to  plan events or activities and solve real life  problems.  Calculates durations of activities and events  including situations bridging across several  hours and parts of hours using both 12 hour  clock and 24 hour notation.  Estimates the duration of a journey based  on knowledge of the link between speed,  distance and time. | | Applies knowledge of the relationship between speed, distance and time to find each of the three variables.  Calculates time durations across hours and days. | Demonstrates effective time management skills, for example, working with different time zones or making plans, including across midnight.  Carries out calculations involving speed, distance and time involving decimal fraction hours.  Calculates time durations across hours, days and months. |
| **Suitable Activities** | | | |
| What type of activity might pupils work on? | Tasks which ask pupils to:   * tell the time using 12 hour clocks – both analogue and digital; * Convert and 12 hour time into 24 hour time and vice versa; * Read and interpret most timetables. | Tasks which ask pupils to:   * Solve, using TDS formulae, basic problems including half and quarter hours; * Calculate the average speed of something; * Create and interpret simple time-distance-speed graphs. | Tasks which ask pupils to:   * discuss time management and its importance in everyday life * to compare and contrast solutions to time management issues |

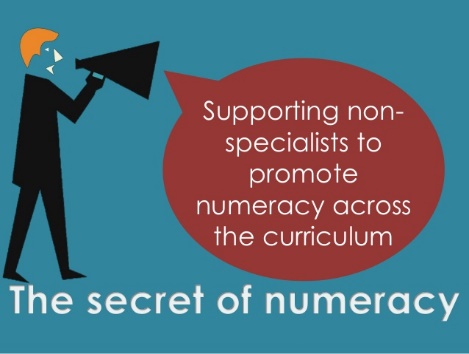
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| **Example Tasks & Activities** | | | |
| **Subjects**  **(and relevant Es & Os)** | **Level 2** | **Level 3** | **Level 4** |
| **Modern Languages**  Listening and Talking with others:  MLN 2-05a, 3-05a, 4-05a  Reading to appreciate other cultures:  MLN 2-09a, 3-09a, 4-09a | Use timetables to plan a journey for the class to take to France, using one method of transport and stating arrival and departure times and the duration of the journey. | Work as part of a group to plan a journey for the class to take to France, comparing different methods of travel and the distance that would be covered for each one, the time it would take and showing an understanding of time zones and differences. | Present a piece of work to the class about their school exchange trip to France which compares and contrasts various different options for travel, takes into account the time pressures that could be a part of it and allows people to choose the best option. |
| **Science**  Forces, Electricity and Waves:  SCN 3-07a, 4-07a | Car on a slope  -  testing th  e effect of different surfaces, heights  of a ramp and weight of a ca | Design an experiment which will allow you to make a variety of calculations using speed, distance and time and work out what affects the time it takes to travel. | Pupils use appropriate methods to measure, calculate and display graphically the speed of an object, and show how these methods can be used in a selected application.  By making accurate measurements of speed and acceleration, pupils can relate the motion of an object to the forces acting on it and apply this knowledge to transport safety. |
| **Technologies**  Computing Science Contexts for Developing technological Skills & Knowledge:  TCH 2-08a, 3-08a, 4-08a, 4-08b | Pupils can share their understanding regarding the impact and use of software application. | Using some form of coding programme such as Scratch to change the speed or distance of an object that is moving around on the screen, using the formula to prove the theory before using it. | Pupils select and use hardware and software with supports business activities. |
| **PE**  Movement skills, competencies and concepts:  HWB 2-21a/22a/23a, 3-21a/22a/23a, 4-21a/22a/23a | Ideas of chance and uncertainty, data and analysis, fractions, decimals and percentages, time, number and number processes. | Ideas of chance and uncertainty, data and analysis, fractions, decimals and percentages, time, number and number processes. Using comparisons of data for Identification of strengths of themselves as learners and others. | Ideas of chance and uncertainty, data and analysis, fractions, decimals and percentages, time, number and number processes. Pupil led activities, demonstrating a high level of skills being used creatively, accurately, consistently and with control. |
| Social Subjects  People past events and societies  SOC 2-02s SOC 2-03a SOC 2-04a SOC 2-06a  SOC 3-02s SOC 3-03a SOC 3-04a SOC 3-05a SOC 3-06a | Transport studies - changes in the use of different kinds of transport over time and think about how long journeys would take for each method.  Create detailed timelines in a variety of ways (illustrations/ICT) to evidence significant dates, artefacts, people and events from history.  Use a variety of primary and secondary evidence to explore history topics and show the similarities and differences between the present and past.  Debate the significance of historical figures and events and present informed evidence of their impact and legacy. | Conduct a river study where pupils can measure the width, depth and speed of a river. Speed can be determined by putting a float in the water over a measured distance. |  |

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| **Experiences & Outcomes for planning in Measurement** | | | |
| **Experiences and Outcomes** | **2nd Level Summary of Core Skills assessed in Benchmarks** | **3rd Level Summary of Core Skills assessed in Benchmarks** | **4th Level Summary of Core Skills assessed in Benchmarks** |
| **MNU 2-11a/3-11a/4-11a**  I can use my knowledge of the sizes of familiar objects or places to assist me when making an estimate of measure.  I can solve practical problems by applying my knowledge of measure, choosing the appropriate units and degree of accuracy for the task and using a formula to calculate area or volume when required.  I can apply my knowledge and understanding of measure to everyday problems and tasks and appreciate the practical importance of accuracy when making calculations.  **MNU 2-11b**  I can use the common units of measure, convert between related units of the metric system and carry out calculations when solving problems.  **MNU 2-11C**  I can explain how different methods can be used to find the perimeter and area of a simple 2D shape or volume of a simple 3D object. | |  | | --- | | Uses the comparative size of familiar objects  to make reasonable estimations of length,  mass, area and capacity.  Estimates to the nearest appropriate unit,  then measures accurately: length, height and  distance in millimetres (mm),  centimetres (cm), metres (m) and  kilometres (km); mass in grams (g) and  kilograms (kg); and capacity in millilitres (ml)  and litres (l).  Calculates the perimeter of simple straight  sided 2D shapes in millimetres (mm),  centimetres (cm) and metres (m).  Calculates the area of squares, rectangles  and right-angled triangles in square  millimetres (mm2), square  centimetres (cm2) and square metres (m2).  Calculates the volume of cubes and cuboids  in cubic centimetres (cm3) and cubic metres  (m3).  Converts between common units of  measurement using decimal notation,  for example,  550 cm = 5·5 m; 3·009 kg = 3009 g.  Chooses the most appropriate measuring  device for a given task and carries out the  required calculation, recording results in the  correct unit.  Reads a variety of scales accurately.  Draws squares and rectangles accurately  with a given perimeter or area. | |  | | Chooses appropriate units for length, area and volume when solving practical problems.  Converts between standard units to three decimal places and applies this when solving calculations of length, capacity, volume and area. | Demonstrates understanding of the impact of truncation and premature rounding. |
| **Suitable Activities** | | | |
| What type of activity might pupils work on? | Tasks which include;   |  | | --- | | Estimation to the nearest appropriate unit, measuring accurately: length, height and perimeter in millimetres (mm), centimetres  (cm) and metres (m); distances in kilometres (km); weights in grams (g) and kilograms (kg); capacity in millilitres (ml) and litres (l).  Using the comparative size of familiar objects  to make reasonable estimations of length,  mass, area and capacity. |   Converting between common units of measurement using decimal notation, for example, 550cm = 5·5m; 3·009kg = 3009g and applies this knowledge when solving problems.  Choosing the most appropriate measuring device for a given task, carrying out the required calculation, and recording results in the correct unit.  Reads a variety of scales accurately.  Drawing of squares and rectangles accurately with a given perimeter or area.  Calculate the area of squares, rectangles and right angled triangles in square millimetres (mm2) square centimetres (cm2) and square metres (m2). | Tasks which include;  Choosing appropriate units for length, area and volume when solving practical problems.  Converting between standard units to 3 decimal places and applies this when solving calculations of length, capacity, volume and area.  Calculating the area of a 2D shape where the units are inconsistent.  Finding the area of compound 2D shapes constructed from squares, rectangles and triangles.  Finding the volume of compound 3D objects constructed from cubes and cuboids. | Tasks which include;  Demonstrating the understanding of the impact of truncation and premature rounding.  Calculating the area of kites, parallelograms and trapeziums.  Using formulae and calculates the surface area of cylinders, cuboids and triangular prisms.  Calculating the volume of triangular prisms and cylinders using formulae. |
| **Example Tasks & Activities** | | | |
| **Subjects** | **Level 2** | **Level 3** | **Level 4** |
| **Social Studies**  **Geography**  **SOC 2-12a**  **SOC 3-11a**  **SOC 3-12a** | Mapping – looking at different types of maps and different scales on maps.    Measuring the distance on a map using scale.  Compare and contrast the effects of weather in Britain on people and society with those in a different area.  Develop and use mental maps of Scotland, Britain, Europe and the world and relates these to print and online maps | Atlas and map skills.Exposition, discussion, enquiry, activity relating to grid references, scales and measuring distances. Possibility of island map activity.  Use of contours and isobars.  Compare and contrast the effects of weather in Britain on people and society with those in a different area |  |
| **Home Economics**  **Textiles**  **TCH 2-11a/3-11a/4-11a** | Use a range of graphic technologies, manually and digitally to communicate ideas, concepts and experiment with use of shape, colour and texture.  Car on a slope  -  testing th  e effect of different surfaces, heights  of a ramp and weight of a ca | Apply a range of graphic techniques using sketching, drawing and software. | Extend use of manual and digital graphics and techniques to realise ideas, concepts and products. |
| **Art and Design**  **EXA 2-02a/3-02a/4-02a** | Choosing and exploring an extended range of media and technologies to create images and objects, comparing and combining them for specific tasks. | Experimenting with a range of media and technologies to create images and objects, using an understanding of their properties. | Continue to experiment with a range of media and technologies, handling them with control and assurance to create images and objects.  Appling understanding of the properties of media and of techniques to specific tasks. |
| **Technologies**  **Design and construct models**  **TCH 2-09a/3-09a/4-09a** | Extending and enhancing design skills to solve problems and construct models | Create solutions in 3D and 2D and justify the construction/graphic methods and the design features. | Create solutions in 3D and 2D and justify the construction/graphic methods and the design features. |

**Numeracy Progressions: Researching and evaluating data to assess risks and make informed choices**

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| **Experiences & Outcomes for planning in Data and Analysis and Ideas of Chance and Uncertainty** | | | | |
| **Experiences and Outcomes** | **2nd Level Summary of Core Skills assessed in Benchmarks** | | **3rd Level Summary of Core Skills assessed in Benchmarks** | **4th Level Summary of Core Skills assessed in Benchmarks** |
| **2-20b**  *I have carried out investigations and surveys, devising and using a variety of methods to gather information and have worked with others to collate, organise and communicate the results in an appropriate way.*  **2-20a/3-20a/4-20a**  *Having discussed the variety of ways and range of media used to present data, I can interpret and draw conclusions from the information displayed, recognising that the presentation may be misleading;*  *Work collaboratively, making appropriate use of technology, to source information presented in a range of ways, interpret what it conveys and discuss whether I believe the information to be robust, vague or misleading;*  ***E****valuate and interpret raw and graphical data using a variety of methods, comment on relationships I observe within the data and communicate my findings to others.*  **2-22a/3-22a/4-22a**  *I can conduct simple experiments involving chance and communicate my predictions and findings using the vocabulary of probability;*  *I can find the probability of a simple event happening and explain why the consequences of the event, as well as its probability, should be considered when making choices;*  *By applying my understanding of probability, I can determine how many times I expect an event to occur, and use this information to make predictions, risk assessment, informed choices and decisions.* | Collects, organises and displays data accurately in a variety of ways including through the use of digital technologies, for example, creating surveys, tables, bar graphs, line graphs, frequency tables, simple pie charts and spreadsheets.  Analyses, interprets and draws conclusions from a variety of data.  Draws conclusions about the reliability of data taking into account, for example, the author, the audience, the scale and sample size used.  Uses the language of probability accurately to describe the likelihood of simple events occurring, for example equal chance; fifty-fifty; one in two, two in three; percentage chance; and .  Plans and carries out simple experiments involving chance with repeated trials, for example, ‘what is the probability of throwing a six if you throw a die fifty times?’. | | Sources information or collects data making use of digital technology where appropriate.  Interprets data sourced or given.  Describes trends in data using appropriate language, for example, increasing trend.  Determines if information is robust, vague or misleading by considering, for example, the validity of the source, scale used, sample size, method of presentation and appropriateness of how the sample was selected.  Uses the probability scale of 0 to 1 showing probability as a fraction or decimal fraction.  Demonstrates understanding of the relationship between the frequency of an event happening and the probability of it happening.  Uses a given probability to calculate an expected outcome, for example, ‘the probability of rain in June is 0·25 so how many days do we expect it to rain?’  Calculates the probability of a simple event happening, for example, ‘what is the probability of throwing a prime number on a 12 sided die?’  Identifies all of the mutually exclusive outcomes of a single event and calculates the probability of each.  Investigates real-life situations which involve making decisions on the likelihood of events occurring and the consequences involved. | Interprets raw and graphical data.  Uses statistical language, for example, correlations, to describe identified relationships.  Calculates the probability and determines the expected occurrence of an event.  Applies knowledge and skills in calculating probability to make predictions. |
| **Suitable Activities** | | | | |
| What type of activity might produce this? | | Tasks which ask pupils to:   * work together investigating and carrying out surveys * discuss how a survey was carried out and the results of the survey * answer questions relating to graphs, bar graphs, line graphs, pie charts * carry out experiments to predict how ‘likely’ it is an event will occur. * Work with simple chance (probability) using fractions regarding events such as; Tossing a coin; Rolling a six-sided dice; Picking a card (colour, spade, ace); Choosing counters from a bag. | Tasks which ask pupils to:   * Discuss the problems involved in carrying out a real life survey as a statistician * use a computer program to input data and draw appropriate graphs * work with more complicated probability *i.e. Probability of a score of 7 when rolling two dice; Probability of three heads when 3 coins are tossed* * discuss probability and prediction in the real world, e.g. weather forecasting * develop an understanding of the work of a statistician in health work, population sampling etc. | Tasks which ask pupils to:   * read and interpret different displays of data e.g. pie charts, box plats, stem and leaf diagrams etc. * present data in a wide range of graphical formats * make predictions and assess any risk that is involved * make informed choices * Real life tasks surrounding probabilities *i.e. P=1/2 does not mean that the event will occur every second time but rather that if there are a sufficiently large number of trials the event will occur in half of them.* |
| **Example Tasks & Activities** | | | | |
| **Subjects**  **(and relevant Es & Os)** | | **Level 2** | **Level 3** | **Level 4** |
| **Whole School activities** – self-evaluation and target setting techniques | | Pupils draw a pie chart to sum up the lesson. This activity could be differentiated for students by either keeping the timings simple (i.e. half the lesson I... (Half the pie chart), a quarter of the lesson I... (A quarter of the pie chart), an eighth of the lesson I... | As a plenary activity in a lesson, or perhaps even kept at the start of every new topic in their exercise books, students can create a suitable graph/chart to 'graph' their progress throughout a topic. Here they can practise their skills of drawing suitable axis, with a consistent scale, and plotting points on their graph across a given time period. You can discuss here with students the criteria that they'll put on their 'progress' axis, whether it be a grade, level or other scale. You could also discuss the benefits of one graph/chart over another. | Pupils use smaller time intervals, to create pie chart i.e. *I spent 4 minutes reflecting on my progress (so a 24 degree slice would be needed to represent this*). In order to do this the students will need to divide the 360 degrees in a circle up accordingly; 1 minute of the lesson would be represented by a 6 degree slice of the pie chart. This information could then be displayed in a variety of graphical formats |
| **Social Studies**  People, past events and societies: 2.04/3.04/4.04  2.06/3.06/4.06  People in society, economy and business: SOC 2.15a/3.15a/4.15a  SOC 16a  People, place and environment: 2.10a/3.10a/4-10a | | Use a Venn diagram to sort out shared characteristics between people, societies and past events – see this link for an example.  <https://www.tes.com/teaching-resource/venn-diagram-and-hcf-lcm-starter-6189626>  Compare numerical figures from previous Scottish Elections and use this to map out changes since beginning of Scottish Parliament.  Charts on state of armies in battles of Stirling and Falkirk.  Feudal Society.  Traffic surveys – counting the different types of vehicles and plotting on graphs, then drawing conclusions.  Community surveys – travel to work, shop types as part of a local area study, drawing conclusions and presenting findings.  Political Surveys – looking at opinion poll data on tables and graphs.  Comparing different pieces of numerical data and using this information to draw  conclusions based on evidence possible use of the census data as a context looking at e.g. travel to work.  Using weather statistics from charts and graphs, measure the impact of weather and climate between the local area and a foreign country.  Research weather during important battles.  Survey, record, and present information about tourism in the local area  Market research of local businesses, products, and services for Enterprise activities.  Pupils could conduct surveys in their local area and present the information in graphical form i.e. a litter survey of their community. | As pupils move through the levels, the Venn diagrams would become more challenging.  <https://www.tes.com/teaching-resource/venn-diagram-and-hcf-lcm-starter-6189626>  Urbanisation, Occupations of women in 19th century and during WWI, Death rates on the Titanic in relation to passenger class. Graphs and statistics will be analysed and created in relation to these topics.  Pupils could record a variety of weather data over a period of time and present the information in graphical form, choosing the most suitable method. This could be compared/contrasted to a different climate.  Using data from air quality surveys to compare the quality of life of different areas and consider the consequences of different levels of particulates – this could have an international dimension.  Using census data to make comparisons and draw conclusions about topics such as population change through the use of population pyramids.  Engage with and evaluates the usefulness of a variety of primary and secondary evidence about unfamiliar events (if from the past, placing them correctly in a chronology of Scottish, British, European or world events) and use sources to research an issue of their choice | Pupils could be using their skills to design an activity using a Venn diagram, which they would give to their peers.  <https://www.tes.com/teaching-resource/venn-diagram-and-hcf-lcm-starter-6189626>  Evaluate conflicting sources of evidence to sustain a line of argument i.e. compare statements made by different political parties and discover whether or not these statements have been turned into realities.  Urbanisation, emigration/immigration from and to Scotland, WWI armies and related industries. Graphs and statistics will be analysed and created in relation to these topics.  Pupils could collect and present a range of data i.e. population figures, pollution figures, climate figures for their local area and discuss the impact that each element has on an area. Elements of probability and chance could be included here i.e. there is an increased chance of polluting if population continues to increase. |
| **Health and Wellbeing**  Physical education, physical activity and sport: 2.24a/3.24a/4.24a | | Pupils have to measure their heights for a given activity, or perhaps their heart rates and work together to present the data. Heart rates could be measured over a period of weeks, measuring impact of a weekly aerobic session for example. | Pupils line up in ascending order and then ask the class to work out the range, median and mode of their heights, heart rates, hand spans, weights etc. | Pupils line up in ascending order and then ask the class to work out the range, median and mode of their heights, heart rates, hand spans, weights etc.  Work out the odds and probability of one member of the class becoming a professional athlete. |

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| **Whole School Activities**  **Eco Schools –**  [**http://www.keepscotlandbeautiful.org/sustainable-development-education/eco-schools**](http://www.keepscotlandbeautiful.org/sustainable-development-education/eco-schools) | Using the Eco Schools programme is an excellent method of demonstrating skills in Information Handling and applying skills in a new and unfamiliar context. In particular activities can be devised around: monitoring of litter in the school or local area; surveys on methods of transport; classifying and describing biodiversity present in the school grounds; reporting on amounts of waste that can be recycled. These all fit in with different areas of the Eco Schools Green Flag award. |

[](https://www.google.co.uk/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&ved=0ahUKEwjGi5etnc_VAhXmBsAKHcL2DqEQjRwIBw&url=https://www.slideshare.net/didau/the-secret-of-numeracy&psig=AFQjCNHe012TtIKe-HO3NHxT5FLDEWobyA&ust=1502542321601109)

**APPENDIX - Considerations for Numeracy across Learning School Policy**

**When planning for Numeracy across Learning in your school it is important that all teaching staff are consulted and feel part of the process. SLT need to take a central role in supporting this process e.g. by setting aside time in the collegiate calendar, ensuring that there is a range of people who are responsible for NAL not just the Maths Department and by meeting regularly with those responsible to ensure they have a clear picture of how the process is developing.**

**Role of departments**:

Undertake an audit of Numeracy across Learning (see appendix). All departments will ensure that the aspects of mathematics identified from the audit are clearly signposted in their schemes of work. In addition, the role of the mathematics department is important:

* in using subject-specific examples for teaching and learning activities;
* in liaison with other departments;
* in training other staff in the use of flexible methods of calculation;
* by agreeing terminology and conventions;
* by giving information as to when numeracy aspects are covered in mathematics.

Good liaison should help to ensure that all staff use common approaches that mirror those used in mathematics lessons. Approaches to calculations should be the same in all subjects. All teachers will need to know about:

* the use of formal and informal written methods, especially with lower attaining pupils;
* the expectation that pupils should add and subtract pairs of two-digit numbers mentally;
* stating how and when calculators should be used.

**Subject Leaders**

It is the responsibility of subject leaders to:

* Model good numeracy teaching in their subject area;
* Research current good practice in Numeracy relevant to their subject;
* Audit Numeracy practice within their department and use CLPL and Performance Management to enhance staff skills;
* Utilise relevant assessment data in setting departmental targets;
* Ensure that each scheme of work has clear and appropriate numeracy objectives and promote sharing of good practice through departmental meeting time;
* Monitor the ways in which staff use these objectives to plan and deliver lessons;
* Review through lesson observations, work scrutiny exercises and departmental self-evaluation the impact of numeracy teaching on the progress of learners.

**Individual Teachers**

It is the responsibility of all classroom teachers to:

* Model good numeracy skills in their subject area;
* Utilise all relevant assessment data in devising appropriately challenging targets for pupils in their classes so that departmental targets may be achieved;
* Deploy shared strategies;
* Build into lesson planning the agreed numeracy strategies of the subject area;
* Strive to meet numeracy related objectives in the performance management process and/or identify opportunities for CPD;
* Mark pupils work according to school and departmental assessment policies and set pupils challenging numeracy goals within their subject area;
* Monitor and reward identified progress in numeracy;
* Support those pupils with additional numeracy needs using a variety of differentiated approaches.

**Monitoring Impact in Numeracy across Learning:**

Suitable success criteria against which the impact of NAL might be measured:

* More teachers are aware of developments in mathematics and numeracy.
* Awareness levels of teachers are raised about the use of numeracy in their own subject(s).
* Confidence levels of teachers raised to deal with numeracy in their own subject(s).
* More teachers plan effectively for numeracy in their own subject(s).
* Increased liaison between mathematics department and other departments about strategies for teaching mathematics, times when mathematical topics are taught and subject-specific examples for use in mathematics lessons.
* A higher proportion of pupils like mathematics.
* Confidence levels of pupils raised when using mathematics in mathematics lessons and in other subjects.
* A higher proportion of pupils are aware of the mathematics used in other subjects.
* A higher proportion of pupils are aware of the usefulness of mathematics in other subjects.
* The school is a numeracy rich environment, through good use of displays, noticeboards throughout the school.

**Planning, Assessment and Moderation:**

It is important that all teachers engage with the benchmarks in the relevant subject areas and that there is a shared understanding of the standards in numeracy. The following are points for discussion:

* Audit will provide a clear identification of relevant links with subjects.
* Subject area planning must identify the numeracy outcomes which have been agreed.
* Holistic assessments, providing opportunities for pupils to demonstrate their learning in numeracy are created at planning stage.
* Support with moderation provided through AMF
* A member of each "key" numeracy department to have moderation discussions to ensure consistency across the 3 levels, led by the maths department to ensure consistency
* Head teachers/management team to support and provide time for maths department to lead the moderation.

For further guidance please refer to the following documents from Education Scotland:

* <https://education.gov.scot/improvement/Documents/Numeracy/NUM11NumeracyAcrossLearningPLR.pdf>
* <https://education.gov.scot/Documents/numeracy-across-learning-pp.pdf>

These are links to excellent Education Scotland PowerPoints for practitioner engagement (Glow login required);

* <https://glowscotland.sharepoint.com/sites/PLC/numeracyhub/Session%201%20Numeracy%20Across%20Learning/Module%202%20Numeracy%20across%20learning.pdf#search=numeracy%20across%20learning%20in%20secondary>
* <https://glowscotland.sharepoint.com/sites/PLC/numeracyhub/Session%202%20Contextualised%20learning%20in%20numeracy%20a1/Contextualised%20learning%20-%20Secondary.pdf#search=numeracy%20across%20learning%20in%20secondary>

In addition, please access the National Numeracy and Mathematics Hub for support and guidance (Glow login required):

* <https://glowscotland.sharepoint.com/sites/PLC/numeracyhub/SitePages/Home.aspx?wa=wsignin1.0>

For further resources on Numeracy across Learning please visit the Numeracy section on Sharing Argyll Learning Ideas -

* **Exemplar for Numeracy audit -** [**https://blogs.glowscotland.org.uk/ab/sali/files/2016/12/Numeracy-across-learning-audit-for-third-level.docx**](https://blogs.glowscotland.org.uk/ab/sali/files/2016/12/Numeracy-across-learning-audit-for-third-level.docx)
* **Posters -** [**https://blogs.glowscotland.org.uk/ab/sali/files/2016/12/Numeracy-Across-the-Curriculum-Posters.pdf**](https://blogs.glowscotland.org.uk/ab/sali/files/2016/12/Numeracy-Across-the-Curriculum-Posters.pdf)
* **Holistic assessment exemplar –**[**https://blogs.glowscotland.org.uk/ab/sali/files/2016/12/S1-mapping-holistic-task.docx**](https://blogs.glowscotland.org.uk/ab/sali/files/2016/12/S1-mapping-holistic-task.docx)
* **Third Level Tracker example –** [**https://blogs.glowscotland.org.uk/ab/sali/files/2016/12/Tracking-document-for-Numeracy-across-Learning.docx**](https://blogs.glowscotland.org.uk/ab/sali/files/2016/12/Tracking-document-for-Numeracy-across-Learning.docx)
* **Example of Pupil Log –** [**https://blogs.glowscotland.org.uk/ab/sali/files/2016/12/S1-pupil-log-book-exemplar.docx**](https://blogs.glowscotland.org.uk/ab/sali/files/2016/12/S1-pupil-log-book-exemplar.docx)

