Level 3 to 5 Pathways Overview

- Benchmarks have been highlighted using the kite bullet
- Benchmarks that are underlined are the responsibility of all subjects

Significant Aspects of Learning (SAL) for each level is in bold

SAL for Level 5 relate to content of Unit Assessments.

❹ indicates topics which are benchmarked at level 4 but we feel should be included as part of level 3

Topic Time		3rd Level Upper		4th Level Core	4th Level Upper	Level 5
1 – 8 periods	Whole Numbers MNU 303a Rounding/ Estimate MNU 301a Number Operation Calculation MNU 303b	➢ Recap x/÷ by single digit & 10/100/1000 (and multiples of) ○ Long Multiplication ○ Long Division ○ Large Numbers (millions, billions,) ○ **Rounding** to 1 fig of accuracy then estimating an answer to a sum.	Whole Numbers MNU 4-03a Calculations MTH 4-03b Scientific Notation MTH 4-06b	○ +, – , x and ÷ in context ○ +, – , x and ÷ of Integers ➢ Order of Ops (BODMAS) ➢ **Large numbers → sci notat** ➢ **Small numbers →sci notat** ○ Real life contexts (e.g. distances in space, micro-biology, etc) ➢ Interprets & solves multi-step problems using the 4 operations	○ Recap x/÷ by single digit & 10/100/1000 (and multiples of) and +/-/x÷ integers ➢ **Sci notation → normal** ○ Order numbers in scientific notation. ➢ Order of Operations involving indices (BIDMAS). ○ **Calculations using scientific notation** (including using a calculator).	○ **Simplifying surds** ○ **Rationalising the denominator** (non conjugate) ○ Function notation – including surds
2 - 6 periods	Decimals MNU 307a (part) MNU 301a (part)	○ Recap of basic decimals ➢ **Rounding to 1, 2, and 3 d. p.** ○ **Rounding in context** ○ x/÷ by multiples of 10, 100, 1000 ➢ Uses rounding to routinely estimate the answers to calculations.	Rounding & Accuracy MNU 4-01a Fractions, Decimals & %s MNU 4-07a	○ Recap rounding whole numbers to nearest whole/10/100/1000 ➢ Recap rounding decimals to 1/2/3 d. p. ○ Round to 1 fig of accuracy ➢ Calculations involv rounding ○ Money calculations (trailing zero) ➢ x decimals together ○ ÷ two decimals together	➢ Rounding to spec Sig fig ○ +/- decimals (gaps) ○ x/÷ decimals by multiples of 10/100/1000 ○ Express one number as a % of another ➢ % inc/dec (incl VAT) ○ Simple interest ○ **Tolerance in Number?**	○ Revise rounding to a given number of sig figs ○ Revise expressing one value as a % of another ○ **Reverse %s** ○ **Appreciation/depreciation involving compound interest**
3 - 4 periods	Data Handling MTH 321a	○ Recap Bar/Line Graphs, Pictograms ○ Interpret/Construct Pie Charts (using %s) ○ Mean and Range ➢ Collects data by choosing a representative sample to avoid bias ➢ Organises and displays data appropriately in a variety of forms making effective use of technology as appropriate	Statistics MNU 4-20a, MTH 4-21a MTH 4-20b	➢ Draw/Interpret Bar Graphs & Histograms ➢ Construct frequency table with class/group intervals ➢ Draw/Interp simple Pie Charts (°s) ○ Making/Interpreting Stem & Leaf Diagrams ○ **Finding Mean, Median, Mode and Range** (and their appropriate use) ○ **Discrete/continuous data – freq v grouped freq; bar v histogram**? ➢ **Appropriate stat diagrams**	○ More complicated Pie charts ○ Mean from a frequency table ○ Stem & leaf ➢ Drawing/Interpreting Boxplots & Dotplots ○ Construct Scattergraphs ○ Line of Best fit ➢ Correlation terms ○ Interpolation/Extrapolation ➢ **Justify the most appropriate statistical diagram to display a given data set** ○ Median from Stat diagram	○ Tables with ≥ 5 categories of info. ○ Charts/tables with values missing or scale not obvious ○ 5 figure summary (Q_1, Q_3) ○ Boxplots ○ SIQR ○ **Standard deviation** ○ Dot plots ○ Revise scattergraphs ○ **Determine the equation of best fitting straight line** ○ Estimate y given x
8	Block 1 Test	**Misleading Statistics Project**			**Application of Mathematics in the world of work**	

Topic Time		3rd Level Upper		4th Level Core	4th Level Upper	Level 5
4 - 4 periods	Time MNU 210a MNU 210b MNU 210c Speed, Dist and Time MNU 310a	➢ Harder time intervals (how many days?) ○ Reading timetables ➢ **Basic S/D/T calcs** ○ Decimal time (½, ¼, ¾) ○ D/T graphs	Time MNU 4-10a Distance, Speed & Time MNU 4-10b	➢ Time intervals – across midnight & time zones ○ Simple S, D, T calculations ○ Decimal Time (extend to 3rd 10th & 20th) ○ S, D, T calculations (including involving decimal time.)	○ Convert between hours & hours/mins (any). ➢ S, D & T calculations involv decimal fraction hours. ➢ Time intervals (hrs/days/months) ○ Journey Planning (including stop-overs)	○ Revise S, D, T calculations
5 - 12 periods	Frac & %s MNU 307a (revisit) Fraction Manipulation MTH 307b Mixed Numbers MTH 307c	➢ Recap equivalent frac/dec/%s, fractions/%s of quantities, simplifying. ○ Extend eg 35%(n-calc) ○ %s on the calculator ○ Simp/Equiv fractions 12/9, etc ○ Order Dec, %, Frac ➢ Equivalent Fractions & Decimals ➢ **+/-simple fractions** (diff denominator)	Fractions, Decimals & %s MNU 4-07a Fractions MTH 4-07b	○ Recap basic fractions & percentages of quantities ○ Convert frac ↔ dec ↔ %s ➢ Comparing the above *(including deciding on appropriate use)* ➢ **+ & – of proper fractions & mixed number fractions** ➢ **x of proper fractions** ➢ **x of wh no. and mixed no. fractions**	➢ Application – choosing best format to use ➢ Calculates the % inc/dec of a value ➢ Make comparisons, decisions & choices based on above ○ Simple Interest ○ Recap prop ↔ improper frac ○ **Recap +/-/x fractions** ○ **÷ Fractions** (both types?) ○ Problem Solving involving 4 operators in fractions	○ Find % & fractions of shapes and quantities. ○ Recognise & use mixed fractions. ○ Compound Interest ○ **+/-/x/÷ mixed no fractions**. ○ **Algebraic fractions – 4 operators** ○ **Reducing an algebraic fraction to its simplest form**
6 - 6 periods	Angles – properties/ triangles MTH 317a	○ Recap naming, supp, comp, F, Z, X, angles in a Δ & round a point ➢ **Angles in Quadrilaterals** (incl at intersection of diags)	Angles in a Circle MTH 4-17a	○ Recap from 3rd Level Upper ○ Angle between hands on analogue clock ○ Isosceles Triangles (2 radii & chord) in a circle ○ **Angles in a Semi-circle**	○ Recap from 3rd Level Upper ➢ **Angle between r and tan & use it to find missing angles** ➢ Applies knowledge of △s, Ðs and ○s (incl ◗s) to solve problems	○ Recap from 4th level. ○ Relationships between the centre, chord and perpendicular bisector ○ ***Interior & exterior angles of polygons***
7 - 2 periods	Symmetry MTH 319a	○ Recap draw/indentify lines of symmetry in 2D shapes ○ Harder line symmetry – oblique and double mirror lines	Symmetry MTH 4-19a Coordinates MTH 4-18a Transform of Shapes MTH 4-18b	○ Recap Line Symmetry ➢ **Rotational Symmetry** (**order**/**fraction**, complete diagram) ➢ Reflections and Translations of points or shapes on a coordinate grid.	○ Recap line/rotation symmetry ○ **Identify centre** of rotational symmetry ➢ **Translations and Reflections of points or shapes** on a coord grid (mapping notation A → A')	○ ***Trig Graphs including transformations (sin or cos, amplitude, vert translation, multiple angle, phase angle)*** ○ Trig identities
8	Block 2 Test	Budgeting			Personal Finance and Debt Management	

Topic Time		3rd Level Upper		4th Level Core	4th Level Upper	Level 5
8 - 8 periods	Coords (4 quads) MTH 318a Negative Nos incl manipulation MNU 304a	➢ ❹ - Four Quads (recap) ○ Plot & join pts to produce shapes, patterns, etc. in all quads ➢ **+/– integers** ➢ **x/÷ integers**	Gradient & Straight Lines MTH 4-13b, MTH 4-13c MTH 4-13d	➢ **Gradient (v ÷ h) incl coords** ➢ Plotting *y = ax* and *y = ax ± b* from table of values to form str lines ➢ Gradient problems in context (does ramp meet regulations?) ○ Using Lines to estimate. ➢ **Horiz & Vertic Lines (name/gradient)**	○ **Gradient formula** ○ Interpret m and c (+/-/Ramps) ○ **Eqn of st line - 2 coords & c** ○ Sig of point of intersection ○ $m_1 = m_2$ ➢ **Revise y=a, x=b** (inc plot) ○ Graph of parabola (incl line of symmetry)	○ Recap y=mx+c ○ ***Use of y-b=m(x-a)*** ○ Identify gradient/y-intercept from y=mx+c ○ Identify gradient/y-intercept from ax+by+c=0 or equivalent
9 - 4 periods	Measure Units MNU 211a/b Measure – MNU 311a part	Extend to further S.I. units: ○ **kg ↔ tonnes** ○ **ml ↔litres** ○ **mg ↔ g**	Measure MNU 4-11a	➢ **Tolerance** ➢ Demonstrates that the context of the question needs to be considered when rounding	➢ Effects of premature rounding ➢ Demonstrates understanding of the impact of truncation and premature rounding	○ Inter-relationship between units in different families. ○ Use vocabulary associated with measurement to make comparisons for length, weight, volume & temperature.
10 - 6 periods	Areas of 2D Shape MNU 311a Compound shapes MTH 311b Circles MTH 4-16b	○ Recap A/P composite rectangular shapes ➢ ❹ **- A/C of a circle** ➢ ❹ – P/A of ◇s, parallelo and trapeziums	Circles MTH 4-16b Surface Area MTH 4-11b	➢ ❹ – P/A of ◇s, parallelo and trapeziums with inconsistent units ➢ **Finding d/r given C** ➢ **S. A. of Cubes & Cuboids** ○ Composite shapes - combination of ⌂, ■, O's, etc.	Using formulae: ➢ **S. A. of △ Prisms, □-based Pyramids** ➢ **Finding d/r given A** ➢ **CSA of a cylinder** ➢ **S.A. of cylinder** ○ **Cost effective wrapping/nets**	○ **Calculate the arc length/area of a sector of a circle.** ○ **Finding an angle of a sector**
11 - 5 periods	Volume MNU 311a (revisit) Volume of compound MTH 311b (revisit)	➢ **Vol of cuboid/cube using formulae** (inconsistent units) ○ Vol of compound 3D shapes (some lengths missing) + practical contexts	Volume MTH 4-11c	○ Def of a prism (names) ○ Vol of a Prism V = Ah (A given) ➢ Volume of a Cylinder. ○ Capacity (1litre = 1000ml, 1ml = $1cm^3$)	○ Vol of prism (A not given) ➢ Volume of △ Prism using formula ○ Prob Solv inv Vol of Prism (incl finding r or h)	○ Recap vol of cylinder and prism. ○ **Calculate the volume of a standard solid - sphere, cone, pyramid** ○ Interpret results of measurement involving temp.
12 - 8 periods	Algebra – Collecting like terms/ substitution MTH 314a Algebra – Equations MTH 315a	○ Collect like terms (incl x^2) ○ Revise BIDMAS ➢ **Substitution** (extend to integer & C=0.05m+75) ○ Recap solving x+b=c, ax=b (integer solutions) ➢ Solve equations ax+b=c ○ ❹ - Inequality symbols	Expressions MTH 4-14a Equations & Inequalities MTH 4-15a	○ Collect like terms (incl x^2) ➢ Subst – extend to brackets ➢ Br Brackets (numeric multiplier) ➢ Break Brackets & Simplifying ○ Recap Solv equations (a*x*+b=c) ➢ Solving more complex equations ax+b=cx+d (x>0) ➢ Simple ineq – x>3 from closed intervals	➢ Eqns involving brackets ➢ Br Brackets algebraic multiplier ○ Double bracket (incl indices) ○ Solve Eqns – integers/fractions ➢ Simple inequalities (ax+b<c) ➢ Solves problems by expressing the given info appropriately as an equation, inequality or formula	○ **Recap algebraic expressions involving expansion of brackets** ○ Short-cut for squaring a bracket ○ **Completing square in quad exp with unitary x^2** coeff. ○ Equations involving fractions ○ ***Inequalities (reverse symbol)***
8	Block 3 Test	**Famous Mathematicians and their impact Project.**				

Topic Time		3rd Level Upper		4th Level Core	4th Level Upper	Level 5
13 - 9 periods	Multiples / Factors MTH 305a Primes MTH 305b Powers MTH 306a	➢ Solves problems using multiples and factors ➢ **Prime factors/Decompos** ➢ **Express wh nos as powers e.g. $27=3^3$** ○ $\sqrt[2]{x}$ and $\sqrt[3]{x}$ (mentally)	Factors MTH 4-14b Powers & Roots MTH 4-06a	○ Recap HCF ➢ Factorising simple expressions using common numerical factor ➢ Recap Squared/Cubed/Root extend to $\sqrt{9}=\pm 3$ ➢ **Higher whole number powers** and roots ○ Substitution into quadratic equation	○ Algebraic Factors ○ Difference of 2 squares ○ Higher whole number powers ○ **Using the calculator for powers & roots (square & cube)** ○ Draw graphs of quadratic from tables	○ **Recap factorising from 4U** ○ **Trinomials with ax^2 where a =1** ○ ***Quadratic equations*** ○ ***Quadratic formula*** ○ ***Discriminant*** ○ **Laws of indices**
14 - 9 periods	Properties of 2D Shapes MTH 317a (revisit) Drawing 2D Shapes MTH 316a	○ Recap properties of triangles and quadrilaterals ○ Extend to kite/rhombus diagonal properties ○ Extend to parallelogram trapezium diagonal properties ○ **Revisit draw shapes**	Pythagoras MTH 4-16a (part) SOH-CAH-TOA MTH 4-16a (revisit)	○ 'Hypotenuse' definition ➢ **Pythagoras' Theorem – finding hyp** ➢ **Pythagoras' Theorem – finding shorter side** ➢ **Trigonometry – find an angle**	○ Recap Pythagoras ○ Pythagoras in Isosceles & Equilateral Triangles ○ **Pythagoras on coordinate plane** ➢ **Trigonometry – find a side**	○ ***Converse of Pythagoras*** ○ Determining co-ords from 3D diagram ○ Pythagoras in 3D ○ **Sine Rule** ○ **Cosine Rule** ○ **Area = ½ ab sin C**
15 - 6 periods	Producing formula MTN 315b Number Seq/rules MTH 313a	○ Recap Linear, Square & Δ, Sequences ○ Cube numbers ○ Recap simple (1-step) form ○ **Formulae from tables (two-step – in words)** ➢ Express worded in algebraic notation e.g. standing charge + rate giving C=0.05m+75 etc.	Patterns MTH4-13a	○ Recap Simple Formulae from Level 3 ○ **Sequences for pictorial patterns** (e.g. fence post) ➢ **Making Formulae – in symbols for n^{th} term** ➢ **Using n^{th} term formulae to extend a sequence**	➢ Recap make and **using Formulae (including working backwards) with appropriate symbols** ○ **Change subject**: G=x+a to x E=3w-k to w A=V/h to h V = IR to I	○ Recap of 4th level ○ ***Extend 'change the subject' to formulae involving roots and powers***
16 - 6 periods	Proportion & Ratio MNU 308a	➢ Convert between different currencies ○ Graphs of Direct Prop. (Ready Reckoners) ○ Simple ratio calculation ○ Simple scale using ratio	Ratio & Proportion MNU 4-08a	○ Problem Solving – direct proportion, foreign exchange ratio calculations. ○ Sharing using ratio. ○ Inverse Proportion (basic) ○ Graph of direct proportion ➢ Uses knowledge of proportion to solve problems in real-life which involve changes in related quantities	○ Simultaneous Equations – graphically, substitution, elimination – one co-eff equal ○ Elimination - extend to changing co-eff(s).	○ ***Recap Sim Equations*** ○ Construct sim equations from text. ○ **Sketch graph of parabola** ○ Graph of $y=k(x+p)^2+q$ where $k=\pm 1$ ○ *Equation from graph -* $y=kx^2$ *or* $y=(x+p)^2+q$
Block 4 Assessment						

Topic Time		3rd Level Upper		4th Level Core	4th Level Upper	Level 5
17 - 2 periods	Probability MNU 322a	○ Simple probability – fraction, decimal, %, ratio ➢ Relationship between the freq of an event happening and the probability of it happening ➢ Use a given probability to calculate an expected outcome. ○ Investigates real-life situations which involve making decisions on the likelihood of events occurring and the **consequences** involved	Probability MNU 4-22a	➢ Recap finding probability ➢ Expected Frequency ○ **Modelling**?	○ **Use probability to make predictions:** ○ **Risk assessment** ○ **Choice/decision** ○ Misleading probability	○ Recap finding probability ○ Recap expected Frequency
18 - 4 periods	Enlarge / Reduce MTH 317c Bearings / Maps MTH 317b	➢ **Recap Scale Drawing** ➢ **Enlarging & reducing regular/irregular shapes given a scale factor** ➢ Uses bearings in a navigational context including creating scale drawing	Similar Shapes MTH 4-17b	○ Scale Factors ➢ Finding unknown lengths using similarity ○ Scale drawings involving bearings (acute & obtuse angles)	○ Use linear scale to enlarge/reduce shapes ○ Finding unknown areas	○ *Recap linear/area scales* ○ ***Finding unknown volumes*** ○ **Adding/subtracting vectors using components** ○ **Adding/subtracting vectors using directed line segments** ○ **Magnitude of a vector** ○ **Reverse Bearings** ○ **Use of bearings within trig**

Project	Outcome	Content
Mis-leading Statistics	Information Handling MNU 320a MTH 320b	➢ Sources information or collects data making use of digital technology. ➢ Interpret information from a variety of sources including internet, TV, newspapers ➢ Interpret data presented as pictographs, line graphs, bar graphs, scatter diagrams, etc. ➢ **Misleading Data – assess (robust/vague/misleading) and explain (validity of source, scale used, sample size, method of presentation & appropriateness of how the sample was selected).**
Budgeting	Money MNU 309a MNU 309b	○ Real life financial choices e.g. bank accounts, loans, credit, credit cards and cash back ○ Investigate, compare & explain financial contracts e.g. mobile phones, sky and broadband ○ Living expenses and budgeting ➢ 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.
Famous Mathematicians	Famous Mathem-aticians MTH 312a	○ **Famous Mathematicians – Why are they famous? Where did they learn stuff? Who did they work with? How is their work relevant today?** ○ **Use a variety of methods to research, discuss & present their contributions** ➢ Researches and communicates using appropriate mathematical vocabulary and notation, the work of a famous mathematician or a mathematical topic and explains the relevance and impact they have on society.
Personal Finance and Debt Management	Personal Finance and Debt Manage-ment MNU 409a MNU 409c	➢ 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.
Mathematics – its impact	MTH 412a	➢ Contributes to discussions and presentations on the role of mathematics in everyday life and in the workplace. ➢ Investigates the mathematical skills required for a range of careers, including those in STEM subjects.