Year 11 Maths: Personalised Learning Checklist (PLC) – Crossover Foundation

Learning Journey

1	Probability
2	Quadratics
3	Units and Graphs
4	Shape & Construction
5	Equations & Inequalities
6	Ratio & Proportion
7	Pythagoras & Trigonometry
8	Number
9	Angles & Measure
10	Fractions & Percentages
11	Statistics
12	Perimeter, Area & Volume
13	Sequences
14	Reasoning & Proof

Unit 1 – Probability	**MathsWatch**
Language of probability, 0-1 probability scale, random, fair, equally likely, bias, unequally likely	14
Calculate probability and write as fractions, decimals or percentages	59
Sample space diagrams for combined events	126
Mutually exclusive events & their probabilities	60
Experimental probability	125
Expected results from repeated experiments	125
Use a frequency tree to record outcomes of an event	57
Use listing strategies to identify all permutations or combinations	58
Represent outcomes using a Venn diagram Find the union and intersection of sets	127a, 186
Recognise the symbols { } for sets, ∩ for intersection and ∪ for union	127b, 186
Know the addition law for mutually exclusive events: P(A or B) = P(A) + P(B)	204
Know the multiplication law for independent events: P(A & B) = P(A) x P(B)	204
Use a tree diagram to solve problems involving combined events that are independent and dependent	151, 175

Key Vocabulary		**Careers**
Probability	Expected	• Scientists
Chance	Expectation	• Market Research
Likelihood	Experiment	• Finance
Impossible	Trial	• Statisticians
Unlikely	Theoretical probability	• And many more!
Likely	Experimental probability	
Even chance	Relative frequency	
Certain	Frequency tree	
Random	Combination	
Fair	Permutation	
Biased	Probability tree diagram	
Event	Independent events	
Outcome	Dependent events	**Career Transferable Skill**
Frequency	Conditional probability	**Analytical Skills.**
Equally likely	Venn diagram	Construct logical arguments and expose illogical ones
Mutually exclusive	Set	
Sample space	Union	
Two-way table	Intersection	
Combined	Complement	

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Unit 2 – Quadratics	**MathsWatch**
Using algebraic notation	7
Simplifying expressions by collecting like terms	33
Simplifying expressions using index laws	34, 35, 82, 131
Expanding single brackets	93, 134a
Factorising into one bracket	94
Expanding double brackets	134b
Factorise quadratic expressions of the form $x^2 + bx + c$	157a
Factorising the difference of two squares $x^2 – a^2 = (x – a)(x + a)$	157b
Solve quadratic equations by factorising	157
Draw the graph of quadratic functions of the form $y = ax^2 + bx + c$	133a
Use quadratic graphs to estimate values of y for given values of x and vice versa	133a
Identify and interpret roots, intercepts and turning points of quadratic functions graphically	160
Find approximate solutions to a quadratic equation using a graph	160

Key Vocabulary		**Careers**
Quadratic	Parabola	• Engineering (all types)
Square	Intersection	• Finance and Accounting
Solution	Intercept	• Computer Programming
Solve	Turning point	• Business including investment
Factorising	Vertex	• Scientist
Complete the square	Minimum	• Operational Research
Quadratic formula	Maximum	
Discriminant	Approximate	
Root		**Career Transferable Skill**
Real root		**Problem Solving Skills**
		Present a solution clearly, making your assumptions explicit.
		Useful Personality Traits
		Intellectual rigour

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Unit 3 – Units and Graphs	**MathsWatch**
Read, convert and calculate with time Convert units of length, mass and capacity	111
Understand and calculate compound units involving speed, distance and time	142a
Understand and calculate compound units involving density, mass and volume	142b
Understand and calculate pressure	142c
Understand and calculate population density	
Solve problems involving compound units	142a, b, c
Solve problems involving time, timetables, speed and distance tables	6b
Plot and interpret graphs in real contexts	
Plot and interpret distance-time graphs	143
Interpret the gradient of a straight line graph as a rate of change	97
Review plotting linear graphs, y = mx + x, gradient and intercept	96, 97 159a, 159b
Recognise, sketch and interpret graphs of quadratic, cubic and reciprocal functions	133b 161a, 161b

Key Vocabulary		**Careers**
Compound unit Rate Measure Unit Conversion Speed Distance Time Miles per hour Metres per second Kilometres per hour Average speed Density Mass Volume Grams per cubic centimetre Kilograms per cubic metre	Pressure Force Area Newtons per square metre Pascal Population density Cost per item Pay rate Flow rate Gradient Rate of change	• Business including advertising, real estate and purchasing • Finance and Economics • Research including science, engineering and computing • Construction • Surveyor • Architect • Healthcare  **Career Transferable Skill** **Deductive Reasoning** The ability to apply general rules to specific problems to produce answers that make sense.

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Unit 4 – Shape & Construction	**MathsWatch**
Solve geometrical problems involving coordinates	113
Calculate midpoint of a line	98
Properties of 3D shapes (including faces, edges and vertices)	43
Construct and interpret plans and elevations of 3D shapes	51
Understand and use isometric drawings	
Recognise, draw and interpret nets of 3D shapes	44
Congruence and congruence criteria for triangles (SSS, SAS, ASA, RHS)	166
Use compasses	
Use ruler and protractor or compasses to construct triangles	147
Construct an angle bisector	145c
Construct perpendicular bisectors and lines	145a, 145b
Construct loci	146
Use scale diagrams	38

Key Vocabulary		**Careers**
Face Edge Vertex Plan Elevation View Net Congruent Congruence Similar Similarity Scale factor Multiplier Construct Construction lines Arc Bisect Perpendicular	Angle bisector Perpendicular bisector Locus Loci Scale Bearing	• Architects • Visual Design • Construction and Installation • Production • Pilot/Air Traffic Controller  **Career Transferable Skill** **Analytical Skills** Follow complex reasoning. Accuracy

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Unit 5 – Equations & Inequalities	**MathsWatch**
Solve equations with one step Solve equations with two or more steps Solve equations with the unknown on both sides	99, 135a
Solve equations with the unknown in the denominator	135a
Construct and solve an equation	137
Solve simultaneous equations using elimination	162
Solve simultaneous equations using substitution	
Solve simultaneous equations graphically	140
Construct and solve simultaneous equations	162
Read and draw inequalities on a number line	138
Solve single inequalities Solve inequalities with the variable on both sides	139
Construct and solve inequalities	139
Substitute numbers into expressions Substitute numbers into algebraic formulae Substitute numbers into real-life formulae Substitute numbers into functions	95
Rearrange a formula to change the subject	136

Key Vocabulary		**Careers**
Equation Solve Solution Unknown Operation Inverse Balance Simultaneous Elimination Substitution Intersection	Variable Inequality Solution Number line Set Boundary Inclusive Substitute Substitution Evaluate Formula Function Rearrange Subject	• Engineering (all types) • Finance and Accounting • Computer Programming • Operational Research • Business including investment • Cooking (Substitution) • Scientist  **Career Transferable Skill** **Problem Solving Skills** Present a solution clearly, making your assumptions explicit. **Useful Personality Traits** Intellectual rigour

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Unit 6 – Ratio & Proportion	**MathsWatch**
Write and simplify ratios	38
Use equivalent ratios to find unknown amounts	106a, 165a
Convert between ratios, fractions and percentages	106b
Share amounts in a ratio	106a
Solve best-buy or better value problems	41
Understand direct proportion and solve problems involving direct proportion	42, 199
Understand inverse proportion and solve inverse proportion problems Understand that X is inversely proportional to Y is equivalent to X is proportional to $\frac{1}{Y}$	107, 199
Graphs of direct and inverse proportion	199
Interpret direct proportion equations	199
Interpret inverse proportion equations	199

Key Vocabulary		**Careers**
Ratio Part Whole Fraction Equivalent Simplify Scale factor Scaling Convert Conversion Concentration Better value Best-buy	Proportion Proportional Direct proportion Inverse proportion Scale Scale factor Multiplier Constant	• Finance including bank, stocks and shares • Design including graphic, art and interior • Cookery • Construction  **Career Transferable Skill** **Information Ordering** The ability to arrange things or actions in a certain order or pattern according to a specific rule or set of rules

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Unit 7 – Pythagoras & Trigonometry	**MathsWatch**
Pythagoras' Theorem	150a, 150b
Understand sin, cos and tan in trigonometry	168
Use trigonometry to find unknown sides in triangles	168
Use trigonometry to find unknown angles in triangles	168
Use exact trigonometric values	173

Key Vocabulary		**Careers**
Pythagoras' Theorem Hypotenuse Square Square root Trigonometry Trigonometric ratio Opposite side Adjacent side Sine (sin) Cosine (cos) Tangent (tan) Angle Side length Degree		• Engineers • Astronomy • Surveyors • Forensic Science • Ecology



Career Transferable Skill

Problem Solving Skills.

Tackle a problem with confidence, even when the solution is not obvious.

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Unit 8 – Number	**MathsWatch**
Error intervals - express rounding and truncation errors using inequality notation $a < x \leq b$	155a, 155b
Limits of accuracy – know rounded measurements are inaccurate by up to half a unit each way	132
The rest of the unit is a review of Unit 10.2 & Unit 10.4	
Factors, HCF, Multiples, LCM	28, 79, 80
Primes and prime factors	28, 78
Powers and Roots	29, 81, 82
Order sets of integers and decimals	3a, 3b
Add/subtract, multiply & divide with integers & decimals	17, 18, 19, 20 66a, 66b 67a, 67b
Solve problems involving finance such as bills & bank statements	22
Order of operations (BIDMAS)	68
Standard form	83

Key Vocabulary		**Careers**
Rounding error Error interval Inclusive Truncate, truncation Upper/Lower bound Maximum/minimum Multiple Lowest Common Multiple (LCM) Factor Highest Common Factor (HCF) Divisible Prime Prime Factor Decomposition Product Factor Tree Venn diagram	Square Number Cube Number Index (Power) Base Exponent (Power) Indices (Powers) Square Root Cube Root Root Surds Add, sum, total Subtract, difference Multiply, product Divide, quotient Inverse operation Order of operations Brackets Indices Evaluate Negative, positive Standard form	• Cyber Security • Computer Programming • Construction • Distribution and Resource Management • Finance and Human Resources • Scientists • Data Entry • Healthcare • Management • Data Science



Career Transferable Skill

Good Working Habits.
Be thorough and painstaking in your work.
Analytical Skills.
Pay attention to detail

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Unit 9 – Angles & Measure	**MathsWatch**
Notation for labelling lengths and angles, including the names of angles (acute, obtuse, right, reflex)	13
Notation for labelling right angles, parallel lines and equal lengths or sides and angles in shapes	9
Angle rule: vertically opposite angles are equal	
Angle rule: angles around a point add to 360	45
Angle rule: angles at a point on a straight line add to 180	45
Angles in parallel lines: alternate, corresponding and interior angles	120
Combining angle facts	
Angle sum of a triangle is 180, and use of equilateral and isosceles	121a, 121b
Angle sum of quadrilateral is 360, and use of special quadrilaterals	122
Names and properties of triangles, quadrilaterals and polygons	9, 10, 11
Angle sum of any polygon & interior or exterior angles in regular polygons	123
Draw and measure line segments and angles accurately	46a, 46b
Bearings (8 compass bearings, and 3-figure bearings)	124
Scale factors, scale diagrams and maps	38

Key Vocabulary		**Careers**
Acute Right Angle Obtuse Reflex Vertically Opposite Parallel Transversal Corresponding Angles Alternate Angles Co-interior Angles Supplementary Equilateral triangle Isosceles triangle Scalene triangle Quadrilateral Square Rectangle Parallelogram	Trapezium Kite Rhombus Equal Opposite Adjacent Polygon Regular Interior angle Exterior angle Line segment Compass Bearing (3-figure bearing) Clockwise & Anticlockwise Scale factor Scale	• Architect including Interior Design • Construction work • Games programmer and Visual Design • Sports • Fashion  **Career Transferable Skill** **Problem Solving Skills** Be flexible and approach the same problem from different points of view.

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Unit 10 – Fractions & Percentages	**MathsWatch**
This unit is a review of Units 10.8, 10.10 & 10.13	
Shade fraction diagrams or say what fraction of a diagram is shaded	24
Convert between improper and mixed numbers	26
Equivalent fractions & simplifying fractions	25a, 25b
Order fractions, decimals and percentages	70
Convert between fractions, decimals and percentages, including recurring decimals	84, 177
Find fractions of amounts	72
Add and subtract fractions Add and subtract mixed numbers	71
Multiply with fractions Multiply mixed numbers	73
Divide with fractions Divide with mixed numbers	74
Solve problems involving fractions and mixed numbers	
Write numbers as percentages of other numbers Express one quantity as a fraction of another	88, 89
Find percentages of amounts	86, 87
Percentage change	108a, 108b
Find original values in percentage problems	109
Find the percentage an amount has changed by	108b
Simple interest	110
Compound interest	164
Growth and decay	164

Key Vocabulary		**Careers**
Numerator Denominator Improper fraction Mixed number Equivalent Simplify Cancel Lowest terms Common denominator Decimal Terminating decimal Recurring decimal Product Reciprocal	Percentage Multiplier Increase Decrease Original Profit Loss Discount Sale Interest Simple interest Compound interest Growth Decay Exponential	• Food related careers • Construction and Vehicle Maintenance • Finance • Administration – Data, Human Resources and office work • Sales. retail, real estate and travel • Healthcare • Agriculture • Business  **Career Transferable Skill** **Analytical Skills.** Work precisely **Problem Solving Skills** Tackle a problem with confidence

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Unit 11 – Statistics	**MathsWatch**
Understand sampling	176a
The rest of the unit is a review of Unit 10.5 & Unit 10.14	
Construct and interpret bar charts, comparative bar charts and vertical line charts	15, 64 65a, 65b
Construct and interpret pictograms	16
Construct and interpret pie charts	128a
Compare data using appropriate representations or averages	
Interpret and construct tables and line graphs for time series data	153
Plot bivariate data on a scatter graph Understand positive and negative correlation Draw and use a line of best fit on a scatter graph	129
Calculate the range	62
Calculate the median	62
Find the mode	62
Calculate the mean	62
Averages from a frequency table	130a
Averages from grouped data	130b
Averages from diagrams	
Choose suitable averages and solve problems	

Key Vocabulary		**Careers**
Data Sample Population Random Frequency Frequency table Tally chart Pictogram Key Bar chart Pie chart Sector Time series Trend Scatter graph Correlation Line of best fit	Mode Modal value Most frequent value No mode Median Ordered Middle value Mean Total, sum Midpoint Range Spread Consistent Consistency Maximum, Minimum Difference Compare Outlier	• Marketing • Business and Finance • Social Science • Sports • Media including journalism  **Career Transferable Skill** **Analytical Skills** Construct logical arguments and expose illogical ones.

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Unit 12 – Perimeter, Area & Volume	**MathsWatch**
Circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector, segment	116
The rest of the unit is a review of Unit 10.11	
Find area and perimeter of simple shapes	52
Area of a rectangle (Area = length x width)	53
Area and perimeter of compound shapes	52, 53
Area of a triangle (Area = ½ x base x height)	54
Area of a parallelogram (Area = base x height)	55
Area of a trapezium (Area = ½(a + b) x height)	56
Circumference of a circle $C = 2\pi r = \pi d$	118
Area of a circle $A = \pi r^2$	117
Arc length & perimeter of sectors of circles Area of sectors of circles	167
Volume of cuboids (V = length x width x height)	115
Volume of a prism (V = area of cross-section x height) Volume of a cylinder ($V = \pi r^2$ x height)	119
Surface area of a prism	114a, 114b
Volume and surface area of a sphere Volume and surface area of a pyramid Volume and surface area of a cone	169 170 171
Sketch the net of a solid	44
Convert between units of area and volume	

Key Vocabulary		**Careers**
Circumference Radius Diameter Sector Chord Segment Tangent Arc Perimeter Dimensions Area Square units Perpendicular Compound shape Volume Surface area Cubic units Cross-section Net	Rectangle Square Parallelogram Triangle Trapezium Circle Circumference Radius Diameter Sector Cube Cuboid Prism Cylinder Sphere Pyramid Cone	• Construction • Dentist • Surveyor • Architect • Animation and art-based careers  **Career Transferable Skill** **Critical thinking** Observation, analysis and inference

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Unit 13 – Sequences	**MathsWatch**
This unit is a review of Unit 10.9	
Term-to-term rules: generate a sequence or identify a rule and continue a sequence	37
Understand position-to-term rules (nth term) and substitute numbers in	102a
Know the features of an arithmetic sequence (terms have a common difference)	
Arithmetic sequences – nth term (use or find) Determine if a number is a term of a sequence	103
Sequences of patterns – nth term	
Know the features of a quadratic sequence (differences have equal gaps)	
Quadratic sequences – nth term (use)	102b
Special sequences – know features of, & recognise (eg) Square numbers (1, 4, 9, 16, 25, 36, 49, 64, 81, 100…) Cube numbers (1, 8, 27, 64, 125, …) Triangle numbers (1, 3, 6, 10, 15, 21, 28, 36, 45, …)	104
Knows the features of a geometric sequence (terms have a common ratio)	163
Geometric sequences – recognise, find common ratio, continue and use nth term	163
Know the features of a Fibonacci sequence (each term is the sum of the previous two terms)	141
Fibonacci sequences – recognise and continue the sequence	141

Key Vocabulary		**Careers**
Sequence Term Pattern Rule Generate Continue Ascending Descending Rule Term-to-term rule Position Position-to-term rule n^{th} term Substitute Evaluate	Arithmetic Difference Common difference Quadratic Square numbers Cube numbers Triangle numbers Geometric Ratio Common ratio Multiplier Fibonacci	• Finance and Business • Scientists • Production • Agriculture  **Career Transferable Skill** **Information Ordering** The ability to arrange things or actions in a certain order or pattern according to a specific rule or set of rules

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Unit 14 – Reasoning & Proof	**MathsWatch**
Know the difference between an equation (true for a specific value) and an identity (true for all values)	158
Show algebraic expressions are equivalent, and construct algebraic proofs	
Construct geometric proofs using angle facts	
Understand the proof of the angle sum of a triangle using alternate angles	
Construct geometric proofs using congruence & similarity	
Reasoning	156

Key Vocabulary		**Careers**
Equation Identity Equivalent Proof Prove Justify Explain		• Scientist • Operational Research • Finance and Accounting • Lawyer  **Career Transferable Skill** **Problem Solving Skills** Present a solution clearly, making your assumptions explicit. **Analytical Skills.** Follow complex reasoning.