Year 10 Maths: Personalised Learning Checklist (PLC) – Crossover Foundation

Learning Journey

1	Angles & Measure
2	Numbers & the Number System
3	Manipulating
4	Calculating & Place Value
5	Representing & Interpreting
6	Rounding & Accuracy
7	Equations & Formulae
8	Fractions & Decimals
9	Sequences
10	Fraction Calculations
11	Perimeter, Area & Volume
12	Linear Graphs
13	Percentages
14	Analysing
15	Ratio
16	Pythagoras & Trigonometry
17	Transformation & Vectors
18	Quadratics

Unit 1 – 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 2 – Numbers & the Number System	**MathsWatch**
Find multiples and lowest common multiples of numbers	28, 80
Find factors and use divisibility rules	28
Find highest common factors of numbers	79
Recognise prime numbers 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, …	28
Find the prime factors of a number	78
Use prime factors to calculate HCF and LCM	79, 80
Read, write and evaluate powers and roots	29, 81, 82
Recognise and use square numbers up to 15^2, and their square roots, and cube numbers 1, 8, 27, 64, 125 and 1000 and their cube roots. Recognise powers of 2, 3, 4 and 5 Know that 1000 = 10^3 and 1 million = 10^6 Know that a number to the power zero is 1	81
Read, write and evaluate negative powers	154
Use a scientific calculator to find powers and roots	
Convert a root to a rough decimal value	

Key Vocabulary		**Careers**
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	• Cyber Security • Computer Programming • Construction • Distribution and Resource Management • Scientists  **Career Transferable Skill** **Problem Solving Skills.** *Be flexible and approach the same problem from different points of view.*

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Unit 3 – Manipulating	**MathsWatch**
Recognise: expression, equation, inequality, term, formulae, function	158
Know and use basic algebraic notation	7
Simplify expressions by collecting like terms	33
Simplify expressions using multiply and divide	34, 35
Use rules of indices to simplify expressions $a^m \times a^n = a^{m+n}$ $a^m \div a^n = a^{m-n}$ $(a^m)^n = a^{mn}$ $a^0 = 1$	131
Multiply (expand) a single bracket and simplify expressions involving expanding a single bracket	93, 134a
Expand and simplify two brackets (including those involving surds)	134b
Factorise into single brackets by taking out common factors	94
Factorise quadratic expressions of the form $x^2 + bx + c$	157a
Use the difference of two squares: $x^2 - a^2 = (x + a)(x - a)$	157b

Key Vocabulary		**Careers**
Algebra Variable Expression Equation Inequality Formula Term Function Identity Coefficient Constant Simplify Collect Like Terms Like Terms Unlike Terms	Indices Expand Factorise Quadratic Difference of two squares	• Computer Programmers • Engineering (All types) • Finance – Economists, planner, accountants. • Scientists  **Career Transferable Skill** **Useful Personality Traits** Intellectual rigour Clear communication skills and logical thinking

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Unit 4 – Calculating & Place Value	**MathsWatch**
Understand place value	2
Use the signs $<, \leq, >, \geq, =, \neq$ to compare numbers, including compound inequalities to compare three or more numbers (e.g. -1<0.5<4)	5
Order a set of integers and decimals	3a, 3b
Find the midpoint of two numbers	27
Add, subtract, multiply and divide with negative numbers	67a, 67b
Add and subtract with integers and decimals	17, 18
Multiply with integers, and multiply integers and decimals by a decimal	19, 66a
Divide with integers, divide a decimal by an integer, an integer by a decimal, and a decimal by a decimal	20, 66b
Multiply and divide with place value	92
Use a scientific calculator	
Apply order of operations to multi-step calculations	68
Interpret, write and compare numbers in standard form (positive and negative indices)	30, 83
Calculate with standard form	83
Enter numbers in standard form on a calculator	

Key Vocabulary		**Careers**
Place value Units or ones Ten, Hundred, Thousand, Million Tenths, Hundredths, Thousandths Integer Decimal Decimal point Inequality Compound inequality Greater than (>) Less than (<) Greater than or equal to (≥) Less than or equal to (≤) Not equal to (≠) Between	Order Ascending Descending Add, sum, total Subtract, difference Multiply, product Divide, quotient Inverse operation Order of operations Brackets Indices Evaluate Negative, positive Standard form	• Finance and Human Resources • Computer Programming • 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 5 – Representing & Interpreting	**MathsWatch**
Know that: discrete data is data which can be listed or counted; continuous data is measured data; primary data is data you have collected yourself; secondary data has been collected by someone else; qualitative data is descriptive; quantitative data is numerical	63
Construct and interpret frequency tables	15, 65a
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	
Construct and interpret 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
Know interpolation is estimating within data values on a graph, and this is generally reliable Know extrapolation is estimating outside data values on a graph, and this is unreliable	

Key Vocabulary		**Careers**
Data	Width	• Marketing
Sample	Height	• Business and Finance
Population	Pie chart	• Social Science
Discrete	Sector	• Sports
Continuous	Category	• Media including journalism
Primary	Proportion	
Secondary	Percentage	
Qualitative	Time series	
Quantitative	Trend	
Frequency	Cyclical	
Frequency table	Bivariate data	
Tally chart	Scatter graph	
Scale	Correlation	**Career Transferable Skill**
Label	Line of best fit	**Analytical Skills**
Plot	Interpolate	Construct logical arguments and expose illogical ones.
Pictogram	Extrapolate	
Key		
Bar chart		

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Unit 6 – Rounding & Accuracy	**MathsWatch**
Round to the nearest 1000, 100, 10 or whole number	31
Round to a specified number of decimal places	32
Round to a specified number of significant figures	90
Round to an appropriate degree of accuracy	
Estimate calculations by rounding to one significant figure	91
Estimate and check if solutions to problems are of the correct size	91
Determine if an estimate is an overestimate or underestimate	
Express rounding errors as $a \leq x < b$ Understand error interval notation $a \leq x < b$	155a, 155b

Key Vocabulary		**Careers**
Integer		• Cyber Security
Decimal		• Computer Programming
Decimal point		• Scientists
Compare		• Engineering
Appropriate degree of accuracy		• Production and Construction
Estimate		
Midpoint		
Round (up/down)		
Nearest		
Decimal place		
Significant figure		
Estimate, approximate		**Career Transferable Skill**
Rounding error		**Problem Solving Skills**
Error interval		Think clearly.
Inclusive		
Truncate, truncation		
Upper/Lower bound		
Maximum/minimum		

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Unit 7 – Equations & Formulae	**MathsWatch**
Express problems algebraically	137
Solve equations when the solution is a positive or negative integer, or a fraction Solve equations involving brackets	135a
Solve equations where the unknown is the numerator of a fraction	135a
Solve equations where the unknown appears on both sides	135a
Solve two simultaneous equations using the elimination method	162
Substitute integers into expressions and formulae Given a formula, find outputs from inputs, and inputs from outputs	95
Rearrange a formula to change the subject	101, 136

Key Vocabulary		**Careers**
Algebraic expression	Expand	• Engineering (all types)
Represent	Simplify	• Finance and Accounting
Variable	Check	• Computer Programming
Unknown	Simultaneous equation	• Scientist
Term	Elimination, eliminate	• Operational Research
Coefficient	Substitution, substitute	• Business
Constant	Function	
Operation	Input, output	
Inverse operation	Subject	
Equation	Rearrange	
Linear equation		
Equal		
Balance		
Solve		
Step		
Solution		
Value		



Career Transferable Skill

Problem Solving Skills

Present a solution clearly, making your assumptions explicit. Tackle a problem with confidence, even when the solution is not obvious

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Unit 8 – Fractions & Decimals	**MathsWatch**
Shade fraction diagrams or say what fraction of a diagram is shaded	24
Convert between improper and mixed numbers	26
Equivalent fractions	25a
Simplify fractions	25b
Write fractions and mixed numbers in order of size using common denominators	70
Find a number between two fractions or integers	27
Know fractions represent division with decimal answers	84
Convert between fractions and decimals, with or without a calculator	84
Identify if a fraction is terminating or recurring	
Convert recurring decimals to fractions on a calculator	177
Order fractions and decimals by converting to decimals	70

Key Vocabulary		**Careers**
Fraction	Compare	• Healthcare
Whole	Order	• Sales
Part	Common denominator	• Food related careers
Equal parts	Midpoint	• Agriculture
Numerator	Convert	• Construction and Vehicle Maintenance
Denominator	Decimal	
Proper fraction	Terminating decimal	
Improper fraction	Recurring decimal	
Mixed number	Quotient	
Unit fraction		
Equivalent		
Simplify		
Cancel		
Factor		
Highest common factor (HCF)		
Lowest terms		



Career Transferable Skill

Analytical Skills.

Manipulate precise and intricate ideas.

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Unit 9 – Sequences	**MathsWatch**
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, 213
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 10 – Fraction Calculations	**MathsWatch**
Find fractions of amounts, with or without a calculator	72
Given a fraction, and the result, find the original amount or answer word problems related to fractions	
Express one quantity as a fraction of another	69
Add and subtract fractions Add and subtract mixed numbers	71
Multiply with fractions Multiply mixed numbers	73
Reciprocals	75
Divide with fractions Divide with mixed numbers	74
Solve problems involving fractions and mixed numbers	
Complete fraction calculations on a calculator	

Key Vocabulary		**Careers**
Fraction Proper fraction Improper fraction Mixed number Numerator Denominator Common denominator Equivalent fraction Simplify Cancel Factor Highest common factor Lowest terms Product Reciprocal		• Healthcare • Sales • Business • Agriculture • Construction and Vehicle Maintenance  **Career Transferable Skill** **Problem Solving Skills** Tackle a problem with confidence, even when the solution is not obvious.

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Unit 11 – Perimeter, Area & Volume	**MathsWatch**
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 = $\frac{1}{2}$ x base x height)	54
Area of a parallelogram (Area = base x height)	55
Area of a trapezium (Area = $\frac{1}{2}$ (a + b) x height)	56
Circumference of a circle C = 2πr = πd	118
Area of a circle A = πr^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 = πr^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**
Perimeter	Rectangle	• Construction
Length	Square	• Dentist
Width	Parallelogram	• Surveyor
Distance	Triangle	• Architect
Units	Trapezium	• Animation and art-based careers
Base	Circle	
Height	Circumference	
Dimensions	Radius	
Formula	Diameter	
Area	Sector	
Square units	Cube	
Perpendicular	Cuboid	
Compound shape	Prism	
Volume	Cylinder	
Surface area	Sphere	
Cubic units	Pyramid	
Cross-section	Cone	
Net		

Career Transferable Skill

Critical thinking

Observation, analysis and inference

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Unit 12 – Linear Graphs	**MathsWatch**
Work with coordinates in all four quadrants	8
Plot graphs of linear functions written in the form: y = ax + b or ax + by + c = 0	96
Use linear graphs to estimate values of y for given values of x and vice versa	96
Understand intercept and rate of change (gradient) of a graph	97
Use the form y = mx + c to identify gradient and intercept algebraically	
Find the equation of a straight line graph	159a
Interpret the equation of a straight line graph	159a
Equations of parallel lines, including use of y = mx+c	
Find the equation of a line through one point with a given gradient	159b
Find the equation of a line through two given points	159b

Key Vocabulary		**Careers**
Coordinate	Intercept	• Business including advertising, real estate and purchasing
Quadrant	Gradient	• Finance and Economics
Plot	Slope	• Research including science, engineering and computing
Axes	Positive gradient	• Healthcare
x-axis	Negative gradient	
y-axis	Rate of change	
Intersection	Parallel	
Linear		
Equation		
Function		
Substitute		

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 13 – Percentages	**MathsWatch**
Convert between fractions, decimals and percentages with or without a calculator	85
Know the calculator converter function keys	
Find a percentage of an amount without a calculator	87
Calculate the percentage of an amount with a calculator using a decimal or fraction multiplier	86
Increase or decrease by a percentage without a calculator	108a
Use fraction/decimal multipliers to increase or decrease by a percentage	108a
Work with percentages over 100% and decimal percentages	
Express one number/quantity as a percentage of another	88, 89
Compare quantities using percentages	
Find the percentage an amount has changed by (percentage change = actual ÷ original or percentage change = finish ÷ start)	108b
Solve simple interest problems	110
Solve compound interest problems	164
Find the original value in percentage problems	109
Growth and decay problems	164

Key Vocabulary		**Careers**
Percentage Per cent Whole Part Value Proportion Fraction Decimal Convert Equivalent Multiplier Scale factor Multiply Divide Calculate	Increase Decrease Original Profit Loss Discount Sale Interest Simple interest Compound interest Growth Decay Exponential	• Finance including bank accounts! • Fashion and Sports • Sales including retail, real estate and travel • Administration – Data, Human Resources and office work  **Career Transferable Skill** **Communication Skills.** Develop your capacity to assimilate and communicate highly technical information.

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Unit 14 – Analysing	**MathsWatch**
Know averages are a measure of central tendency and give a summary of a set of data	62
Know a range is a measure of spread (consistency) Calculate the range from a list, table or diagram	62
Calculate the median	62
Find the mode from a list or diagram	62
Calculate the mean from a list or diagram	62
Averages from frequency tables	130a
Averages from diagrams	
Averages from grouped data	130b
Choose a suitable average and solve problems Understand outliers and their effect on calculations	
Compare sets of data using mean and range	

Key Vocabulary		**Careers**
Data Sample Population Statistics Distribution Frequency Average Typical Representative 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 Limitation	• Marketing • Business and Finance • Social Science • Sports • Media including journalism • And many more….  **Career Transferable Skill** **Analytical Skills** Construct logical arguments and expose illogical ones.

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Unit 15 – Ratio	**MathsWatch**
Compare 2 or more quantities using ratio notation (eg lengths, areas and volumes)	38
Simplify a ratio, including those with units	38
Write a ratio in the form 1 : n or n : 1	
Ratios and fractions	106b
Sharing amounts in a ratio	106a
Solve problems involving ratios, including comparing ratios and considering the difference between values	165a, 165b, 165c
Use ratios in real contexts such as conversion, comparison, scaling, mixing and concentrations	39, 105, 106b
Solve better value or best-buy problems	41
Solve problems involving unit pricing	41

Key Vocabulary		**Careers**
Ratio Part Whole Proportion Fraction Equivalent Simplify Scale factor Scaling Convert Conversion Concentration Better value Best-buy		• 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 16 – Pythagoras & Trigonometry	**MathsWatch**
Identify the hypotenuse in a right-angled triangle (the longest side, opposite the right-angle)	150b
Know the formula for Pythagoras' Theorem: $c^2 = a^2 + b^2$ where c is the hypotenuse	150a, 150b
Use the formula for Pythagoras' Theorem to find lengths in right-angled triangles	150b, 150c
Know the term surd and give exact answers in surd form when required (eg $\sqrt{10}$)	
Label a right-angled triangle with hypotenuse (H), opposite (O) and adjacent (A)	168
Know that the ratio O/H is sine/sin of the angle	168
Know that the ratio A/H is cosine/cos of the angle	168
Know that the ratio O/A is tangent/tan of the angle	168
Know the trigonometric ratios SOH CAH TOA	168
Use trigonometry to calculate missing lengths in right-angled triangles	168
Use trigonometry to calculate missing angles in right-angled triangles	168
Know the exact values of sin θ and cos θ for $\theta = 30, 45, 60$ and 90	173
Know the exact values of tan θ for $\theta = 30, 45, 60$	173

Key Vocabulary		**Careers**
Pythagoras' Theorem Hypotenuse Square Square root Surd 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.

Year 10 Maths: Personalised Learning Checklist (PLC) – Crossover Foundation

Learning Journey

1	Angles & Measure
2	Numbers & the Number System
3	Manipulating
4	Calculating & Place Value
5	Representing & Interpreting
6	Rounding & Accuracy
7	Equations & Formulae
8	Fractions & Decimals
9	Sequences
10	Fraction Calculations
11	Perimeter, Area & Volume
12	Linear Graphs
13	Percentages
14	Analysing
15	Ratio
16	Pythagoras & Trigonometry
17	Transformation & Vectors
18	Quadratics

Unit 17 – Transformation & Vectors	**MathsWatch**
Line symmetry and rotational symmetry	11
To draw and describe a translation of a shape	50
To draw and describe a reflection of a shape	48
To draw and describe a rotation of a shape	49
Enlarge a shape using a centre and scale factor	148
Carry out combinations of transformations Describe the resultant of multiple transformations as a single transformation	184
Understand invariant points of a transformation	
Understand similarity and find missing values in similar shapes	144
Add and subtract vectors	174
Multiply a vector by a scalar	174
Draw vectors on a diagram and describe them	174
Identify parallel vectors	174
Use vectors to construct geometric arguments	219

Key Vocabulary		**Careers**
Line symmetry Rotational symmetry Order of rotational symmetry Horizontal Vertical Diagonal Equation Graph Reflection Reflect Symmetrical Object Image Congruent Rotation Rotate Clockwise Anticlockwise	Angle of rotation Centre of rotation Enlarge Enlargement Scale factor Centre of enlargement Translation Translate Vector Resultant Invariant point Scalar Parallel Position vector	• Computer Games Design • Animation • Art related careers • Architecture • Advertising  **Career Transferable Skill** **Useful Personality Traits.** Creativity

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Unit 18 – Quadratics	**MathsWatch**
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Simplifying expressions using index laws	34, 35, 82, 131
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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	157a
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 Square Solution Solve Factorising Complete the square Quadratic formula Discriminant Root Real root	Parabola Intersection Intercept Turning point Vertex Minimum Maximum Approximate	• Engineering (all types) • Finance and Accounting • Computer Programming • Business including investment • Scientist • Operational Research  **Career Transferable Skill** **Problem Solving Skills** Present a solution clearly, making your assumptions explicit. **Useful Personality Traits** Intellectual rigour