UNIT 1 MATHEMATICAL METHODS

BOOK 1 – POLYNOMIALS I

Section 1: Introduction to Algebra

Substitution of Values

Expanding Expressions
The Distributive Law
Expanding Expressions by Rule

Techniques in Factorisation
Number Systems

Section 2: Linear Polynomials

Polynomial Expressions

Factorising Linear Polynomials
Highest Common Factor
Grouping Terms

Solving Linear Equations
Solving Equations Using the Null Factor Law
Solving Literal Equations
Rearrangement and Substitution
Simultaneous Equations

Graphs of Linear Polynomials
Technology Neutral Applications

Determining Rules for Linear Functions

Sketching and Solving Linear Inequations

Linear Models and Applications

Section 3: Quadratic Polynomials

Factorising Quadratic Polynomials
Factorising Quadratic Trinomials by Rule
The Difference of Two Squares
The FOIL Technique
Completing the Square
Transposition Using Completing the Square
Grouping Terms
Expressions that Can be Reduced to Quadratics

Solving Quadratic Equations
Solving Equations
Solving Equations Using the Null Factor Law
Verifying Solutions
The Quadratic Formula
The Discriminant
Solving Equations by Equating Coefficients
Points of Intersection of a Quadratic with a Line or Quadratic

Graphs of Quadratic Polynomials
Quadratics Written as Combinations of Linear Factors
Quadratic Functions in their Fully Expanded Form
Technology Neutral Applications

Transformations of Quadratic Functions
Transformations of Functions
Dilations
Reflections
Translations
Summary of Transformation Notations
Order of Transformations
Identifying Transformations
The Perfect Square or Transformation Form
Sketching Curves by Considering Transformations

Determining Rules for Quadratic Functions

Sketching and Solving Quadratic Inequations

Quadratic Models and Applications

The Discriminant Function
Calculating the Discriminant
Solving Discriminant Applications
Applications Involving X Intercepts/Roots
Applications Involving Curve Features
Applications Involving Points of Intersection

Section 4: Matrices
Dimensions/Order/Size of Matrices
Equality of Matrices

The Algebra of Matrices
Addition and Subtraction of Matrices
Scalar Multiplication
Matrix Multiplication
The Determinant & Multiplicative Inverse
Finding Inverse Matrices
Solving Matrix Equations
Solving Linear Simultaneous Equations

Matrix Representation of Transformations
Finding the Image of a Point
Finding the Image of a Function or Relation

BOOK 2 – POLYNOMIALS II

Section 5: Cubic Polynomials

Factorising Cubic Polynomials
Grouping Terms
The Sum or Difference of Two Cubes
Division of Polynomial Expressions
The Remainder Theorem
The Factor Theorem
Long Division
Division Done Easy
Synthetic Division

Solving Cubic Equations
Solving Equations Using the Null Factor Law
Solving Equations by Equating Coefficients
Point(s) of Intersection Between a Cubic and a Line or Quadratic

Graphs of Cubic Polynomials
Cubic Functions Written as Combinations of Linear Factors
Technology Neutral Applications
Cubic Functions in their Fully Expanded Form
Technology Neutral Applications
Cubic Functions Written in Transformation Form
Transformations of Cubic Functions
Sketching Cubic Functions by Considering Transformations
Technology Neutral Applications

Sketching and Solving Cubic Inequations

Determining Rules for Cubic Functions

Cubic Models and Applications

Section 6: Quartic Polynomials

Factorising Quartic Polynomials
Highest Common Factors
Grouping Terms
Disguised Quartic Expressions
Factor Theorem & Division

Solving Quartic Equations

Graphs of Quartic Polynomials
Quartic Functions Written as Combinations of Linear Factors
Technology Neutral Applications
Quartic Functions in the Fully Expanded Form
Technology Neutral Applications
Quartic Functions Written in Transformation Form
Transformations of Quartic Functions
Sketching Quartic Functions by Considering Transformations
Technology Neutral Applications

Sketching and Solving Quartic Inequations

Determining Rules for Quartic Functions

Quartic Models and Applications

Section 7: Higher Order Polynomial Functions
Even Power Functions
Odd Power Functions
End Behaviour
Factors and Roots

Section 8: Families of Polynomial Functions
Linear Families
Quadratic Families
Cubic Families
Quartic Families

Section 9: Approximating the Roots of Polynomial Graphs

Roots & Intervals
Numerical Estimation of Roots (The Method of Bisection)
Graphical Estimation of Roots
Using Points of Intersection to Estimate Roots

BOOK 3

RELATIONS, FUNCTIONS AND THEIR GRAPHS

Section 1: Relations and Functions
Relations and Correspondence
Functions and Inverses
Domains and Ranges
Notations Used to Describe Domains and Ranges
Including and Excluding Values
Number Systems
Finding the Domain
Finding the Range
Largest Possible Domain
Function Notation

Section 2: Other Relations
The Rectangular Hyperbola
The Truncus
The Circle
The Square Root Function
The Cube Root Function

Section 3: Hybrid Functions

Section 4: Inverse Functions and Relations
Inverse Relations
Inverse Functions
Identifying Inverse Pairs
Sketching Inverse Functions
Finding Equations Describing Inverse Functions

RATES OF CHANGE

Section 5: Rates of Change

Definitions and Notations

Types of Rates of Change

Constant Rates of Change

Variable Rates of Change
Average Rates of Change
The Graphical Approach
The Numerical Approach
The Algebraic Approach
Instantaneous Rates of Change
The Graphical Approach
The Numerical Approach
The Algebraic Approach

Sketching Rate of Change Graphs from the Graph of f(x)

Vessels and Rates of Change

Motion and its Graphs
Important Rules and Definitions
Distance, Displacement and Position
Speed and Velocity
Acceleration
Distance – Time Graphs
Displacement – Time Graphs
Speed – Time Graphs
Velocity – Time Graphs
Acceleration – Time Graphs
Relationships Between Motion Graphs

BOOK 4

COORDINATE GEOMETRY

Section 1: Coordinate Geometry

The Distance Between Two Points

Collinear Points

The Midpoint of a Line

Parallel and Perpendicular Lines

Perpendicular Bisectors

Proofs in Coordinate Geometry
To Prove that the Given Lines are Parallel
To Prove that the Given Lines are Perpendicular
To Prove that a Triangle is Scalene, Isosceles or Equilateral
To Prove that a Triangle is a Right-Angled Triangle
To Prove that a Quadrilateral is a Parallelogram
To Prove that a Quadrilateral is a Square
To Prove that a Quadrilateral is a Rectangle
To Prove that a Quadrilateral is a Trapezoid
Applications

PROBABILITY

Section 2: Probability

Basic Probability Facts

Overview of Set Language

Venn Diagrams

Probabilities of Compound Events
Choices of Events – The Addition Rule
Combinations of Events – The Multiplication Rule
Independent Events
Dependent Events – Conditional Probability

Probability Diagrams
Tree Diagrams
Lattice Diagrams
Karnaugh Maps
Helpful Information for Probability Applications

Mixed Questions in Probability