4. 4 Learning Objectives for Key Stage 4 (S4 - S5)

4. 4. 1 Number and Algebra Dimension (Key Stage 4)

Unit	Learning objectives	Suggested time ratio
Observing Patterns and Expressing Generality		
More about Polynomials	• manipulate polynomials further including long division up to simple quadratic divisor • <u>recognize the concept of division algorithm</u> • <u>understand and use remainder and factor theorems to factorize polynomials up to degree 3</u> • <u>appreciate the power of factor theorem and also be aware of the limitation of the theorem</u>	9
Arithmetic and Geometric Sequences and their Summation	• <u>explore further the properties of arithmetic and geometric sequences</u> • <u>develop and use the general terms of the sequences</u> • <u>investigate and use the general formulas of the sum to n terms of arithmetic and geometric sequences</u> • <u>develop an intuitive idea on limit and deduce the formula for sum to infinity for certain geometric series</u> • <u>solve real-life problems such as interest, growth and depreciation, geometric problems etc.</u> • **explore recurrence in some sequences	10
Algebraic Relations and Functions		
Quadratic Equations in One Unknown	• formulate and solve quadratic equations by factor method and formula • solve the equation $ax^2 + bx + c = 0$ by plotting the graph $y = ax^2 + bx + c$ and reading the x-intercepts • be aware of the approximate nature of the graphical method • choose the most appropriate strategy to solve quadratic equations • recognize the conditions for the nature of roots • understand the hierarchy of real-number system and be aware of the characteristics of rational numbers when expressed in decimals Note: Further exploration on properties of quadratic graphs would be in the Unit "Function and Graphs".	17

Note: The objectives with asterisk (**) are exemplars of **enrichment topics**.
     The objectives <u>underlined</u> are considered as **non-foundation** part of the syllabus.

Unit	Learning objectives	Suggested time ratio
More about Equations	● formulate and solve equations which can be transformed into quadratic equations ● formulate and solve one linear and one quadratic simultaneous equations by algebraic method ● solve equations by reading intersecting points of given graphs ● appreciate the power and understand the limitation of graphical method in solving equations ● choose the most appropriate strategy to solve equations ● **explore the algebraic method to solve cubic or higher degree equations	15
Variations	● discuss the relations between 2 changing quantities ● sketch the graphs of direct and inverse variations and recognize the algebraic representations between the quantities ● recognize and appreciate the algebraic representations of various variations such as those in the forms of $V=\pi r^2 h$ or $y=k_1+k_2 x$, etc. ● apply the relations to solve real-life problems	13
Linear Inequalities in Two Unknowns	● represent the linear inequalities in 2 unknowns on a plane ● discuss the solution of compound linear inequalities connected by 'and' ● solve systems of linear inequalities in two unknowns ● solve linear programming problems	15
Exponential and Logarithmic Functions	● understand and use the laws of rational indices ● understand the definition of logarithmic functions and recognize the common logarithm is not the only type of the function ● examine the properties of the graphs of exponential and logarithmic functions ● explore and study the relations between the properties of logarithmic function and that of exponential function ● appreciate the application of logarithm in various real-life problems	18

Note: The objectives with asterisk (**) are exemplars of **enrichment topics**.
 The objectives underlined are considered as **non-foundation** part of the syllabus.

Unit	Learning objectives	Suggested time ratio
Functions and Graphs	• relate the idea of input-processing-output to the meaning of dependent and independent variables • understand the basic idea of a function from the tabular, symbolic and graphical representations of a function <u>and the dummy nature of x</u> • use the notation for a function • explore various properties of quadratic functions such as vertex, axis of symmetry, the optimum value(s) from their graphs • <u>appreciate the contribution of Arabians on the method of completing the square and use it to find the properties of quadratic functions</u> • <u>appreciate the power of the method in generating a perfect square expression</u> • sketch and compare graphs of various types of functions • solve $f(x) > k$, $f(x) < k$, $f(x) \geq k$, $f(x) \leq k$ by reading graphs of $f(x)$ • <u>explore the effects of transformation on the functions from tabular, symbolic and graphical perspectives</u> • <u>visualize the effect of transformation on the graphs of functions when giving symbolic relations</u>	16

Note: The objectives with asterisk (**) are exemplars of **enrichment topics**.

The objectives <u>underlined</u> are considered as **non-foundation** part of the syllabus.