

INTRODUCTION

The ***Complete Study Guide for CSEC Mathematics*** covers the syllabus content of the Caribbean Secondary Education Certificate (CSEC) Mathematics Syllabus (Effective for examinations from May-June 2018). The intention of the authors is to provide support material for students as they prepare for this examination. The treatment of the topics is comprehensive, yet concise, thereby allowing students to focus on the essential concepts and principles that are necessary for success in CSEC Mathematics.

This study guide assumes that students will be exposed to classroom learning experiences. Students must also acquire sufficient practice through such experiences, especially through interactions with their tutors and peers. The specific features that the guide addresses are:

- It acts as a companion to the student who needs to be familiar with the content of each topic and with the skills required to master the content.
- It presents the material in a well-sequenced and coherent form, so that critical understandings are addressed, while developing a sound foundation.
- The material has aesthetic appeal through the use of colour, diagrams and graphic displays. This will facilitate all learning styles, especially the visual and multi-sensory learner.
- There is a wide range of worked examples to guide the students on how a topic is tested at the examination level. These examples vary in terms of content and difficulty level.
- The examples also provide model solutions, so that students are guided in how to construct proper responses questions.

The authors have pooled their wide experiences in the teaching of mathematics with their knowledge of content and pedagogy, to produce this guide.

Shereen A. Khan & Fayad W. Ali

TABLE OF CONTENTS

CHAPTER 1 – COMPUTATION

Fractions	1
<i>Representing fractions, equivalent fractions, mixed numbers and improper fractions, addition and subtraction of fractions, multiplication of fractions, division of fractions, mixed operations involving fractions</i>	
Decimals	4
<i>Expanded notation, expressing decimals as common fractions, expressing common fractions as decimals, mixed operations involving decimals</i>	
Approximations	5
<i>Decimal places, standard form (scientific notation), significant figures</i>	

CHAPTER 2 – NUMBER THEORY

Types of numbers	7
<i>Number sets, rational numbers, irrational numbers, real numbers, odd and even numbers, prime and composite numbers, multiples and factors, lowest common multiple (L.C.M.), highest common factor (H.C.F.), solving problems involving H.C.F and L.C.M., number sequences, properties of operations, identity elements and inverses, number bases</i>	

CHAPTER 3 – CONSUMER ARITHMETIC

Percentages	17
<i>Concept of percent, percent to fraction, percent to decimal, fraction to percent, calculating the percent of a quantity, expressing one quantity as a percent of another, calculating the whole given a part expressed as a percent, profit and loss, discount, sales tax, commission, formula for calculating compound interest, appreciation and depreciation, hire purchase</i>	
Ratios	21
<i>Definition and notation, sharing a quantity in a given ratio, finding the missing part of a ratio, unitary method, equivalent rates (ratios) method, currency conversion, overtime, utility bills</i>	

CHAPTER 4 – INTRODUCING ALGEBRA

Directed numbers	26
<i>Addition and subtraction, multiplication and division</i>	
Algebraic symbols	27
<i>Formulating algebraic expressions, simplifying algebraic expressions, addition and subtraction of algebraic terms, multiplication and division and algebraic terms, laws of indices. Simplifying algebraic terms with indices</i>	
Substitution	31
Binary operations	32

CHAPTER 5 – EQUATIONS AND INEQUALITIES

Solution of equations	33
<i>Additive inverse, multiplicative inverse, equations involving one inverse, equations involving two inverses, equations with unknown on both sides, equations involving brackets</i>	
Word problems	34
Algebraic fractions	34
<i>L.C.M. of algebraic terms, adding and subtracting algebraic fractions, solving equations involving fractions, solving equations involving brackets and fractions</i>	
Linear inequalities	37
<i>Solution of inequalities</i>	

CHAPTER 6 – ALGEBRAIC FACTORISATION AND FORMULAE

Algebraic factorisation	40
<i>Highest common factor in algebra, common factor method, common factors with grouping, quadratic expressions, difference of two squares</i>	
Formulae	43

CHAPTER 7 – SET THEORY

Basic concepts	46
<i>Defining and describing sets, naming sets, elements of a set, number of elements in a set, empty sets, finite and infinite sets, set builder notation, Universal set, subset, complement of a set, equivalent sets, equal sets, Venn diagrams, union of two sets, intersection of two sets, disjoint sets, number of elements in the union of two sets, solving problems on sets – Venn diagrams</i>	

CHAPTER 8 – ANGLES AND ANGLE PROPERTIES

Introducing angles	56
<i>Points, lines and rays, defining angles, classification of angles by size of turn, unit for measuring angles, using a protractor to measure angles, naming angles, properties of angles, angles formed by intersecting lines, angles formed by parallel lines</i>	

CHAPTER 9 – PLANE GEOMETRY

Plane figures	62
<i>Triangles, naming triangles, sum of the angles in a triangle, exterior angle of a triangle, general properties of triangles, types of triangles, congruence, similar figures, Pythagoras' theorem, quadrilaterals, polygons, regular and irregular polygons, sum of the interior angles of a polygon, sum of the exterior angles of a polygon</i>	

CHAPTER 10 – MEASUREMENT

Measurement attributes	74
<i>The metric system of measures, perimeter of plane shapes, area of plane shapes, area of the triangle, area of trapezium, estimating the area of shapes – curved edges, measurement of the circle,</i>	
Scale drawings	79
<i>Errors in a measurement, volume and surface area, nets of three dimensional shapes, surface area of solids, measurement of the sphere</i>	

CHAPTER 11 – GEOMETRIC CONSTRUCTIONS

Geometric instruments	87
<i>Constructing angles, drawing a line of a given length, constructing the perpendicular bisector of a straight line, constructing the perpendicular to a line from a point outside the line, constructing a line passing through a given point and parallel to a given line, constructing plane figures, constructing triangles, constructing a parallelogram</i>	

CHAPTER 12 – COORDINATE GEOMETRY

The Cartesian plane	95
<i>Length of a straight line, midpoint of a straight line, gradient of a straight line, positive and negative gradient</i>	
The equation of a straight line	100
<i>Horizontal and vertical lines, linear and non-linear equations, graphing linear equations, to determine the equation of a straight line given the value of m and c, to determine the equation of a straight line given the gradient and a point on the line, to determine the equation of a straight line given two points on the line, intercepts on the x and y axes</i>	

CHAPTER 13 – SIMULTANEOUS EQUATIONS

Solution of a linear equation	105
<i>Solution of linear equations in two variables, solving simultaneous equations – elimination, solving simultaneous equations – substitution, worded problems involving two variables</i>	

CHAPTER 14 – RELATIONS AND FUNCTIONS

Relations	112
<i>Representing relations – arrows diagrams and ordered pairs, types of relations, relations and functions, the inverse of a function, composite functions, the composition of inverse functions</i>	

CHAPTER 15 – STATISTICS AND PROBABILITY

Statistics	121
<i>Sample statistics and population parameters, types of variables, frequency distributions, displaying data</i>	
Statistical indices	128
<i>Measurement scales</i>	
Measures of central tendency	129
<i>The mean, the median, the mode, mean, median and mode from frequency tables</i>	
Measures of spread or dispersion	133
<i>The range, semi-interquartile range, median and quartiles from cumulative frequency curve, the standard deviation</i>	
Probability	138
<i>The probability scale, equiprobable or equally likely events, impossible and certain events, laws of probability</i>	

CHAPTER 16 – TRANSFORMATION GEOMETRY

Transformations	145
<i>Translation, translation on the Cartesian plane, properties of translations</i>	
Reflection	147
<i>Reflection on the Cartesian plane, properties of reflection</i>	
Rotation	151
<i>Rotation on the Cartesian plane, rotational symmetry, properties of rotation</i>	
Dilation or enlargement	154
<i>Enlargement and reduction, enlargement on the Cartesian plane, properties of enlargement</i>	

CHAPTER 17 – MATRICES AND MATRIX TRANSFORMATIONS

Matrices	160
<i>Rows and columns, order of a matrix, row matrices, column matrices, square matrices, the position of elements in a matrix, diagonal elements, diagonal matrices, zero matrix, operations on matrices, scalar multiplication, equal matrices, the identity or unit matrix, matrix multiplication, commutative property, identity elements and inverses – 2×2 matrices, inverse of a 2×2 matrix, property of the inverse, using matrices to solve a pair of simultaneous equations, using matrices to solve word problems</i>	
Matrix transformations	169
<i>Matrices for translation, deriving matrices for transformations, matrices for reflection, matrices for rotation, matrix for dilation (enlargement), matrices for combined transformations</i>	

CHAPTER 18 – VECTORS

Vector and scalar quantities.....174
Vector notation, parallel and equal vectors, adding parallel vectors, adding non-parallel vectors, vectors on the Cartesian plane, position vectors, unit vectors, the modulus of a vector, the direction of a vector, adding of vectors – unit vector notation, unit vectors that are not parallel to the x and y axes, proofs in vectors

CHAPTER 19 – INVESTIGATIONS

Patterns in Mathematics.....182
Continuing a pattern

CHAPTER 20 – GEOMETRY OF THE CIRCLE

Parts of the circle.....186
Diameter and chord, arcs, segments, sectors, the tangent of a circle
Circle theorems.....187

CHAPTER 21 – QUADRATIC FUNCTIONS

Defining quadratic functions.....193
The quadratic function, interpreting the quadratic graph
Solving quadratic equations.....195
Solving quadratic equations by graphical methods, solving quadratic equations by factorisation, solving quadratic equations using the quadratic formula, solving quadratic equations by completing the square, determining the maximum and minimum of a quadratic function, the points of intersection of a line and a curve, solving a pair of equations in two variables when one is linear and the other is not linear

CHAPTER 22 – VARIATION

Direct and inverse variation.....202
Direct variation, inverse variation

CHAPTER 23 – TRIGONOMETRY

Solution of right-angled triangles.....205
The standard notation for a triangle, right-angled triangles, solving triangles, Pythagoras’ theorem, introducing trigonometric ratios, trigonometric ratios
Solution of non-right-angled triangles.....208
Application of trigonometry.....211
Angles of elevation and depression, bearings
Solid trigonometry.....217

CHAPTER 24 – TRAVEL GRAPHS

Types of travel graphs.....219
The gradient of a straight line, gradient of a curve, travel graphs

CHAPTER 25 – LINEAR PROGRAMMING

Terminology.....227
Equalities and inequalities in one variable, linear inequations on the Cartesian plane, conventions in drawing lines, solution of a system of inequalities, converting worded problems into linear inequalities, linear programming