Dawood Public School
Course Outline 2019-20
Cambridge O Level Mathematics (Syllabus D) 4024
Grade X

Books:

- Seng, T.et al, 2006, New Syllabus Mathematics 1 (6th Edition), Singapore; Oxford University Press
- Seng, T.et al, 2006, New Syllabus Mathematics 2 (6th Edition), Singapore; Oxford University Press
- Seng, T.et al, 2008, New Syllabus Mathematics 3 (6th Edition), Singapore; Oxford University Press

Introduction:

This syllabus provides a comprehensive set of progressive learning objectives for mathematics. The objectives detail what the learner should know or what they should be able to do in each year of education. The learning objectives provide a structure for teaching and learning and a reference against which learners' ability and understanding can be checked.

This syllabus is designed to promote continuity, coherence and progression within the study of Mathematics. The syllabus builds on the knowledge, understanding and skills developed within the Key Stage of Study for Mathematics.

This syllabus has been designed to meet the requirements of the GCSE regulations.

In studying a course based on this specification, students should be encouraged to make appropriate use of Information and Communications Technology (ICT), for example, spreadsheets and databases.

It has been designed to be as free as possible from ethnic, gender, religious, political or other forms of bias.

Assessment:

All candidates take two papers: Paper 1 and Paper 2.

Each paper may contain questions on any part of the syllabus and questions will not necessarily be restricted to a single topic.

Paper 1: 2 hours
Paper 1 has approximately 25 short answer questions.
• Candidates should show all working in the spaces provided on the question paper. Omission of essential working will result in loss of marks. • **No calculators are allowed for this paper.** • **80** marks weighted at 50% of the total

Paper 2: 2 hours 30 minutes
Paper 2 has approximately 11 structured questions.
• Candidates should answer all questions. • **Electronic calculators may be used and candidates should have access to a calculator for this paper.** • Candidates should show all working in the spaces provided on the question paper. • Omission of essential working will result in loss of marks. • **100** marks weighted at 50% of the total

Assessment at a Glance

Additional materials for examinations:
For both Paper 1 and Paper 2, candidates should have these geometrical instruments:
- a pair of compasses
- a protractor
- a ruler

Tracing paper may be used as an additional material for both of the written papers.
For Paper 2, candidates should have an electronic calculator – see below for details.

Paper 1 – the use of all calculating aids is prohibited.
Paper 2 – all candidates should have a silent electronic calculator. A scientific calculator with trigonometric functions is strongly recommended.
• Unless stated otherwise within an individual question, three figure accuracy will be required. This means that four figure accuracy should be shown throughout the working, including cases where answers are used in subsequent parts of the question. Premature approximation will be penalised, where appropriate. • In Paper 2, candidates with suitable calculators are encouraged to use the value of π from their calculators. • The value of π will be given as 3.142 to 3 decimal places for use by other candidates. This value will be given on the front page of the question paper only.

Units
SI units will be used in questions involving mass and measures: the use of the centimetre will continue. Both the 12-hour clock and the 24-hour clock may be used for quoting times of the day. In the 24-hour clock, for example, 3.15 a.m. will be denoted by 03 15; 3.15 p.m. by 15 15, noon by 12 00 and midnight by 24 00.
Students will be expected to be familiar with the solidus notation for the expression of compound units, e.g. 5 cm/s for 5 centimetres per second, 13.6 g/cm3 for 13.6 grams per cubic centimetre.

Mathematical Instruments:
Apart from the usual mathematical instruments, candidates may use flexi curves in this examination.

Syllabus Aims and Assessment:
The syllabus demands understanding of basic mathematical concepts and their applications, together with an ability to show this by clear expression and careful reasoning.
In the examination, importance will be attached to skills in algebraic manipulation and to numerical accuracy in calculations.

Aims
The course should enable students to:
- develop their mathematical knowledge and oral, written and practical skills in a manner which encourages confidence;
- read mathematics, and write and talk about the subject in a variety of ways;
- develop a feel for number, carry out calculations and understand the significance of the results obtained;
- apply mathematics in everyday situations and develop an understanding of the part which mathematics plays in the world around them;
- solve problems, present the solutions clearly, check and interpret the results;
- develop an understanding of mathematical principles;
- recognize when and how a situation may be represented mathematically, identify and interpret relevant factors and, where necessary, select an appropriate mathematical method to solve problems;
- use mathematics as a means of communication with emphasis on the use of clear expression;
- develop the abilities to reason logically, to classify, to generalise and to prove;

Assessment objectives:
The two assessment objectives in Cambridge O Level Mathematics are:

AO1 Mathematical techniques
AO2 Applying mathematical techniques to solve problems

AO1: Mathematical techniques
Candidates should be able to:
- recognise the appropriate mathematical procedures for a given situation
- perform calculations by suitable methods, with and without a calculator
- understand systems of measurement in everyday use and make use of them in the solution of problems
- estimate, approximate and work to degrees of accuracy appropriate to the context and convert between equivalent numerical forms
- organise, interpret and present information accurately in written, tabular, graphical and diagrammatic forms
- use mathematical and other instruments to measure and to draw to an acceptable degree of accuracy
- recognise and use spatial relationships in two and three dimensions, particularly when solving problems
- interpret, transform and make appropriate use of mathematical statements expressed in words or symbols
- recall, apply and interpret mathematical knowledge in the context of everyday situations

AO2: Applying mathematical techniques to solve problems
In questions which are set in context and/or which require a sequence of steps to solve, candidates should be able to:
- recognise patterns and structures in a variety of situations and form and justify generalisations
- make logical deductions from given mathematical data
- respond to a problem relating to a relatively unstructured situation by translating it into an appropriately structured form
- analyse a problem, select a suitable strategy and apply an appropriate technique to obtain its solution
- apply combinations of mathematical skills and techniques in problem solving
- set out mathematical work, including the solution of problems, in a logical and clear form using appropriate symbols and terminology

Relationship between assessment objectives and components

The weightings allocated to each of the assessment objectives (AOs) are summarised below:
The table shows the assessment objectives as an approximate percentage of each component and as an approximate percentage of the overall Cambridge O Level Mathematics qualification.

Component	AO1 (%)	AO2 (%)	Weighting of component in overall qualification (%)
Paper 1	55–65	35–45	50
Paper 2	28–38	62–72	50
Weighting of AO in overall qualification	40–50	50–60	

Breadth of Study:

During the key stage, students should be taught the knowledge, skills and understanding through:

a. activities that ensure they become familiar with, and confident using, standard procedures for the range of calculations appropriate to this level of study;
b. solving familiar and unfamiliar problems in a range of numerical, algebraic and graphical contexts and in open-ended and closed form;
c. using standard notations for decimals, fractions, percentages, ratio and indices;
d. activities that show how algebra, as an extension of number using symbols, gives precise form to mathematical relationships and calculations;
e. activities in which they progress from using definitions and short chains of reasoning to understanding and formulating proofs in algebra and geometry;
f. a sequence of practical activities that address increasingly demanding statistical problems in which they draw inferences from data and consider the uses of statistics in society;

Mathematical Notations:
The list which follows summarize the notation used:

Mathematical Symbols

=	is equal to
≠	is not equal to
≡	is identical to or is congruent to
≈	is approximately equal to

Operations

a+b	a plus b
a-b	a minus b
a×b, ab, a.b	a multiplied by b
a÷b, a, a/bb	a divided by b

Functions

f	function f
f (x)	the value of the function f at x

sin, cos, tan, cosec, sec, cot} the circular functions

Resource List:

Supplementary Text Books:

- Sang, T.et al, 2008, New Syllabus Mathematics Work book 1, 2 & 3 (6th Edition), Singapore; Oxford University Press
- Bostock, L, S Chandler, A Shepherd, E Smith ST(P) Mathematics Books 1A to 5A (Stanley Thornes)

Book 1A	Book 2A	Book 3A	Book 4A
Book 1B	Book 2B	Book 3B	Book 4B

- Buckwell, Geoff Mastering Mathematics (Macmillan Education Ltd) 0 333 62049 6
- Collins, J, Warren, T and C J Cox, Steps in Understanding Mathematics (John Murray) Book 1 Book 2 and Book 3
- Cox, C J and D Bell Understanding Mathematics Books 1–5 (John Murray) Book 1 Book2 and Book 3
- MSM Mathematics Group MSM Mathematics Books 1, 2, 3Y, 4Y, 5Y (Nelson) Murray, Les Progress in Mathematics Books 1E to 5E (Stanley Thornes; Book 1E, Book 2E, Book 3E, Book 4E and Book 5E

Websites:

- www.nrich.com
- www.hoddereducation.com
- www.collinseducation.com
- www.pearsonschoolsandfecolleges.co.uk
- www.hoddereducation.com
- www.lettsandlonsdale.com
- www.counton.org
- www.math.com
- www.maths-help.co.uk
- www.mathsnet.net

Monthly Course Distribution

MONTH	CHAPTERS	DURATION
AUGUST	• Further Trigonometry • Graphical Solution of Functions	3 Weeks 1 Week
SEPTEMBER	• Graphical Solution of Functions • More on Probability • Linear Inequalities in two variables	1 Week 2 Weeks 1 Week
OCTOBER	• Graphs applied to Kinematics • Revision	2 Weeks
NOVEMBER	**Revision for Mid-Year Examination**	
DECEMBER	**Mid-Year Examination**	
JANUARY	• Geometric Properties of Circles	3 Weeks
FEBRUARY	• Past Papers • Revision Exercises Book 4 • Revision	
MARCH	**Mock Examination**	

SYLLABUS CONTENT

August

- Further Trigonometry and Three Dimensional Problems. Book 3, Chapter 8 and 9
- Graphs of Functions and Graphical Solution. Book 3, Chapter 7

Topic	Learning Objectives	Notes/Examples
Further Trigonometry Book 3 (6th edition) Chapter 11 Pages 297-334	• Solve trigonometrical problems in two dimensions including those involving angles of elevation and depression and bearings. • Apply Pythagoras' theorem and the sine, cosine and tangent ratios for acute angles to the calculation of a side or of an angle of a right-angled triangle. • Extend sine and cosine functions to angles between 90° and 180°; solve problems using the sine and cosine rules for any triangle and the formula1/2 *ab*sin *C* for the area of a triangle. • Solve simple trigonometrical problems in three dimensions. ➢ Calculations of the angle between two planes or of the angle between a straight line and plane will not be required. • Interpret and use three-figure bearings measured clockwise from the north (i.e. 000°–360°).	Measured clockwise from the north, i.e. 000°–360°. Example 1 Find the bearing of A from B if the bearing of B from A is 125°. Angles will be quoted in, and answers required in, degrees and decimals of a degree to one decimal place.
Graphical Solution of Equations Book 4 (6th edition) Chapter 1 (Ex 1b) Pages 17-38	• Demonstrate familiarity with cartesian coordinates in two dimensions. • Interpret and use the following graphs in practical situations: ➢ travel graphs ➢ conversion graphs • Draw graphs from given data. • Construct tables of values and draw graphs for functions of the form $y = ax$ n where $n = -2, -1, 0, 1, 2, 3$, and simple sums of not more than three of these and for functions of the form $y = ka^x$where a is a positive integer. • Interpret graphs of linear, quadratic, reciprocal and exponential functions. • Find the gradient of a straight line graph. • Solve equations approximately by graphical methods. • Estimate gradients of curves by drawing tangents.	

September

- More on Probability. Book 4, Chapter 3
- Linear Inequalities in two Variables. Book 4, Chapter 1

Topic	Learning Objectives	Notes/Examples
Probability of combined events Book 4 (7th edition) Chapter 3 Pages 51-72	• Calculate the probability of a single event as either a fraction or a decimal (not a ratio). • Calculate the probability of simple combined events using possibility diagrams and tree diagrams where appropriate. ➢ In possibility diagrams outcomes will be represented by points on a grid ➢ In tree diagrams outcomes will be written at the end of branches and probabilities by the side of the branches	Probabilities should not be given as ratios. Problems could be set involving extracting information from tables or graphs. Example 1 P(blue) = 0.8, find P(not blue) Example 2 Use results of experiments with a spinner to estimate the probability of a given outcome Example 3 Use probability to estimate from a population
Linear Inequalities in two Variables Book 4 (7th edition) Chapter 1 Pages 1-20	• Solve simple linear equations in one unknown. • Solve simple linear inequalities. • Order quantities by magnitude and demonstrate familiarity with the symbols=, ≠, >, <, ≤, ≥. • Form inequalities when shading is done, leaving the region shaded or unshaded when inequalities are given.	Linear programming problems are not included.

October

- Graphs Applied to Kinematics. Book 3, Chapter 7

Topic	Learning Objectives	Notes/Examples
Further Graphs and Graphs Applied to Kinematics Book 4 (6th edition) Chapter 2 Pages 39-72	• Apply the idea of rate of change to easy kinematics involving: ➢ distance-time graphs ➢ speed-time graphs ➢ acceleration ➢ retardation • Calculate distance travelled as area under a linear speed-time graph.	

November

Revision for Mid Year Examination

December

Mid Year Examination

January

- Geometrical Properties of Circle. Book 3, Chapter 13

Topic	Learning Objectives	Notes/Examples
Geometrical Properties of Circle Book 3 (6th edition) Chapter 13 Pages 363-392	• Calculate unknown angles and give simple explanations using the following geometrical properties: ➢ angles on a straight line ➢ angles at a point ➢ vertically opposite angles ➢ angles formed by parallel lines ➢ angle properties of triangles and quadrilaterals ➢ angle properties of polygons including angle sum ➢ angle in a semi-circle ➢ angle between tangent and radius of a circle ➢ angle at the centre of a circle is twice the angle at the circumference ➢ angles in the same segment are equal ➢ angles in opposite segments are supplementary • Use the following symmetry properties of circles: ➢ equal chords are equidistant from the centre ➢ the perpendicular bisector of a chord passes through thecentre ➢ tangents from an external point are equal in length	Candidates will be expected to use the correct geometrical terminology when giving reasons for answers. Angle properties of polygons includes angle sum.

February

Revision for Mock Examination

March

Mock Examination

Assessment and Home Work

Students will be assessed by taking test of each and every chapter. Home Work shall be given on a daily basis.