

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

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.
<ul style="list-style-type: none">• 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.
<ul style="list-style-type: none">• 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;
- recognise 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 examination tests the ability of candidates to:

- recall, apply and interpret mathematical knowledge in the context of everyday situations;
- set out mathematical work, including the solution of problems, in a logical and clear form using appropriate symbols and terminology;
- organise, interpret and present information accurately in written, tabular, graphical and diagrammatic forms;
- perform calculations by suitable methods;
- use an electronic 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;
- use mathematical and other instruments to measure and to draw to an acceptable degree of accuracy;
- recognise patterns and structures in a variety of situations and form generalisations;
- interpret, transform and make appropriate use of mathematical statements expressed in words or symbols;
- Interpret, use and present information in written, graphical, diagrammatic and tabular forms;

Breadth of Study:

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

- activities that ensure they become familiar with, and confident using, standard procedures for the range of calculations appropriate to this level of study;
- solving familiar and unfamiliar problems in a range of numerical, algebraic and graphical contexts and in open-ended and closed form;
- using standard notations for decimals, fractions, percentages, ratio and indices;
- activities that show how algebra, as an extension of number using symbols, gives precise form to mathematical relationships and calculations;
- activities in which they progress from using definitions and short chains of reasoning to understanding and formulating proofs in algebra and geometry;
- 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 |
| $a \times b$, ab , $a.b$ | a multiplied by b |
| $a \div b$, a/b | 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
- National Mathematics Project (NMP) Mathematics for Secondary Schools Red Track Books 1 to 5 (Longman Singapore Publishers Pte Ltd)

Book 1	Book 2	Book 3
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- Cox, C J and D Bell Understanding Mathematics Books 1–5 (John Murray) Book 1 Book2 and Book 3

Websites:

- www.nr丰富.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	<ul style="list-style-type: none"> • Trigonometric Ratios • Matrices 	2 Weeks 2 Weeks
SEPTEMBER	<ul style="list-style-type: none"> • Mensuration • Area and volume of similar figures 	3 Weeks 1 Week
OCTOBER	<ul style="list-style-type: none"> • Linear graphs and their applications • Coordinate Geometry 	2 Weeks 2 Weeks
NOVEMBER	Revision for Mid-Year Examination	
DECEMBER	Mid-Year Examination	
JANUARY	<ul style="list-style-type: none"> • Solution of Quadratic Equations • Graphical Solution of equations (Ex# 1a). 	3 Weeks 1 Week
FEBRUARY	<ul style="list-style-type: none"> • Functions • More on Probability (Ex# 6a, 6b, 6c) 	2 Weeks 2 Weeks
MARCH	<ul style="list-style-type: none"> • Continuation of Probability (Ex# 6b, 6c) • Frequency Distribution • Scatter Diagram 	1 Week 2 Weeks 1 Week
APRIL	Revision for Final Examination	
MAY	Final Examination	

SYLLABUS CONTENT

August

- Trigonometric Ratios. Book 3, Chapter 10
- Matrices Addendum. Chapter 5 and Chapter 11

Topic	Learning Objectives	Notes/Examples
Trigonometric Ratios Book 3 Chapter 10 Pages 261-288	<ul style="list-style-type: none"> • Define the three basic trigonometrical ratios in terms of the lengths of the hypotenuse side, opposite side and adjacent side with respect to an acute angle of a right-angled triangle. • Find the value of a trigonometrical ratio using a calculator. • Find the length of a side of a right-angled triangle using trigonometrical ratios. • Find the value of an angle of a right-angled triangle using trigonometrical ratios. • Solve problems involving angles and lengths of a right-angled triangle. • Solve practical everyday life problems using trigonometrically ratios. • Solve trigonometrical problems in two dimensions including those involving angles of elevation and depression. 	
Matrices Addendum Chapter 3	<ul style="list-style-type: none"> • Display information in the form of a matrix of any order. • Solve problems involving the calculation of the sum and product (where appropriate) of two matrices, and interpret the results. • Calculate the product of a scalar quantity and a matrix. • Use the algebra of 2×2 matrices including the zero and identity 2×2 matrices. • Calculate the determinant and inverse of a non- singular matrix. (\mathbf{A}^{-1} denotes the inverse of \mathbf{A}) 	

September

- Mensuration. Book 3, Chapter 12
- Area and volume of similar figures. Book3, Chapter 9

Topic	Learning Objectives	Notes/Examples
Mensuration Book 3 Chapter 12 Pages 335-358	<ul style="list-style-type: none"> • Find the area and circumference of: <ul style="list-style-type: none"> ➢ a circle ➢ a quadrant ➢ a semi-circle • Find the length and area of a sector. • Solve problems involving: <ul style="list-style-type: none"> ➢ the perimeter and area of a rectangle and triangle ➢ the circumference and area of a circle ➢ the area of a parallelogram and a trapezium ➢ the surface area and volume of a cuboid, cylinder, prism, sphere, pyramid and cone ➢ arc length and sector area as fractions of the circumference and area of a circle 	Formulae will be given for the surface area and volume of the sphere, pyramid and cone
Area and volume of similar figures Book 3 Chapter 9 Pages 239-256	<ul style="list-style-type: none"> • Solve problems using the relationship between areas of similar figures. • Solve problems using the relationship between volumes of similar solids. 	

October

- Linear graphs and their applications. Book 3, Chapter 7
- Coordinate Geometry. Book 3, Chapter 4

Topic	Learning Objectives	Notes/Examples
Linear graphs and their applications Book 3 Chapter 7 Pages 169-194	<ul style="list-style-type: none">• Interpret and use graphs in practical situations.• Draw graphs using data from practical situations.• Read Travel Graphs.• Locate the position of a coordinate point on a graph and find the length of a line segment.	
Coordinate Geometry Book 3 Chapter 4 Pages 75- 86	<ul style="list-style-type: none">• Find the gradient of a line joining two given points.• Find the length of a line segment given the coordinates of its end points• Intercept and finding the equation of a straight line graph in the form $y = mx + c$• Find the equation of a straight line, given its gradient makes one point on the line.• Find the gradients of parallel and perpendicular lines.• Solve geometry problems involving the use of coordinates.	<p>Example 1: Find the equation of a line parallel to $y=4x-1$ that passes through $(0,-3)$</p> <p>Example 2: Find the gradient of a line perpendicular to $y=3x+1$</p> <p>Example 3: Find the equation of a line perpendicular to one passing through the coordinates $(1, 3)$ and $(-2, -9)$</p>

November

Revision for Mid-Year Examination

December

Mid-Year Examination

January

- Solution of Quadratic Equations. Book 3, Chapter 1
- Graphical Solution of Equations. Book 4, Chapter 1

Topic	Learning Objectives	Notes/Examples
Solution of Quadratic Equations Book 3 Chapter 1 Pages 1-20	<ul style="list-style-type: none"> • Use letters to express generalised numbers and express basic arithmetic processes algebraically. • Substitute numbers for words and letters in formulae. • Transform simple and more complicated formulae. • Construct equations from given situations. • Solve quadratic equations by factorization: <ul style="list-style-type: none"> ➢ either by use of the formula ➢ or by completing the square 	Example 1: Factorize $9x^2 + 15xy$ Example 2: Expand $3x(2x - 4y), (x+4)(x-7)$
Graphical Solution of Equations Book 4 Chapter 1 Pages 1-36 Ex# 1a	<ul style="list-style-type: none"> • Construct a table of values of x and y for: <ul style="list-style-type: none"> ➢ a cubic function, $y = ax^3 + bx^2 + cx + d$ ➢ a reciprocal function, $y = x^{-1}$ and $y = x^{-2}$ ➢ an exponential function, $y = x^{a^2}$ ➢ and plot the graphs of these functions on graph paper • Find the value(s) of x for a given value of y and the value of y for a given value of x from the given graphs. • $y = x^{a^2}$ Sketch graphs of quadratic functions of the form $=, y = \pm(x-a)(x-b)$ and $y = \pm(x-p)^2+q$ where a, b, p and q are constants. • Draw the graphs of a quadratic function and use it to solve related quadratic equations graphically. • Draw the graphs of cubic and reciprocal. 	

February

- Functions. Book 3 Addendum
- More on Probability. Book 4, Chapter 6

Topic	Learning Objectives	Notes/Examples
Functions Book 3 Addendum	<ul style="list-style-type: none"> • Use function notation, e.g. $f(x) = 3x - 5$, $f: x \rightarrow 3x - 5$ to describe simple functions, and the notation $f^{-1}(x) = x + 5$ and $f^{-1}: x \rightarrow x + 5$, describe their inverses. • Demonstrate familiarity with Cartesian coordinates in two dimensions. 	
More on Probability Book 4 Chapter 6 Pages 207-247	<ul style="list-style-type: none"> • Define experiments and sample space. • Define the classical definition of probability of an event E occurring as $P(E) = \frac{\text{no. of favourable outcomes for an event}}{\text{no. of possible outcomes}}$ <ul style="list-style-type: none"> • Use data to calculate the probability of occurrence of simple events. • Define the experimental probability of the event E happening as: $P(E) = \frac{\text{no. of favourable outcomes for an event}}{\text{no. of possible outcomes}}$	<p>Probabilities should not be given as ratios.</p> <p>Problems could be set involving extracting information from tables or graphs.</p> <p>Example 1: $P(\text{blue}) = 0.8$, find $P(\text{not blue})$</p> <p>Example 2: Use results of experiments with a spinner to estimate the probability of a given outcome</p> <p>Example 3: Use probability to estimate from a population.</p> <ul style="list-style-type: none"> • 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

March

- More on Probability. Book 4, Chapter 6
- Frequency Distribution. Book 3, Addendum Chapter IV
- Scatter Diagrams

Topic	Learning Objectives	Notes/Examples
More on Probability Book 4 Chapter 6 Pages 207-247	<ul style="list-style-type: none">• Use date to calculate the probability of occurrence of simple events.• State that for any event E, $0 \leq P(E) \leq 1$<ul style="list-style-type: none">➢ $P(E) = 0$ if and only if the event E cannot possibly occur.➢ $P(E) = 1$ if and only if the event E will certainly occur.	
Frequency Distribution Book 3 Addendum Chap No. IV	<ul style="list-style-type: none">• Use frequency density to construct and read histograms with equal and unequal intervals.• Calculate the mean, median and mode for individual data and distinguish between the purposes for which they are used.	For unequal intervals on histograms, areas are proportional to frequencies and the vertical axis is labeled 'Frequency density'.
Scatter Diagram	<ul style="list-style-type: none">• Plot scatter graphs with confidence.• Comment on correlation.• Plot and use line of best fit.	

April

Revision for Final Examination

May

Final Examination

Assessment and Homework:

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