

Dawood Public School
Cambridge O Level Additional Mathematics (4037)
Course Outline 2019-2020

Grade X

Syllabus Book

Ho Soo Thong et. Al, 2002; *New Additional Mathematics (Revised 2002)*, Singapore, Paramount Publisher.

Syllabus Aims

The course should enable students to:

1. Consolidate and extend their elementary mathematical skills, and use these in the context of more advanced techniques.
2. Further develop their knowledge of mathematical concepts and principles, and use this Knowledge for problem solving.
3. Appreciate the inter connectedness of mathematical knowledge.
4. Acquire a suitable foundation in mathematics for further study in the subject or in mathematics related subjects.
5. Devise mathematical arguments and use present them precisely and logically.
6. Integrate information technology to enhance the mathematical experience.
7. Develop the confidence to apply their mathematical skills and knowledge in appropriate situations.
8. Develop creativity and perseverance in the approach to problem solving.
9. Derive enjoyment and satisfaction from engaging in mathematical pursuits, and gain an appreciation of beauty, power and usefulness of mathematics.
10. Provide foundation for AS Level/Higher study.

Assessment Objectives

The assessment objectives (AOs) are:

AO1 Demonstrate knowledge and understanding of mathematical techniques

Candidates should be able to:

- recall and use mathematical manipulative techniques
- interpret and use mathematical data, symbols and terminology
- comprehend numerical, algebraic and spatial concepts and relationships.

AO2 Apply mathematical techniques

Candidates should be able to:

- recognize the appropriate mathematical procedure for a given situation
- formulate problems into mathematical terms and select and apply appropriate techniques.

Detailed Syllabus

- Knowledge of the content of Cambridge O Level Mathematics (or an equivalent syllabus) is assumed.
- Cambridge O Level material which is not included in the subject content will not be tested directly but it may be required in response to questions on other topics.
- Proofs of results will not be required unless specifically mentioned in the syllabus.
- Candidates will be expected to be familiar with the scientific notation for the expression of compound units.

Examination Structure

| | | |
|----------------------|---------|----------|
| Mid-Year Examination | 2 hours | 80 marks |
| Final Examination | 2 hours | 80 marks |

- Paper will consist of approximately 10-12 questions of various lengths. There will be no choice of question in the paper.
- Candidates must show all necessary working; no marks will be given to unsupported answers from a calculator.

Structure of Assessments

- Miscellaneous Exercises at the end of each chapter in syllabus book will be given as assignment.
- Test will be taken after completion of chapter.

Electronic Calculators

The use of silent scientific electronic calculators is expected in O level Additional Mathematics (4037). Calculators with any of the following facilities are prohibited, unless specifically stated otherwise in the syllabus.

- Graphic display
- Data banks
- Dictionaries
- Language translators
- Retrieval or manipulation of text or formulae
- QWERTY keyboards
- Built-in symbolic algebraic manipulations
- Symbolic differentiation or integration
- Capability of remote communication with other machines.

MONTHLY COURSE DISTRIBUTION

| MONTHS | CHAPTERS | DURATION |
|-----------|---|-----------|
| AUGUST | <ul style="list-style-type: none"> • Trigonometry | 3 weeks |
| SEPTEMBER | <ul style="list-style-type: none"> • Trigonometric Identities | 2.5 weeks |
| | <ul style="list-style-type: none"> • Circular Measure | 1.5 week |
| OCTOBER | <ul style="list-style-type: none"> • Circular Measure (cont'd) | 2 weeks |
| | <ul style="list-style-type: none"> • Permutations and Combinations | 2 weeks |
| NOVEMBER | <ul style="list-style-type: none"> • Binomial Expansions | 2 weeks |
| | Revision for Mid-Year Examination | |
| DECEMBER | Mid-Year Examination | |
| JANUARY | <ul style="list-style-type: none"> • Equations, Inequalities and Graphs | 3 weeks |
| | <ul style="list-style-type: none"> • Differentiation and its Techniques | 1 week |
| FEBRUARY | <ul style="list-style-type: none"> • Differentiation and its Techniques (cont'd) | 2 weeks |
| | Revision for Final Examination | |
| MARCH | Final Examinations | |

First Term
August – November

| Syllabus Content | Learning Objectives |
|--|---|
| <p>Trigonometry Pages 237-277</p> | <ul style="list-style-type: none"> • Know the six trigonometric functions of angles of any magnitude: <ul style="list-style-type: none"> ➤ sine ➤ cosine ➤ tangent ➤ secant ➤ cosecant ➤ cotangent • Understand amplitude and periodicity and the relationship between graphs of e.g. $\sin x$ and $\sin 2x$. • Draw and use the graphs of $y = a \sin(bx) + c$, $y = a \cos(bx) + c$, $y = a \tan(bx) + c$, where a, b are positive integers and c is an integer. • Use the relationships $\frac{\sin A}{\cos A} = \tan A$, $\frac{\cos A}{\sin A} = \cot A$, $\sin^2 A + \cos^2 A = 1$. $\sec^2 A = 1 + \tan^2 A$, $\operatorname{cosec}^2 A = 1 + \cot^2 A$, and solve simple trigonometric equations involving the six trigonometric functions and the above relationships (not including general solution of trigonometric equations) • Prove simple trigonometric identities. |
| <p>Circular measure Pages 280-292</p> | <ul style="list-style-type: none"> • Solve problems involving the arc length and sector area of a circle, including knowledge and use of radian measure. |
| <p>Permutations and Combinations Pages 296-311</p> | <ul style="list-style-type: none"> • Recognize and distinguish between a permutation case and a combination case. • Know and use the notation $n!$, (with $0! = 1$), and the expressions for permutations and combinations of n items taken r at a time. • Answer simple problems on arrangement and selection. |
| <p>cases with repetition of objects, or with objects arranged in a circle or involving both permutations and combinations, are excluded</p> | |
| <p>Binomial Expansions Pages 314-324</p> | <ul style="list-style-type: none"> • Use the Binomial Theorem for expansion of $(a + b)^n$ for positive integral n. • use the general term $\binom{n}{r} a^{n-r} b^r$, $0 < r \leq n$ |
| <p>knowledge of the greatest term and properties of the coefficients is not required</p> | |
| <p>Useful Websites</p> <ul style="list-style-type: none"> • www.geogebraTube.org/student/m3342 • www.khanacademy.org/math/trigonometry/basic-trigonometry/basic_trig_ratios/v/example--the-six-trig-ratios • www.mathstat.strath.ac.uk/basicmaths/321_trigratiosforanglesofanysizeorsign.html • www.haesemathematics.com.au/samples/ibmyp5plus-2_18.pdf | |

- www.slideshare.net/roszelan/add-mathf4-circular-measure-83
- www.printableworksheets.rokkada.com/?dq=CircularMeasure
- <http://betterexplained.com/articles/easy-permutations-and-combinations/>
- <http://khanacademy.org/math/probability/probability-and-combinatorics-topic/>
- <http://mrnewbatt.wikispaces.com/file/view/MDM4U+U1L4+worksheet.pdf>
- www.purplemath.com/modules/binomial.htm
- www.khanacademy.org/math/trigonometry/polynomial_and-rational/binomial-theorem

November

Revision for Mid-Year Examination

December

Mid-Year Examination

Final Term

January – Feb/March

| Syllabus Content | Learning Objectives |
|--|--|
| <p>Equations, Inequalities and Graphs (Hand out)</p> | <ul style="list-style-type: none"> • Solve graphically or algebraically equations of the type: <ul style="list-style-type: none"> ➤ $ax + b = c$ ($c \geq 0$) ➤ $ax + b = cx + d$ • Solve graphically or algebraically inequalities of the type: <ul style="list-style-type: none"> ➤ $ax + b > c$ ($c \geq 0$) ➤ $ax + b \leq c$ ($c > 0$) ➤ $ax + b \leq (cx + d)$ • Use substitution to form and solve a quadratic equation in order to solve a related equation. • Sketch the graphs of cubic polynomials and their moduli, when given in factorised form: $y = k(x - a)(x - b)(x - c)$. • Solve cubic inequalities in the form $k(x - a)(x - b)(x - c) \leq d$ graphically. |
| <p>Differentiation and its techniques Pages 330-353</p> | <ul style="list-style-type: none"> • Understand the idea of a derived function. • Use the notations $f'(x)$, $\frac{dy}{dx}$. • Differentiate products and quotients of functions. • Apply differentiation to: <ul style="list-style-type: none"> ➤ gradients ➤ tangents ➤ normal |
| <p>Useful Websites</p> <ul style="list-style-type: none"> • www.s-cool.co.uk/a-level/maths/differentiation/revise-it/the-product-rule-and-the-quotient-rule | |

- www.khanacademy.org/math/calculus
- <https://www.tes.co.uk/teaching-resource/a-level-maths-c2-modulus-function-worksheets-6146818>

Feb/March

Revision for Final Examination

March

Final Examination

ADDITIONAL SYLLABUS SUPPORT

Command words

This glossary should help candidates understand what is expected when responding to questions in the assessment. The number of marks allocated for any part of a question is a guide to the depth required for the answer.

| Command Word | What it means |
|--------------------|--|
| Calculate | work out from given facts, figures or information, generally using a calculator |
| Describe | state the points of a topic/give characteristics and main features |
| Determine | establish with certainty |
| Explain | set out purposes or reasons make the relationships between things evident provide why and/or how and support with relevant evidence |
| Give | produce an answer from a given source or recall/memory |
| Plot | mark point(s) on a graph |
| Show (that) | provide structured evidence that leads to a given result |
| Sketch | make a simple freehand drawing showing the key features |
| State | express in clear terms |
| Verify | confirm a given statement/result is true |
| Work out | calculate from given facts, figures or information with or without the use of a calculator |
| Write | give an answer in a specific form |
| Write down | give an answer without significant working |

Reference Booklist for O Level Additional Mathematics 4037

Backhouse, J K and Houldsworth S P T Essential Pure Mathematics: A First Course
(Longman, 1991) 0582066581

Backhouse, J K and Houldsworth S P T Pure Mathematics: A First Course
(Longman, 1985) 0582353866

Bostock L and Chandler S Mathematics: Core Maths for Advanced Level
(Nelson Thornes, 2000) 0748755098

Bostock L and Chandler S Mathematics: Pure Mathematics 1
(Nelson Thornes, 1978) 0859500926

Emanuel, R Pure Mathematics 1
(Longman, 2001) 0582405505

Harwood Clarke, L Additional Pure Mathematics
(Heinemann, 1980) 0435511874

Talbert, J F Additional Maths Pure and Applied
(Longman, 1995) 0582265118