Dawood public school
Course Outline 2016-17
Class X (S, C)

Additional Mathematics (4037)

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 interconnectedness 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. derive enjoyment and satisfaction from engaging in mathematical pursuits, and gain an appreciation of beauty, power and usefulness of mathematics.

Assessment Objectives

The examination will test the ability of candidates to:

1. recall and use manipulative technique;
2. interpret and use mathematical data, symbols and terminology;
3. comprehend numerical, algebraic and spatial concepts and relationships;
4. recognize the appropriate mathematical procedure for a given situation;
5. formulate problems into mathematical terms and select and apply appropriate techniques of solution.

Examination Structure

There will be one paper, of 2 hours and 30 minutes and of 100 marks, in each of midterm and Final term Examinations.

Paper will consist of approximately 10-12 questions of various lengths. There will be no choice of question in the paper.

Electronic Calculators

The use of silent 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
- QWETY keyboards
- Built-in symbolic algebraic manipulations
- Symbolic differentiation or integration
- Capability of remote communication with other machines.

Mathematical Instruments

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

Detailed Syllabus

Knowledge of the content of Ordinary level Syllabus D is assumed. Ordinary level material which is not repeated in the syllabus below will not be tested directly but it may be required in response to questions on other topics. Proof of results will not be required unless specifically mentioned in the syllabus.

Prescribed Book

Ho Soo Thong et. Al 2002; New Additional Mathematic (Revised 2002) Singapore, Paramount Publisher
<table>
<thead>
<tr>
<th>Syllabus contents</th>
<th>Pg no.</th>
<th>Month</th>
<th>Curriculum objectives</th>
<th>Useful Websites</th>
<th>Assessment</th>
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</table>
| 1. Trigonometry  | 237-277| Aug/Sep | – know the six trigonometric functions of angles of any magnitude (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  
$$\frac{\sin A}{\cos A} = \tan A,$$  
$$\frac{\cos A}{\sin A} = \cot A,$$  
$$\sin^2 A + \cos^2 A = 1,$$  
$$\sec^2 A = 1 + \tan^2 A,$$  
$$\cosec^2 A = 1 + \cot^2 A,$$  
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. | 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_trigratiosforanglesofanysizesorigns.html  
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<tbody>
<tr>
<td>2. Circular measure</td>
<td>280-292</td>
<td>Sep/Oct</td>
<td>- solve problems involving the arc length and sector area of a circle, including knowledge and use of radian measure.</td>
<td><a href="http://www.slideshare.net/roszelan/add-mathf4-circular-measure-83">www.slideshare.net/roszelan/add-mathf4-circular-measure-83</a>&lt;br&gt;www.printableworksheets.rokkada.com/?dq=CircularMeasure</td>
<td>• Test will be taken.</td>
</tr>
</tbody>
</table>
| 3. Permutations and       | 296-311 | Oct    | - 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 (cases with repetition of objects, or with objects arranged in a circle or involving both permutations and combinations, are excluded | http://betterexplained.com/articles/easy-permutations-and-combinations/<br>http://khanacademy.org/math/probability/probability-and-combinatorics-topic/<br>http://mrnewbatt.wikispaces.com/file/view/MDM4U+U1L4+worksheet.pdf | • Test will be taken.  
• Assignment will be given.                      |
| combinations              |         |        |                                                                                                                                                                                                                      |                                                                                                     |                                                 |
| 4. Binomial expansions    | 314-324 | Nov    | - use the Binomial Theorem for expansion of \((a + b)^n\) for positive integral \(n\);  
- use the general term \(\binom{n}{r} a^{n-r} b^r\), \(0 < r \leq n\) (knowledge of the greatest term and properties of the coefficients is not required). | www.purplemath.com/modules/binomial.htm<br>www.khanacademy.org/math/trigonometry/polynomial_and-rational/binomial-theorem | • Assignment will be given.                      |
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<tr>
<td>Differentiation and its techniques</td>
<td>330-353</td>
<td>Dec</td>
<td>-understand the idea of a derived function;</td>
<td><a href="http://www.mathsisfun.com/calculus/derivatives-rules.html">www.mathsisfun.com/calculus/derivatives-rules.html</a></td>
<td>Mid term Examinations</td>
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<td>-use the notations $f'(x)$, $\frac{dy}{dx}$</td>
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<td></td>
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<td>-differentiate products and quotients of functions;</td>
<td><a href="http://www.s-cool.co.uk/a-level/maths/differentiation/revise-it/the-product-rule-and-the-quotient-rule">www.s-cool.co.uk/a-level/maths/differentiation/revise-it/the-product-rule-and-the-quotient-rule</a></td>
<td>Assignment will be given.</td>
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<tr>
<td></td>
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<td>-apply differentiation to gradients, tangents and normals.</td>
<td><a href="http://www.khanacademy.org/math/calculus">www.khanacademy.org/math/calculus</a></td>
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<td>Jan</td>
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<td>Feb</td>
<td>-apply differentiation to connected rates of change and small increments.</td>
<td><a href="http://www.s-cool.co.uk/a-level/maths/differentiation/">www.s-cool.co.uk/a-level/maths/differentiation/</a></td>
<td>Assignment will be given.</td>
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<td>Mar</td>
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<td>Final Examinations</td>
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Mathematical Notation

The list which follows summarizes the notation used in the CIE’s Mathematics examinations.

1. Miscellaneous Symbols

- \( = \) is equal to
- \( \neq \) is not equal to
- \( \equiv \) is identical to or is congruent to
- \( \approx \) is approximately equal to
- \( \cong \) is isomorphic to
- \( \propto \) is proportional to
- \( < \) is less than
- \( > \) is greater than
- \( \leq \) is less than or equals to
- \( \geq \) is greater than or equals to
- \( \infty \) infinity

2. Operations

- \( a + b \) a plus b
- \( a - b \) a minus b
- \( a \times b, ab, a \cdot b \) a multiplied by b
- \( a \div b, a/b \) a divided by b
- \( a : b \) the ratio of a to b
- \( \sqrt{a} \) the positive square root of the real number a
- \( |a| \) the modulus of the real number a
- \( n! \) n factorial for \( n \in \mathbb{N} \) (0! = 1)
- \( \binom{n}{r} \) the binomial coefficient \( \frac{n!}{r!(n-r)!} \) for \( n, r \in \mathbb{N}, 0 \leq r \leq n \)

3. Functions

- \( f \) function f
- \( f(x) \) the value of the function f at x
- \( f : A \rightarrow B \) f is a function under which each element of set A has an image in set B
- \( f : x \mapsto y \) the function f maps the element x to the element y
- \( f^{-1} \) the inverse of the function f
- \( g \circ f, gf \) the composite function of f and g which is defined by
- \( (g \circ f)(x) = g(f(x)) \)
- \( \frac{dy}{dx} \) the derivative of y with respect to x

4. Exponential and Logarithmic Functions

- \( e \) base of natural logarithms
- \( e^x \) exponential function of x
- \( \log_a x \) logarithm to the base a of x
- \( \ln x \) natural logarithm of x
- \( \lg x \) logarithm of x to base 10
5. Matrices

- $M$ a matrix $M$
- $M^{-1}$ the inverse of the square matrix $M$
- $M^T$ the transpose of the matrix $M$
- $\det M$ the determinant of the square matrix $M$

Reference Booklist

O Level Additional mathematics 4037

Suggested Books

Backhouse, J K and Houldsworth S P T Pure Mathematics: A First Course (Longman, 1985) 0582353866
Bostock L and Chandler S Mathematics: Core Math for Advanced Level (Nelson Thornes, 2000) 0748755098
Emanuel, R Pure Mathematics 1 (Longman, 2001) 0582405505
Harwood Clarke, L Additional Pure Mathematics (Heinemann, 1980) 0435511874
Talbert, J F Additional Math Pure and Applied (Longman, 1995) 0582265118