MATHEMATICS

INTRODUCTION

The public assessment of this subject is based on the Curriculum and Assessment Guide (Secondary 4—6) Mathematics jointly prepared by the Curriculum Development Council and the Hong Kong Examinations and Assessment Authority. Candidates have to refer to the Guide for the knowledge, understanding, skills and attitudes they are required to demonstrate in the assessment.

The curriculum comprises a Compulsory Part and an Extended Part. Candidates taking the HKDSE Mathematics Examination may choose to take either the Compulsory Part only or the Compulsory Part plus one of the two modules of the Extended Part.

ASSESSMENT OBJECTIVES

The assessment objectives of the Compulsory Part are to test the candidates’:

1. knowledge of the mathematical facts, concepts, skills and principles presented in the Curriculum and Assessment Guide;
2. familiarity with and use of mathematical symbols;
3. ability to use appropriate mathematical techniques for solving a variety of problems; and
4. ability to communicate ideas and to present arguments mathematically.

The assessment objectives of Module 1 (Calculus and Statistics) of the Extended Part are to test the candidates’:

1. understanding of the concepts, principles and methods in Calculus and Statistics presented in the Curriculum and Assessment Guide; and
2. ability to apply appropriate techniques in Calculus and Statistics for solving a variety of problems.

The assessment objectives of Module 2 (Algebra and Calculus) of the Extended Part are to test the candidates’:

1. understanding of the concepts, principles and methods in Algebra and Calculus presented in the Curriculum and Assessment Guide; and
2. ability to apply appropriate techniques in Algebra and Calculus for solving a variety of problems.

MODE OF ASSESSMENT

The mode of public assessment in the Compulsory Part is shown below:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weighting</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Examination</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paper 1</td>
<td>Conventional questions</td>
<td>65%</td>
</tr>
<tr>
<td>Paper 2</td>
<td>Multiple-choice questions</td>
<td>35%</td>
</tr>
</tbody>
</table>

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The mode of public assessment in Module 1 (Calculus and Statistics) is shown below:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weighting</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Examination</td>
<td>Conventional questions</td>
<td>100%</td>
</tr>
</tbody>
</table>

The mode of public assessment in Module 2 (Algebra and Calculus) is shown below:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weighting</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Examination</td>
<td>Conventional questions</td>
<td>100%</td>
</tr>
</tbody>
</table>

**PUBLIC EXAMINATION**

**Compulsory Part**

The examination will consist of two papers:

**Paper 1 (2\(\frac{1}{4}\) hours) (65%)**

This paper will consist of two sections in which all the questions are to be attempted. Section A will consist of questions on the Foundation Topics of the Compulsory Part together with the Foundation Part of the Secondary 1-3 Mathematics Curriculum. Section B will consist of questions on the Compulsory Part together with the Foundation Part and the Non-Foundation Part of the Secondary 1-3 Mathematics Curriculum. Section A will further be divided into two parts. Section A(1) (35 marks) will consist of 8 to 11 elementary questions. Section A(2) (35 marks) will consist of 4 to 7 harder questions. Section B (35 marks) will consist of 4 to 7 questions.

**Paper 2 (1\(\frac{1}{4}\) hours) (35%)**

This paper will consist of two sections in which all the questions are to be attempted. Section A (\(\frac{2}{3}\) of the paper mark) will consist of questions on the Foundation Topics of the Compulsory Part together with the Foundation Part of the Secondary 1-3 Mathematics Curriculum. Section B (\(\frac{1}{3}\) of the paper mark) will consist of questions on the Compulsory Part together with the Foundation Part and the Non-Foundation Part of the Secondary 1-3 Mathematics Curriculum. All questions in the paper will be multiple-choice questions.

**Notes:**
1. Candidates are not expected to perform lengthy manipulations.
2. In calculations candidates are expected to give answers to appropriate degrees of accuracy.
3. Electronic calculators and mathematical drawing instruments may be used in the examination.
4. SI and metric units will be used in the examination wherever appropriate.
5. Candidates should note the common notations to be used in mathematics examination papers.

**Module 1 (Calculus and Statistics)**

The examination will consist of one paper of 2\(\frac{1}{2}\) hours’ duration. The paper will be divided into two sections in which all the questions are to be attempted. Section A (50 marks) will consist of 8-12 short questions. Section B (50 marks) will consist of 3-5 long questions.
Notes:  1. Knowledge of the subject matter in the Compulsory Part together with the Foundation Part and the Non-Foundation Part of Secondary 1-3 Mathematics Curriculum is assumed.
   2. In calculations candidates are expected to give answers to appropriate degrees of accuracy.
   3. Electronic calculators and mathematical drawing instruments may be used in the examination.
   4. Statistical tables will be printed in the question paper where appropriate.
   5. SI and metric units will be used in the examination wherever appropriate.
   6. Candidates should note the common notations to be used in mathematics examination papers.

Module 2 (Algebra and Calculus)

The examination will consist of one paper of \( \frac{3}{2} \) hours’ duration. The paper will be divided into two sections in which all the questions are to be attempted. Section A (50 marks) will consist of 8-12 short questions. Section B (50 marks) will consist of 3-5 long questions.

Notes:  1. Knowledge of the subject matter in the Compulsory Part together with the Foundation Part and the Non-Foundation Part of Secondary 1-3 Mathematics Curriculum is assumed.
   2. Electronic calculators and mathematical drawing instruments may be used in the examination.
   3. Trigonometric formulas will be provided for candidates’ reference in the question paper.
   4. SI and metric units will be used in the examination wherever appropriate.
   5. Candidates should note the common notations to be used in mathematics examination papers.
SCHOOL-BASED ASSESSMENT (SBA)

In the Compulsory Part, students will be required to complete two assessment tasks: one in Secondary 5 and the other in Secondary 6. These tasks will be more extended in nature than the questions in traditional tests and examinations, and should provide opportunities for students to demonstrate their competence in the following skills and abilities, which are embodied in the curriculum objectives:

1. applying mathematical knowledge to solve problems;
2. reasoning mathematically;
3. handling data and generating information; and
4. using mathematical language to communicate ideas.

The assessment tasks can be in the form of written assignments or even practical tasks, and will be conducted mainly in school under teacher supervision. A wide variety of types of tasks can be adopted for assessment purposes, including, for instance, mathematical investigations and solving more sophisticated problems in real-life situations or with mathematics itself.

It is proposed that the required assessment tasks are:

1. one task on mathematical investigation or problem-solving; and
2. one task on data handling.

The detailed requirements, regulations, assessment criteria and guidelines are provided in the SBA Handbook for HKDSE Mathematics (Trial Version) published by the Hong Kong Examinations and Assessment Authority.

There is no time-line for the implementation of SBA in Mathematics and a review will be conducted in the school year 2012/13. During the transition years, the curriculum for Mathematics will remain intact and schools will be expected to conduct the SBA activities as integral parts of learning and teaching and internal assessment as recommended in the Curriculum and Assessment Guide.
The Common Notations to be Used in the Hong Kong Diploma of Secondary Education Mathematics Examination Papers (An asterisk * below indicates that the symbol could be used without further definition for the papers concerned.)

<table>
<thead>
<tr>
<th>Compulsory Part</th>
<th>Module 1</th>
<th>Module 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>*</td>
<td>*</td>
<td>$a \in A$</td>
</tr>
<tr>
<td>*</td>
<td>*</td>
<td>$n(A)$</td>
</tr>
<tr>
<td>*</td>
<td>*</td>
<td>$\emptyset$</td>
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<tr>
<td>*</td>
<td>*</td>
<td>$\mathbb{N}$</td>
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<tr>
<td>*</td>
<td>*</td>
<td>$\mathbb{Z}$</td>
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<td>*</td>
<td>$\mathbb{R}$</td>
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<tr>
<td>*</td>
<td></td>
<td>$\mathbb{R}^2$</td>
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<tr>
<td>*</td>
<td></td>
<td>$\mathbb{R}^3$</td>
</tr>
<tr>
<td>*</td>
<td>*</td>
<td>$A \subseteq B$</td>
</tr>
<tr>
<td>*</td>
<td>*</td>
<td>$\cup$</td>
</tr>
<tr>
<td>*</td>
<td>*</td>
<td>$\cap$</td>
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<tr>
<td>*</td>
<td>*</td>
<td>$A'$</td>
</tr>
<tr>
<td>*</td>
<td>*</td>
<td>$B \setminus A$</td>
</tr>
<tr>
<td>*</td>
<td></td>
<td>$[a, b]$</td>
</tr>
<tr>
<td>*</td>
<td></td>
<td>$(a, b)$</td>
</tr>
<tr>
<td>*</td>
<td></td>
<td>$f : A \rightarrow B$</td>
</tr>
<tr>
<td>*</td>
<td></td>
<td>$\sum_{k=1}^{n} a_k$</td>
</tr>
<tr>
<td>*</td>
<td></td>
<td>$\prod_{k=1}^{n} a_k$</td>
</tr>
<tr>
<td>*</td>
<td></td>
<td>$P_r^n$</td>
</tr>
<tr>
<td>*</td>
<td></td>
<td>$C_r^n$</td>
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<tr>
<td>*</td>
<td></td>
<td>$e^x$, $\exp(x)$</td>
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<tr>
<td>*</td>
<td></td>
<td>$\ln x$</td>
</tr>
<tr>
<td>*</td>
<td></td>
<td>H.C.F.</td>
</tr>
<tr>
<td>*</td>
<td></td>
<td>L.C.M.</td>
</tr>
</tbody>
</table>

$a$ is an element of the set $A$

the number of elements in a finite set $A$

the empty set

the set of natural numbers $\{1, 2, \ldots \}$

the set of integers

the set of rational numbers

the set of real numbers

the 2-dimensional rectangular coordinate system

the 3-dimensional rectangular coordinate system

$A$ is a subset of $B$

union

intersection

the complement of the set $A$ in a given universal set

the complement of the set $A$ in $B$

the closed interval $\{x \in \mathbb{R} : a \leq x \leq b\}$

the open interval $\{x \in \mathbb{R} : a < x < b\}$

$f$ is a function from the domain $A$ to the range $B$

the sum of $n$ numbers $a_1, a_2, \ldots, a_n$

the product of $n$ numbers $a_1, a_2, \ldots, a_n$

the number of permutations of $r$ objects taken from $n$ objects

the binomial coefficient, the number of combinations of $r$ objects taken from $n$ objects

the exponential function with base $e$

the logarithmic function to base $e$

the highest common factor

the least common multiple
Compulsory Part

Module 1

* $M^{-1}$ the inverse of the matrix $M$
* $M^T$ the transpose of the matrix $M$
* $\det M, |M|$ the determinant of the square matrix $M$
* $\overrightarrow{AB}$ the vector represented in magnitude and direction by the directed line segment $AB$
* $\mathbf{a}$ the vector $\mathbf{a}$
* $\hat{\mathbf{a}}$ a unit vector in the direction of $\mathbf{a}$
* $\mathbf{i}, \mathbf{j}, \mathbf{k}$ unit vectors in the directions of the Cartesian coordinate axes
* $|\mathbf{a}|$ the magnitude of $\mathbf{a}$
* $\mathbf{a} \cdot \mathbf{b}$ the scalar product of $\mathbf{a}$ and $\mathbf{b}$
* $\mathbf{a} \times \mathbf{b}$ the vector product of $\mathbf{a}$ and $\mathbf{b}$
* $f'(x), f''(x)$ the first derivative and the second derivative of $f(x)$ with respect to $x$
* $\dot{x}, \ddot{x}$ the first derivative and the second derivative of $x$ with respect to $t$
* $P(A)$ probability of the event $A$
* $P(A|B)$ probability of the event $A$ conditional on the event $B$
* $E(X)$ expectation of the random variable $X$
* $\text{Var}(X)$ variance of the random variable $X$
* $\mu$ population mean
* $\sigma^2$ population variance
* $\bar{x}$ sample mean
* $s^2$ sample variance, $s^2 = \frac{1}{n-1} \sum (x - \bar{x})^2$
* $\text{B}(n, p)$ binomial distribution with parameters $n$ and $p$
* $N(\mu, \sigma^2)$ normal distribution with mean $\mu$ and variance $\sigma^2$
* $\text{Po}(\lambda)$ Poisson distribution with mean $\lambda$