

# 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:

Component		Weighting	Duration
Public Examination	Paper 1      Conventional questions	65%	2¼ hours
	Paper 2      Multiple-choice questions	35%	1¼ hours

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

Component		Weighting	Duration
Public Examination	Conventional questions	100%	2½ hours

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

Component		Weighting	Duration
Public Examination	Conventional questions	100%	2½ hours

## PUBLIC EXAMINATION

### Compulsory Part

The examination will consist of two papers:

#### **Paper 1 (2¼ 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 Topics of the Secondary 1-3 Mathematics Curriculum. Section B will consist of questions on the Compulsory Part together with the Foundation Topics and the Non-foundation Topics 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 Topics 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 Topics and the Non-foundation Topics 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 elementary 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 Topics and the Non-foundation Topics 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  $2\frac{1}{2}$  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 elementary 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 Topics and the Non-foundation Topics 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.

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.)

Compulsory Part   Module 1   Module 2

*	*	*	$a \in A$	$a$ is an element of the set $A$
*	*	*	$n(A)$	the number of elements in a finite set $A$
*	*	*	$\phi$	the empty set
	*	*	$\mathbf{N}$	the set of natural numbers $\{1, 2, \dots\}$
	*	*	$\mathbf{Z}$	the set of integers
	*	*	$\mathbf{Q}$	the set of rational numbers
	*	*	$\mathbf{R}$	the set of real numbers
		*	$\mathbf{R}^2$	the 2-dimensional rectangular coordinate system
		*	$\mathbf{R}^3$	the 3-dimensional rectangular coordinate system
*	*	*	$A \subset B$	$A$ is a subset of $B$
*	*	*	$\cup$	union
*	*	*	$\cap$	intersection
*	*	*	$A'$	the complement of the set $A$ in a given universal set
*	*	*	$B \setminus A$	the complement of the set $A$ in $B$
	*	*	$[a, b]$	the closed interval $\{x \in \mathbf{R} : a \leq x \leq b\}$
	*	*	$(a, b)$	the open interval $\{x \in \mathbf{R} : a < x < b\}$
	*	*	$f : A \rightarrow B$	$f$ is a function from the domain $A$ to the range $B$
	*	*	$\sum_{k=1}^n a_k$	the sum of $n$ numbers $a_1, a_2, \dots, a_n$
	*	*	$\prod_{k=1}^n a_k$	the product of $n$ numbers $a_1, a_2, \dots, a_n$
*	*	*	$P_r^n$	the number of permutations of $r$ objects taken from $n$ objects
*	*	*	$C_r^n$	the binomial coefficient, the number of combinations of $r$ objects taken from $n$ objects
	*	*	$e^x, \exp(x)$	the exponential function with base $e$
	*	*	$\ln x$	the logarithmic function to base $e$
*	*	*	H.C.F.	the highest common factor
*	*	*	L.C.M.	the least common multiple

Compulsory Part Module 1 Module 2

	*	$M^{-1}$	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, $s^2 = \frac{1}{n-1} \sum (x - \bar{x})^2$
	*	$B(n, p)$	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 $\lambda$