



2025年澳門四高校聯合入學考試 (語言科及數學科)

**2025 Joint Admission Examination for
Macao Four Higher Education Institutions (Languages and Mathematics)**

考試大綱 Syllabus

數學正卷 Mathematics Standard Paper

1. _____ :
(Venn)

2. _____ :

3. _____ :

4. _____ :
(H.C.F.) (L.C.M.) ()

5. _____ :

6. _____ :

12. _____ :

(A) _____ :

(_____)

(B) _____ :

13. _____ :

$a \cos$ $b \sin$ _____ ;

14. _____ :

(A)

(B)

15. _____ :

16. _____ :

Examination Duration: 2 hours

1. Fundamental Concepts: real number system; concept of sets and subsets; set operations, union, intersection and complement. Venn diagrams. Mathematical induction.
2. Percentage: its meaning and applications to daily life problems. Profit and loss, discount, simple and compound interest, growth and depreciation.
3. Variations: ratio, proportion; direct, inverse, joint and partial variations.
4. Polynomial and Rational Fraction: manipulation of polynomials, long division and synthetic division, factorization of polynomials: the factor theorem and the remainder theorem; highest common factor (H.C.F.) and least common multiple (L.C.M.); formula for the difference of two squares, formulae for the sum of two cubes and the difference of two cubes; partial fractions.
5. Quadratic Equations and Quadratic Functions: the relation between the solution of a quadratic equation in one variable and its discriminant, the quadratic formula; relations between roots and coefficients; the extreme value of a quadratic function applying the method of completing the square.
6. Indices and Surds: laws of indices; simplification and operations of surds.
7. Algebraic Inequalities: manipulation of algebraic inequalities and absolute inequalities, and their solution sets; solving system of linear inequalities in one or two variables, including graphical solutions; applications to linear programming problems.
8. Logarithmic and Exponential Functions: properties of logarithms, change of bases of logarithms; natural exponential functions; applications in growth and decay processes (including continuous compounding of interest); solving equations of indices and equations of logarithms.
9. Nonlinear equations

12. Rectilinear Figures and Circles:

- (A) Rectilinear Figures: the sum of interior angles of triangles and convex polygons; properties theorem; properties of squares, rectangles, rhombuses, and parallelograms; mid-point theorem and intercept theorem.
- (B) Circles: properties of circles, arcs and chords; angles of chord, angles of circumference, cyclic quadrilaterals, circumcircles; arc lengths and area of sectors.

13. Trigonometry: relation between degree measure and radian measure; trigonometric functions and trigonometric identities, compound angle formula and half-angle formula; the expression $a \cos \theta + b \sin \theta$ and the auxiliary angle formula; area of a triangle; the Sine Law, the Cosine Law; the definitions of inverse trigonometric functions; solving trigonometric equations in one unknown.

14. Analytic Geometry:

- (A) Rectangular Cartesian coordinate system, distance between two points; point of division of a line segment in a given ratio; the slope and intercepts of a straight line, different forms of equations of a straight line; parallel and perpendicular lines. Solving system of linear equations with at most three unknowns.
- (B) The standard form of a circle, its general form, its graph and its properties; the definitions and standard forms of ellipse, hyperbola, and parabola, their graphs and their properties. Intersection of lines and conic.

15. Graphs of functions: sketching of linear, quadratic, cubic, rational, logarithmic, exponential, sine, cosine, and tangent functions; application of the techniques of symmetry, translation, stretching, shrinking, and reflection.

16. Probability and Statistics: random experiment, outcomes and events; addition rule and multiplication rule of probabilities; measures of central tendency: mean, mode, and median; measures of dispersion: range, variance and standard deviation.

A List of Commonly Used Mathematical Symbols and Notations

Symbol	Notation	Description
\mathbb{R}		Set of real numbers
\mathbb{R}^+		Set of positive real numbers
\mathbb{Z}		Set of integers
\mathbb{Z}^+		Set of positive integers
\mathbb{Q}		Set of rational numbers
$x \in A$	$x \in A$	x belongs to A
$\{x \in \mathbb{Z} : x \leq 3\}$		A way of describing a set
$A \subseteq B$	$A \subseteq B$	A is a subset of B
$A \subset B$	$A \subset B$	A is a proper subset of B
$A \cup B$	$A \cup B$	A union B
$A \cap B$	$A \cap B$	A intersection B
A^c	A^c	Complement of A