

Syllabus for EJU Subject Examinations (Basic Scholastic Ability)

Mathematics (with relation to the MEXT curriculum guidelines)

The purpose of this examination is to test whether students from other countries have the basic scholastic ability in math considered necessary for studying at the undergraduate level at Japanese universities.

There are two courses. Course 1 is for undergraduate faculties and departments for which a basic knowledge of math is considered sufficient. Course 2 is for undergraduate faculties and departments for which math is very important.

At the time of taking the examination the examinee must choose whether to take Course 1 or Course 2; the examinee should follow the instructions given by the university or the department to which he is applying.

The topics covered by the examination are listed below. The symbols are the ones used in Japanese high school text books; the English version of the test uses standard English terms, and the Japanese version of the test uses terms used in Japanese high school text books.

- **The Course 1 examination covers only topics 1 to 6.**
- **The Course 2 examination covers all 17 topics.**

<Topics>

- 1 . Equations and Inequalities ... mathematics I
 - (1) Numbers and expressions
 - Real numbers
 - Expansion and factorization of a polynomial
 - (2) Linear inequalities
 - (3) Quadratic equations

- 2 . Quadratic functions ... mathematics I
 - (1) Quadratic functions and their graphs
 - (2) Variation in values of quadratic functions
 - Maximum value and minimum value of quadratic functions
 - Quadratic inequalities

- 3 . Figures and Measurements ... mathematics I
 - (1) Trigonometric ratios
 - Sine, cosine, tangent
 - Relations between trigonometric ratios
 - (2) Trigonometric ratios and figures
 - Sine formulas, cosine formulas
 - Measurements of figures

- 4 . Plane figures ... mathematics A
 - (1) Properties of triangles
 - (2) Properties of circles

- 5 . Set theory and Logic ... mathematics A
 - (1) Sets and the number of elements
 - (2) Propositions and proofs

6 . The number of possible outcomes and Probability ... mathematics A

- (1) Permutations, Combinations
- (2) Probability and its fundamental laws
- (3) Independent trials and probability

7 . Expressions and Proofs, Equations of higher degree ... mathematics II

- (1) Expressions and proofs
 - Division of polynomials, fractional expressions
 - Proofs of equalities and inequalities
- (2) Equations of higher degree
 - Complex numbers and quadratic equations
 - Equations of higher degree

8 . Figures and Equations ... mathematics II

- (1) Points and lines
 - Coordinates of a point
 - Equation of a line
- (2) Circles
 - Equation of a circle
 - Relative position of a circle and a line

9 . Various functions ... mathematics II

- (1) Trigonometric functions
 - General angles
 - Trigonometric functions and their basic properties
 - Addition theorems for trigonometric functions
- (2) Exponential functions and logarithmic functions
 - Expansion of exponents
 - Exponential functions
 - Logarithmic functions

10 . The concept of differentiation/integration ... mathematics II

- (1) The concept of differentiation
 - Differential coefficients and derivatives
 - Applications of the derivative
 - Tangent lines , increase/decrease in function value
- (2) The concept of integration
 - Indefinite integrals and definite integrals
 - Areas of figures

11 . Sequences of numbers ... mathematics B

- (1) Sequences and their sums
 - Arithmetic sequences and geometric sequences
 - Various sequences
- (2) Recurrence formulae and mathematical induction
 - Recurrence formulae and sequences
 - Mathematical induction

12 . Vectors ... mathematics B

- (1) Vectors in a plane
 - Vectors and their operations
 - Scalar product (inner product) of vectors
- (2) Space coordinates and vectors
 - Space coordinates, vectors in a space

13 . Limits ... mathematics III

- (1) Limits of sequences
 - Limit of $\{r^n\}$
 - Sum of an infinite geometric series
- (2) Functions and their limits
 - Composite functions and inverse functions
 - Limit of value of a function

14 . Differential calculus ... mathematics III

- (1) Derivatives
 - Derivatives of the sum/difference/product/quotient of two functions
 - Derivatives of composite functions
 - Derivatives of trigonometric functions, exponential functions, logarithmic functions
- (2) Applications of the derivative
 - Tangent lines, increase/decrease in value of functions, velocity, acceleration

15 . Integral calculus ... mathematics III

- (1) Indefinite integrals and definite integrals
 - Integrals and their basic properties
 - Integration by substitution, integration by parts
 - Integrals of various functions
- (2) Applications of integration
 - Area, volume

16 . Matrices and their applications ... mathematics C

- (1) Matrices
 - Matrices and operations on them
 - Sums, differences, scalar multiples
 - Products of matrices, inverse matrices
- (2) Applications of matrices
 - Systems of linear equations
 - Translation of a point

17 . Expressions and Curves ... mathematics C

- (1) Quadratic curves
 - Parabolas
 - Ellipses and hyperbolas
- (2) Parametric representations
 - Parametric representation of a curve