Syllabus of Entrance Test for Foreign Students Applying for BIT

Subject: Math

I. Objectives

1. Examine the basic knowledge, basic skills, thinking ability and calculation ability of middle school mathematics;
2. Test the ability to analyze and solve problems with relevant mathematical knowledge;
3. Check wether exam taker has basic abilities to learn calculus.

II. Forms

1. Overall arrangement of the exam: 60 minutes, with a total score of 100;
2. The proportion of question types and their fractions: calculating questions take 30%, multiple-choice questions take 40%, filling-in questions take 20% and free response problems take 10% of the total score;
3. The proportion of each part's score in the test paper: about 70% for algebra, about 15% for plane geometry, and about 15% for trigonometric functions.

III. Contents

1. Algebra

(1). Functions and inequalities

a. understand the set and its notation, grasp the concepts of subset, intersection, union and complement, understand the meaning of empty set and complete set, understand the meaning of belonging to, including, and equal relation, master relevant terms and symbols, and correctly represent some simple sets.

b. master the properties of inequalities, can perform basic writing and simple operation on inequalities.

c. master the solutions of linear inequalities (systems) and quadratic inequalities containing one variable, can solve simple fractional inequalities, and understand the concept of intervals; know about what is an absolute value inequality, and can solve a simple absolute value inequality.

d. understand the concept of functions and be able to find the domain of some basic kinds of functions.

e. understand the concept of linear function, grasp its figure and properties, can find its analytic expression; understand the concept of quadratic function, grasp its figure and properties, can find its analytic expression and maximum or minimum value, can flexibly use the properties of quadratic function to solve related problems.

f. understand the concepts of exponents and logarithms, grasp the relevant properties and algorithms.

g. understand the concepts of exponential function and logarithmic function, grasp their figures and properties, and solve the related problems.

h. understand the concept of inverse functions and the relationship between the inverse functions of each other, can find the inverse functions of some simple functions.

i. master the concepts of parity and monotonicity of functions and their figure features, and judge the monotonicity of some simple functions; be able to find the maxima and minima of some particular functions.

(2). Sequences

a. understand the concepts related to sequence.

b. understand the concepts of arithmetic sequence and geometric sequence, master the general terms of arithmetic sequence and geometric sequence and the formula of the sum of the first n terms, and use the formula to solve relevant problems.

c. understand the meaning of sequence limit, master the four operation rules of limit, and be able to find the limit of the sum of the first n terms of infinite geometric sequence whose absolute value of common ratio is less than 1.

(3). 2-D Vectors

a. understand the concept of plane vectors, the definition and geometric meaning of addition, subtraction, multiplication of real numbers and vectors.

b. master the coordinate notation of vectors, the definition of the dot product of vectors, master their algorithms, and can apply them to solve some simple problems.

c. master the distance formula between two points in a plane and the formula for the midpoint of a line segment, and master the translation formula.

(4). Permutation and combination, binomial theorem

a. understand the principle of classification and step counting, understand the concept of permutation and combination, can use the calculation formula of permutation and combination, and can solve the simple word problems of permutation and combination.

b. master the properties of binomial theorem and binomial coefficient, and use them to calculate some simple problems.

2. Geometry

(1). Straight line

a. master the concept of inclination angle and slope of a line, the slope formula of a line passing two points, and the method of judging the parallel and perpendicular relation of two lines.

b. proficient in point-slope, two-point and general equations of line equations, able to find the intersection of two lines, and master the distance formula from point to line.

(2). Conic curves and their equations

a. curves and equations: master the relationship between curves and equations in the cartesian coordinate system and the concept of trajectories, be able to select the appropriate coordinate system to solve the curve equation according to the given conditions, and draw the curve represented by the equation.

b. circle: master the standard equation and general equation of a circle, and master the position relationship between a line and a circle.

c. ellipse: master the standard equation and geometric properties of ellipse, and can solve some problems by definition.

d. hyperbola: master the standard equations and geometric properties of hyperbola, and can solve some problems by definition.

e. parabola: master the standard equations and geometric properties of parabola, and can solve some problems by definition.

3. Trigonometry

(1). The triangle ratio

a. understand the concept of positive angle, negative angle, zero angle, understand the concept of quadrant angle and coterminal side angle, understand the meaning of radians, and can correctly convert radians and angles.

b. master the definition of triangle ratio of any angle, the symbol of triangle ratio, and the basic relation and induction formula of triangle ratios.

c. master the cosine, sine and tangent formulas of the sum and difference of two angles, and can use them to calculate, simplify and prove. Through the derivation of formula, understand its internal connection, develop logical reasoning ability.

d. master sine law, cosine law and triangle area formula, and apply these formulas to solve oblique triangle.

(2). The graphs and properties of trig functions

a. master the figures and properties of sine and cosine functions, and can use them to solve relevant problems; know about the graphs and properties of tangent functions.

b. understand the relationship between the function $y=A\sin(\omega x+\phi)$ and the graph $y=\sin x$, and know the period, maximum and minimum values of the function $y=A\sin(\omega x+\phi)$.