Introduction

The career world is competitive. The competition and the opportunities in the career world become a serious problem for students if they do not study Mathematics, because then they are excluding themselves from the many career paths that need Mathematics. We therefore expect that all our selected students must have achieved a high level of excellence in a fundamental discipline like Mathematics. This is highly desirable if they think they may go into any of the Physical, Social, Health Sciences, Business, Medicine, or related areas.

Experience has shown that students who come to IBA with a poor grade in Math (or who choose to skip Math in schools / colleges) have a difficult time progressing at IBA. So we strongly recommend that the standard of our Mathematical portion of the IBA ENTRY test should be raised significantly. This is in the student's best interest.

The Aims & Objectives of the Mathematical Portion of the IBA Entry Test

The objectives of testing Mathematics in the IBA Entry Test for Undergrad students are as follows:

I. To check if the students have acquired the understanding of concepts of Mathematics and are able to apply them to the problems of the world they live in.

II. To check if a student has a sound basis in Mathematics, which is required to apply it in business fields.

III. To check if a student is enable to reason consistently, to draw correct conclusions for a given hypotheses; and to inculcate in them a habit of examining any situation critically and analytically.

IV. To check if a student is enabling to communicate their thoughts through symbolic expressions and graphs.

V. To check whether or not he/she has developed sense of distinction between relevant and irrelevant data.

VI. To check the students' basic understanding and awareness of the power of Mathematics in generalization and abstraction.

VII. To check if a student has fostered the spirit of exploration and discovery.

To achieve these aims and objectives we should be examining our students in the following areas of Mathematics:

1. Number

candidates should be able to:

use natural numbers, integers (positive, negative and zero), prime numbers, common factors and common multiples, rational and irrational numbers, real numbers; continue given number sequences, recognise patterns within and across different sequences and generalise to simple algebraic statements (including expressions for the nth term) relating to such sequences.

2. Set language and notation

use set language and set notation, and Venn diagrams, to describe sets and represent relationships between sets.

3. Function notation

use function notation,

e.g. $f(x) = 7x - 9$, to describe simple functions, and the notation $f^{-1}(x) = (x + 9) / 7$ to describe their inverses.

4. Squares

square roots, cubes and cube roots calculate squares, square roots, cubes and cube roots of numbers.

5. Decimal fractions and percentages

use the language and notation of decimal fractions and percentages in appropriate contexts; recognise equivalence and convert between these forms.

6. Ordering

order quantities by magnitude and demonstrate familiarity with the symbols $=, \neq, >, <, \leq, \geq$.

7. The four operations

use the four operations for calculations with whole numbers, decimal fractions including correct ordering of operations and use of brackets.

8. Estimation

make estimates of numbers, quantities and lengths, give approximations to specified numbers of significant figures and decimal places and round off answers to reasonable accuracy in the context of a given problem.

9. Limits of accuracy

obtain appropriate upper and lower bounds to solutions of simple problems (e.g. the calculation of the perimeter or the area of a rectangle), provided the appropriate upper and lower bounds for data has been given to a specified accuracy (e.g. measured lengths).

10. Ratio, proportion, rate

an understanding of the elementary ideas and notation of ratio, direct and inverse proportion and common measures of rate; divide a quantity in a given ratio; use scales in practical situations, calculate average speed; −express direct and inverse variation in algebraic terms and use this form of expression to find unknown quantities.

11. Percentages

calculate a given percentage of a quantity; express one quantity as a percentage of another, calculate percentage increase or decrease; carry out calculations involving reverse percentages, e.g. finding the cost price given the selling price and the percentage profit.

12. Exponential and Logarithmic Functions

definition of Exponential and Logarithmic Functions, and mentary characteristics.

13. Measures

use current units of mass, length, area, volume and capacity in pr situations and express quantities in terms of larger or smaller units..

14. Money

solve problems involving money and convert from one currency to another.

15. Personal and household finance

use given data to solve problems on personal and household finance involving earnings, simple interest, discount, profit and loss; extract data from tables and harts.

16. Graphs in practical situations

demonstrate familiarity with cartesian coordinates in two dimensions; interpret and use graphs in practical situations, draw graphs from given data.

17. Graphs of functions

construct tables of values and draw graphs for functions of the form $y = ax^n$ where $n = -1, 0, 1, 2$, and simple sums of not more than three of these and for functions of the form $y = ka^x$ where a is a positive integer; interpret graphs of linear, quadratic, reciprocal and exponential functions; solve equations approximately by graphical methods.

18. Straight line graphs

calculate the gradient of a straight line from the coordinates of two points on it; interpret and obtain the equation of a straight line graph in the form $y = mx + c$; calculate the length and the coordinates of the midpoint of a line segment from the coordinates of its end points.

19. Algebraic representation and formulae

use letters to express generalised numbers and express basic arithmetic processes algebraically, substitute numbers for words and letters in formulae; transform simple and more complicated formulae; construct equations from given situations.

20. Algebraic manipulation

manipulate directed numbers; use brackets and extract common factors; expand products of algebraic expressions; factorise expressions of the form $ax + ay$; $ax + bx + kay + kby$; $a^2x^2 - b^2y^2$; $a^2 - b^2$; $a^3 \pm b^3$; $ax^2 + bx + c$, by splitting the middle term.

21. Indices/ Exponents

handling positive, fractional, negative and “zero” indices.

22. Solutions of equations and inequalities

solve simple linear equations in one unknown; solve fractional equations with numerical and linear algebraic denominators; solve simultaneous linear equations in two unknowns; solve quadratic equations by factorisation and either by use of the formula or by completing the square; solve simple inequalities.

23. Graphical representation of inequalities

represent linear inequalities in one or two variables graphically.

24. Geometrical terms and relationships

use and interpret the geometrical terms: point, line, plane, parallel, perpendicular, right angle, acute, obtuse and reflex angles, interior and exterior angles, regular and irregular polygons, pentagons, hexagons, octagons, decagons.

use and interpret vocabulary of triangles, circles, special quadrilaterals.

solve problems and give simple explanations involving similarity and congruence.

use and interpret vocabulary of simple solid figures: cube, cuboid, prism, cylinder, pyramid, cone, sphere.

use the relationships between areas of similar triangles, with corresponding results for similar figures, and extension to volumes of similar solids.

25. Geometrical constructions

measure lines and angles; construct simple geometrical figures from given data, angle bisectors and perpendicular bisectors.

26. Symmetry

recognise line and rotational symmetry (including order of rotational symmetry) in two dimensions, and properties of triangles, quadrilaterals and circles directly related to their symmetries;

use the following symmetry properties of circles:

(a) equal chords are equidistant from the centre;
(b) the perpendicular bisector of a chord passes through the centre;
(c) tangents from an external point are equal in length.

27. Angle

calculate unknown angles and give simple explanations using the following geometrical properties:

(a) angles on a straight line;
(b) angles at a point;
(c) vertically opposite angles;
(d) angles formed by parallel lines;
(e) angle properties of triangles and quadrilaterals;
(f) angle properties of polygons including angle sum;
(g) angle in a semi-circle;

(h) angle between tangent and radius of a circle;
(i) angle at the centre of a circle is twice the angle at [illegible]rence;
(j) angles in the same segment are equal;
(k) angles in opposite segments are supplementary.

28. Locus

use the following loci and the method of intersecting loci:

(a) sets of points in two dimensions
  (i) which are at a given distance from a given point,
  (ii) which are at a given distance from a given straight line,
  (iii) which are equidistant from two given points;

(b) sets of points in two dimensions which are equidistant from two given intersecting straight lines.

29. Mensuration

solve problems involving

(a) the perimeter and area of a rectangle and triangle,
(b) the circumference and area of a circle,
(c) the area of a parallelogram and a trapezium,
(d) the surface area and volume of a cuboid, cylinder, prism, sphere, pyramid and cone,
(e) arc length and sector area as fractions of the circumference and area of a circle.

30. Trigonometry

apply Pythagoras Theorem and the sine, cosine and tangent ratios for acute angles to the calculation of a side or of an angle of a right-angled triangle (angles will be quoted in, and answers required in, degrees and decimals of a degree to one decimal place);

solve trigonometrical problems in two dimensions including those involving angles of elevation and depression and bearings;

extend sine and cosine functions to angles between 90° and 180°; solve problems using the sine and cosine rules for any triangle and the formula 1/2 ab sin C for the area of a triangle;

31. Statistics

collect, classify and tabulate statistical data; read, interpret and draw simple inferences from tables and statistical diagrams;

construct and use bar charts, pie charts, pictograms, simple frequency distributions and frequency polygons;

use frequency density to construct and read histograms with equal and unequal intervals;

calculate the mean, median and mode for individual data and distinguish between the purposes for which they are used;

construct and use cumulative frequency diagrams; estimate the median,

percentiles, quartiles and interquartile range;

calculate the mean for grouped data; identify the modal class from a grouped frequency distribution.

32. Probability

calculate the probability of a single event as either a fraction or a decimal (not a ratio);

calculate the probability of simple combined events using possibility diagrams and tree diagrams where appropriate. (In possibility diagrams outcomes will be represented by points on a grid and in tree diagrams outcomes will be written at the end of branches and probabilities by the side of the branches.)

33. Matrices

display information in the form of a matrix of any order; solve problems involving the calculation of the sum and product (where appropriate) of two matrices, and interpret the results; calculate the product of a scalar quantity and a matrix; use the algebra of 2 x 2 matrices including the zero and identity 2 x 2 matrices; calculate the determinant and inverse of a non-singular matrix.

34. Vectors in two dimensions

describe a translation by using a vector represented by $\begin{bmatrix} x \\ y \end{bmatrix}$, **a** or $\underline{a}$; add vectors and multiply a vector by a scalar; calculate the magnitude of a vector (Vectors will be printed as **a** or $\underline{a}$ and their magnitudes denoted by modulus signs, e.g. **|a|** or $|\underline{a}|$.)

represent vectors by directed line segments; use the sum and difference of two vectors to express given vectors in terms of two coplanar vectors; use position vectors.