

PRESIDENCY UNIVERSITY, KOLKATA
DEPARTMENT OF STATISTICS
SYLLABUS FOR ADMISSION TEST, 2015

For

B.Sc. STATISTICS HONOURS

This examination is designed to test the basic understanding of Mathematics up to the 12th standard level based on the following topics :

Algebra: Sets, operations on sets, relations and mappings. Prime numbers, factorization of integers and divisibility. Rational and irrational numbers. Permutations and combinations. Principles of mathematical induction. Binomial theorem. Logarithms. Theory of quadratic equations. Polynomials and remainder theorem. Arithmetic, geometric and harmonic progressions. Inequalities involving AM, GM, and HM. Complex numbers, Sequences, Series – logarithmic, exponential. Matrices and determinants up to order 3×3 .

Geometry: Plane geometry of class X level. Geometry of two dimensions with Cartesian and polar coordinates. Concept of a locus. Equation of a line, angle between two lines, distance from a point to a line. Area of a triangle. Circle, parabola, ellipse and hyperbola and equations of their tangents and normals.

Trigonometry: Measures of angles. Trigonometric and inverse trigonometric functions. Trigonometric identities including addition formulæ, Solutions of trigonometric equations. Properties of triangles. Heights and distances.

Calculus:

Differential calculus: Functions and its different types, limit, continuity, derivative, chain rule, derivative of implicit functions and functions defined parametrically. Application of calculus – tangents and normal, maxima and minima, use of calculus in sketching graph of functions. L'Hospital's rule (statement only) and its applications.

Integral calculus: Integration as a reverse process of differentiation, indefinite integral of standard functions. Integration by parts. Integration by substitution and partial fraction. Definite integral as a limit of a sum with equal subdivisions. Fundamental theorem of integral calculus and its applications. Properties of definite integrals.

Differential Equations: Formation of ordinary differential equations, Solution of homogeneous differential equations, Separation of variables method, Linear first order differential equations.

Probability : Basic concepts and Problems on Probability.

UG ADMISSION TEST, 2015 / MODEL QUESTIONS

SUBJECT – STATISTICS (HONOURS)

1. Let A be a matrix of order 3×3 such that $A^T A = I_3$. Then $A^{-1} =$
(a) A^T (b) I_3 (c) A (d) $2I_3$

2. If we divide $3^{2002} + 7^{2002} + 2002$ by 29, the remainder will be
(a) 1 (b) 17 (c) 23 (d) 2

3. Suppose two straight lines $3x+4y=5$ and $4x-3y=15$ cut each other at the point A. Take two points B and C on those two lines, respectively, such that $AB = AC$. If the line BC passes through the point (1, 2) then the possible equations of the straight line BC are
(a) $x-7y+13=0$ or $7x+y=9$ (b) $x+7y+9=0$ or $x-7y-13=0$
(c) $x=y+13$ or $x-y=9$ (d) $x+0.5y-13=0$ or $7x-y+9=0$

4. The locus of the middle points of the chords drawn through the vertex of the parabola $x^2 = 4ay$ is
(a) $x^2 = -4ay$ (b) $y^2 = 4x^2$ (c) $x^2 = 2ay$ (d) $y^2 = 2ax$

5. If $f(x)$ is a real valued differentiable function such that $f(x)f'(x) < 0$ for all real x, then
(a) $f(x)$ is an increasing function (b) $|f(x)|$ is a decreasing function
(c) $f(x)$ is a decreasing function (d) $|f(x)|$ is an increasing function

6. If $z = a + ib$, a, b are real numbers, then $|z|/|z|$ is
- (a) $\frac{a+ib}{\sqrt{a^2+b^2}}$ (b) 1 (c) $a + ib$ (d) $\frac{1}{\sqrt{a^2+b^2}}$
7. The value of $\int_{-\infty}^{\infty} \frac{1}{\pi} \frac{|x|}{1+x^2} dx$ is (a) 0 (b) 1/2 (c) 1 (d) ∞
8. A function $f(x)$ of a variable x has a discontinuity point at $x = 2$. Then which of the following can be said?
- (a) $f(x) + 2$ also has the same discontinuity point (b) $f(x)$ is continuous for all $x < 2$ and for all $x > 2$ (c) $[f(x)]^2$ is continuous for all x (d) $f(x)$ cannot have any other discontinuity point
9. The value of $\sum_{k=1}^n k(nC_k)$ is (a) $n2^{n-1}$ (b) $2^{n+1}C_n$ (c) $n2^n$ (d) $2^{n-1}C_{n-1}$
10. Two buildings with flat roofs are 60m apart. From the roof of the shorter building, 40m in height, the angle of elevation to the edge of the roof of the taller building is 45° . How high is the taller building? (a) 90m (b) 100m (c) 95m (d) 105m
11. Let $f(x) = x [x]$. When x is not an integer, then
- (a) $f'(x)$ is $2x$ (b) $f'(x)$ is $[x]$ (c) $f'(x)$ is $2[x]$ (d) $f'(x)$ does not exist
12. In triangle ABC, $3 \sin A + 4 \cos B = 6$ and $4 \sin B + 3 \cos A = 1$, the angle C is
- (a) 150° (b) 45° (c) 60° (d) 30°
13. In how many ways can one type the word *PRESIDENCY* such that only one letter is wrongly typed? (a) 250 (b) 520 (c) 2^{10} (d) $26^{10} - 10$
14. Six boys and six girls sit in a row randomly. The probability that 'all the girls sit together' is (a) $(7! 6!)/12!$ (b) $7/12$ (c) $36/12!$ (d) $(6! 6!)/12!$
15. The locus of the point of intersection of two lines $\sqrt{3}x - y = 4\sqrt{3}\lambda$ and $\sqrt{3}\lambda x + \lambda y = 4\sqrt{3}$, for any $\lambda (\neq 0)$, is (a) Parabola (b) Circle (c) Ellipse (d) Hyperbola