

Sample Paper-05
Mathematics
Class – XI

Time allowed: 3 hours

Maximum Marks: 100

General Instructions:

- a) All questions are compulsory.
- b) The question paper consists of 26 questions divided into three sections A, B and C. Section A comprises of 6 questions of one mark each, Section B comprises of 13 questions of four marks each and Section C comprises of 7 questions of six marks each.
- c) All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.
- d) Use of calculators is not permitted.

Section A

1. Solve for x if $|x| + x = 2 + i$
2. Write the sum of first n odd numbers
3. Write the n^{th} term if the sum of n terms of an AP is $2n^2 + 3n$
4. If $a < b$ write the length of latus rectum of an ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$
5. If $f(x) = 5$ for all real numbers of x find $f(x+5)$
6. What is the maximum number of objects you can weigh if you have four distinct weights.

Section B

7. Prove that $f'(a+b) = f'(a) + f'(b)$ when $f(x) = x^2$ and when $f(x) = x^3$
8. If α, β are the roots of the equation $x^2 + px + q = 0$ Find $\alpha^3 + \beta^3$.
9. A positive 3 digit number has its units digit zero. Find the probability that the number is divisible by 4.
10. Prove that $\tan(45 + x) = \sec 2x + \tan 2x$
11. Prove by mathematical induction that $n(n+1)$ is even
12. Find $n[(A \cup B \cup C)]$ if $n(A) = 4000$ $n(B) = 2000$ $n(C) = 1000$ and
 $n(A \cap B) = n(B \cap C) = n(A \cap C) = 400$, $n(A \cap B \cap C) = 200$

13. Find the latus rectum, eccentricity and coordinates of the foci of the ellipse $x^2 + 3y^2 = k^2$
14. Find the area of the circle passing through the points $(-8, 0), (0, 8), (12, 0)$
15. If S_1, S_2, S_3 are the sums of $n, 2n, 3n$ terms respectively of an AP prove that $S_3 = 3(S_2 - S_1)$
16. Find the least value of $f(x)$ if $f(x) = 3x^2 - 6x - 11$
17. Find $f(x) + f(1-x)$ if $f(x) = \frac{a^x}{a^x + \sqrt{a}}$
18. Prove that $\frac{\tan 2x \tan x}{\tan 2x - \tan x} = \sin 2x$
19. Find the limit $\lim_{n \rightarrow \infty} \frac{(n+2)! + (n+1)!}{(n+2)! - (n+1)!}$

Section C

20. Find $\frac{dy}{dx}$ given that $y = (\sin^n x \cos nx)$
21. If $(5a), (a-b), b$ are in GP prove that $\log\left(\frac{1}{3}(a+b)\right) = \frac{1}{2}(\log a + \log b)$
22. If the n th term of a series is denoted by $\frac{7^{n-1}}{10^n}$. Find the sum to infinity of the series.
23. Calculate the variance and standard deviation of the following data 8, 12, 13, 15, 22, 14
24. $f(x) = (1+x)^{\frac{1}{x}}, x \neq 0$. Find $f\left(1 + \frac{a}{y}\right)^{by}$
25. The probability of A hitting a target is $\frac{4}{5}$; the probability of B hitting the target is $\frac{3}{4}$ and the probability of C missing the target is $\frac{1}{3}$. What is the probability of the target being hit at least twice.
26. Find the term independent of x in the expansion $\left(ax^2 - \frac{b}{x}\right)^9$