Sample Paper – 2010
Class – XI
Subject - Mathematics

General Instructions:

1. All questions are compulsory.
2. The question paper consist of 29 questions divided into three sections A, B and C. Section A comprises of 10 questions of one mark each, section B comprises of 12 questions of four marks each and section C comprises of 7 questions of six marks each.
3. All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.
4. There is no overall choice. However, internal choice has been provided in 4 questions of four marks each and 2 questions of six marks each. You have to attempt only one of the alternatives in all such questions.
5. Use of calculators is not permitted. You may ask for logarithmic tables, if required.

SECTION – A

1. Find the sum of first 5 terms of the geometric series $1+\frac{2}{3}+\frac{4}{9}+\ldots$

2. For what values of x, the numbers $-\frac{2}{7}$, x, $-\frac{7}{2}$ are in G.P.?

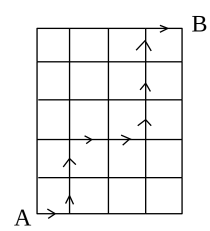
3. If a parabolic reflector is 20 cm in diameter and 5 cm deep, find the focus.

4. Find the centre and radius of the circle $4x^2+4y^2-10x+5y+5=0$.

5. Three vertices of a parallelogram ABCD are $A(3,\ -1,\ 2)$, $B(1,\ 2,\ -4)$, and $C(-1,\ 1,\ 2)$. Find the fourth vertex D.

6. Find the coordinates of the point equidistant from the four points $(a,\ 0,\ 0)$, $(0,\ b,\ 0)$, $(0,\ 0,\ c)$ and $(0,\ 0,\ 0)$.

7. A person is to walk from A to B. However, he is restricted to walk only to the right of A or upwards of A, but not necessarily in the order shown in the adjoining figure. Determine the number of paths from A to B.



8. In how many ways can 6 different rings be worn on the four fingers of the hand?

9. Which number is larger: $(1\cdot 1)^{10000}$ or 1000.

10. Find the middle term in the expansion of $\left(\frac{x}{3}+9y\right)^{10}$.

SECTION – B

11. Prove by the principle of Mathematical Induction, $10^n+3\times 4^{n+2}+5$ is divisible by 9 $\forall n\in N$.

OR

$$\left(1+\frac{3}{1}\right)\left(1+\frac{5}{4}\right)\left(1+\frac{7}{9}\right)........\left(1+\frac{2n+1}{n^2}\right)=(n+1)^2.$$

12. Find the sum of the first n terms of the series: $3+7+13+21+31+...$

13. Find the coordinates of the foci, the vertices, the lengths of major & minor axes and the eccentricity of the ellipse $9x^2+4y^2=36$.

14. Find the area of the triangle formed by the lines joining the vertex of the parabola $y^2=12x$ to the ends of its latus rectum.

15. Find the equation of the hyperbola whose foci are $(0, \pm\sqrt{10})$ and passing through the point $(2, 3)$.

16. Find the coordinates of the points which trisect the segment joining the points $P(4, \ 2, \ -6), \ \& \ Q(10, \ -16, \ 6)$.

OR

Verify that the points $A(0, 7, -10), B(1, 6, -6) \& C(4, 9, -6)$ are vertices of an isosceles triangle.

17. The centroid of a triangle PQR is at the point $(1, 1, 1)$. If the coordinates of P and Q are $(3, -5, 7)$ and $(-1, 7, -6)$ respectively, find the coordinates of the point C.

18. In an examination, Ajay has to pass in each of the six subjects. In how many ways can he fail?

OR

In an examination, a question paper consists of 12 questions divided into two parts i.e. part I and part II, containing 5 and 7 questions, respectively. A student is required to attempt 8 questions in all, selecting atleast 3 from each part. In how many ways can a student select the questions?

19. If ${}^{n-1}C_r : {}^{n}C_r : {}^{n+1}C_r = 6:9:13$, find n and r.

20. If all the permutations of the letters of the word 'INDIA' are arranged as in a dictionary. Find the 50th and 60th words.

21. Show that the middle term of in the expansion of $(1+x)^{2n}$ is $\dfrac{1\cdot3\cdot5...(2n-1)}{n!}\cdot 2^n \cdot x^n$.

OR

Using Binomial Theorem, show that $9^{n+1}-8n-9$ is divisible by 64, whenever n is a positive integer.

22. Prove that $\sum_{r=0}^{n} 3^r \cdot {}^{n}C_r = 4^n$.

SECTION – C

---

23. A person writes four letters of his friends. He asks each one of them to copy the letter and mail to four different persons with instruction that they move the chain similarly.

Assuming that the chain is not broken and it costs Rs. 0.50 to mail one letter, determine the amount spent on the postage when 8^{th} set of letters is mailed.

24. Find a, b and n in the expansion of $(a+b)^n$ if the first three terms of the expansion are 729, 7290 and 30375 respectively.

25. The towers of a bridge, hung in the form of a parabola, have their tops 30 m above the road-way and 200 m apart. If the cable is 5 m above the roadway at the centre of the bridge, find the length of the vertical supporting cable 30 m from the centre.

26. Find the equation of the ellipse with axes along the coordinate axes and passing through $(4, 3)$ & $(-1, 4)$.

27. If A and B are points $(3, 4, 5)$ and $(-1, 3, -7)$ respectively, find the equation of the set of points P such that $PA^2 + PB^2 = k^2$, where k is a constant.

28. How many words can be formed by taking 4 letters at a time out of the letters of the word 'MATHEMATICS'

OR

Determine the number of 5 cards combinations out of a deck of 52 cards if atleast one of the 5 cards has to be a king.

29. Find n, if the ratio of the fifth term from the beginning to the fifth term from the end in the expansion of $\left(\sqrt[4]{2}+\frac{1}{\sqrt[4]{3}}\right)^n$ is $\sqrt{6}:1$.

OR

If the coefficients of a^{r-1}, a^r and a^{r+1} in the expansion of $(1+a)^n$ are in A.P. prove that $n^2 - n(4r+1) + 4r^2 - 2 = 0$.