

**SAMPLE PAPER-2015**  
**CLASS-XII**  
**Subject – Mathematics**

**TIME: 3Hr**

**M.M.100**

**General Instructions:-**

- (i) All questions are compulsory.
- (ii) The question paper consists of **29** questions divided into three sections **A,B,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 **07** questions of **six** marks
- (iii) All questions in section A are to be answered in **one word, one sentence** or as per the exact requirement of the question
- (iv) There is no overall choice. However internal choice has been provided in **04** questions of **four** marks each and **02** questions of **six** marks
- (v) Use of calculators is not permitted. You may ask for logarithmic tables

**Section-A**

1. Find the value of  $\tan^{-1}(\sqrt{3}) + \sec^{-1}(-2)$ .

2. If  $A = \begin{vmatrix} 1 & 2 \\ 4 & 2 \end{vmatrix}$  then show that  $|2A| = 4|A|$ .

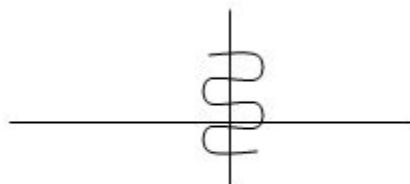
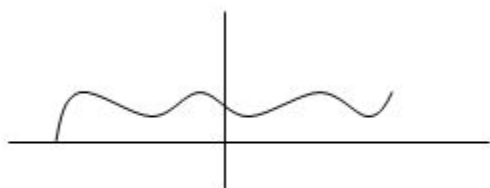
3. If  $A = \begin{vmatrix} 1 & 3 \\ 4 & 5 \end{vmatrix}$  and  $B = \begin{vmatrix} 2 & -1 \\ 1 & 3 \end{vmatrix}$ . Find BA

4. If  $x = a \cos t$  and  $y = a \sin t$ . Find  $dy/dx$ .

5. Find the value of  $x$  for which  $x(i^{\wedge} + j^{\wedge} + k^{\wedge})$  is a unit vector.

6. Find the vector equation for the plane whose Cartesian equation is given by  $2x + 4y - 5z = 3$

7. Which of the following graphs represents a function



8. The position vectors of points A, B, C and D are  $a, b, 2a + 3b$  &  $a - 2b$ . Express  $\vec{DB}$  and  $\vec{AC}$  in terms of  $a$  &  $b$

9. Evaluate:  $\int \frac{dx}{\sqrt{x+a} + \sqrt{x+b}}$ .

10. Without expanding evaluate the determinant

$$\begin{vmatrix} a-b & b-c & c-a \\ b-c & c-a & a-b \\ c-a & a-b & b-c \end{vmatrix}$$

11. Let  $*$  be a binary operation on  $Q$  defined by  $a * b = (ab)/4$ . Show that the operation  $*$  is commutative as well as associative. Also find its identity element.

12. Prove that  $\sin^{-1}(5/13) + \sin^{-1}(7/25) = \cos^{-1}(253/325)$ .

13. Using the properties of determinants show that

$$\begin{vmatrix} \alpha & \beta & \gamma \\ \alpha^2 & \beta^2 & \gamma^2 \\ \beta + \gamma & \gamma + \alpha & \alpha + \beta \end{vmatrix} = (\alpha - \beta)(\beta - \alpha)(\gamma - \alpha)(\alpha + \beta + \gamma).$$

OR

. Using the properties of determinants show that

$$\begin{vmatrix} -bc & b^2 + bc & c^2 + bc \\ a^2 + ac & -ac & c^2 + ac \\ a^2 + ab & b^2 + ab & -ab \end{vmatrix} = (ab + bc + ca)^3$$

Q.14. Examine the continuity of  $f$  where  $f$  is defined by

$$f(x) = \begin{cases} \sin x - \cos x & \text{if } x \neq 0 \\ -1 & \text{if } x = 0 \end{cases}$$

15. If  $y = \tan^{-1} \frac{\sqrt{a} - \sqrt{x}}{1 + \sqrt{ax}}$  find  $dy/dx$ .

OR

If  $(\sin x)^y = (\cos x)^{\sin y}$  find  $dy/dx$

16. Evaluate :  $\int \frac{x^2 + 1}{x^4 + x^2 + 1} dx$ .

Or

Evaluate  $\int \sin^{-1} \frac{2x}{x^2 + 1} dx$

17. The length  $x$  of a rectangle is decreasing at the rate of 5 cm/min and the width  $y$  is decreasing at the rate of 4cm/min . When  $x=8$  cm and  $y=6$ cm , find the rate of change of

(a)the perimeter and (b) the area of the rectangle

18. Evaluate the following integral as limit of sum  $\int_1^2 (3x^2 - 1)dx$

19 Evaluate  $\int_0^{\pi/2} \log \sin x dx$

20.Find the image of the point(-1,-1,3) in the plane  $2x+3y-4z-10=0$ .

21 Find a vector whose magnitude is 3 units and which is perpendicular to the vectors  $\vec{a}$  and  $\vec{b}$  where  $\vec{a} = (3\hat{i} + \hat{j} - 4\hat{k})$ ,  $\vec{b} = (6\hat{i} + 5\hat{j} - 2\hat{k})$

22.X speaks truth 4 out of 5 times. A die is tossed. He reports that there is six. What is the probability that actually there was six?

OR

An urn contains 10 white & 3 black balls. Another urn contains 3 white & 5 black balls .Two balls are drawn at random from the first urn and put into the second urn & then a ball is drawn from the second urn. Find the probability that it is a white ball.

23. Find the inverse of the matrix

$$\begin{pmatrix} 3 & -2 & 3 \\ 2 & 1 & -1 \\ 4 & -3 & 2 \end{pmatrix}$$

and hence solve the system of equations

$$\begin{aligned} 3x-2y+3z-8 &= 0 \\ 2x+ y- z- 1 &= 0 \end{aligned}$$

$$4x-3y+2z-4=0$$

24. Show that the height of a right circular cylinder that can be inscribed in a sphere of radius R is  $2R/\sqrt{3}$

OR

Show that the vertical angle of a right circular cone of given surface area and maximum volume is  $\sin^{-1}(1/3)$ .

25. Find the area of the region  $\{(x,y):0 \leq y \leq x^2+1, 0 \leq y \leq x+1, 0 \leq x \leq 2\}$

26. Solve the following differential equation :  $(1-x^2)(dy/dx) - xy = x^2$ . given  $y=2$  when  $x=0$ .

27. Find the vector equation of a plane through the points  $(2,-3,0)$  and parallel to the lines

$$\vec{r} = 3\hat{i} - 2\hat{j} + 3\hat{k} + t(-\hat{i} + \hat{j} - 2\hat{k})$$

and  $\vec{r} = 2\hat{i} + \hat{k} + s(3\hat{j} + 4\hat{k})$  Also convert the equation to its Cartesian form

Q.28. Two cards are drawn simultaneously with out replacement from well shuffled pack of 52 cards . Find the probability distribution of the number of kings drawn. Find the mean , variance , and standard deviation of the number of kings .

Or

If a fair coin is tossed 10 times find the probability of i) exactly six heads, ii) atleast six heads , iii) atmost six heads

Q 29. A diet for a sick person must contain atleast 4000 units of vitamin, 50 units of minerals and 1400 calories. Two foods X and Y are available at a cost of Rs. 4 and Rs. 3 per unit respectively. One unit of food X contains 200 units of vitamins , 1 unit of minerals and 40 calories, while one unit of food Y contains 100 units of vitamins , 2 units of minerals and 40 calories. Find what combination of foods X and Y should be used to have least cost, satisfying the requirements.

## ANSWERS

1  $\pi$

3 -2 1

4.  $-\cot t$

5.  $\pm 1/\sqrt{3}$

6.  $\vec{r} \cdot (2\vec{i} + 4\vec{j} - 5\vec{k}) = 3$

7. The first graph represents a function of  $x$  whereas the second does not represent a function of  $x$  as for every value of  $x$  has more than one value of  $y$

8.  $\vec{DB} = 3\vec{b} - \vec{a}$  &  $\vec{AC} = \vec{a} + 3\vec{b}$ . Express  $\vec{DB}$  and  $\vec{AC}$  in terms of  $\vec{a}$  &  $\vec{b}$

9.  $\frac{2}{3(a-b)} [(x+a)^{3/2} - (x+b)^{3/2}] + c$

10. zero

11. Identity element = 4

14. continuous  $\forall x \in \mathbb{R}$ 

15.  $\frac{-1}{2\sqrt{x}} \cdot \frac{1}{(1+x)}$

OR

$$\frac{\cos y \cot x + \sin y \tan x}{\cos y \log(\cos x) + \sin y \log(\sin x)}$$

16.  $\frac{1}{\sqrt{3}} \tan^{-1}[(x^2 - 1)/x\sqrt{3}] + c$

OR

$$2x \tan^{-1} x - \log(1+x^2) + c$$

17 (a) -2 cm/min (b) 2 sq.cm/min

18. 6

19.  $(-\pi/2) \log 2$ 20.  $(79/29, 133/29, -129/29)$

21.  $(2\hat{i} - 2\hat{j} + \hat{k})$  or  $-(2\hat{i} - 2\hat{j} + \hat{k})$

22.  $4/9$  Or  $59/130$

23.

$$(1/17) \begin{pmatrix} 1 & 5 & 1 \\ 8 & 6 & -9 \\ 10 & -1 & -7 \end{pmatrix}$$

$x=1, y=2, z=3$

25.  $.23/6$  sq.units

26.  $y(\sqrt{1-x^2}) = \frac{1}{2} \sin^{-1} x - \frac{x}{2} \sqrt{1-x^2} + 2$

27.  $\vec{r} \cdot (10\hat{i} + 4\hat{j} - 3\hat{k}) = 8, 10x + 4y - 3z = 8$

28.

X	0	1	2
P(X)	188/221	32/221	1/221

Mean =  $2/13$ , variance =  $400/2873$ , S.D =  $0.37$

OR

(i)  $105/512$  (ii)  $193/512$  (iii)  $53/64$

29. X : 5 units , Y : 30 units