KENDRIYA VIDYALAYA SANGATHAN, HYDERABAD REGION
MOCK TEST PAPER – 06 (2017-18)

SUBJECT: MATHEMATICS(041)

BLUE PRINT : CLASS XII

Chapter	VSA (1 mark)	Short answer (2 marks)	Long answer - I (4 marks)	Long answer - II (6 marks)	Total
Relations and Functions	1(1)	2(1)	--	--	**3(3)**
Inverse Trigonometric Functions	1(1)	--	--	6(1)	**7(2)**
Matrices	--	2(1)	--	--	**2(1)**
Determinants	1(1)	--	4(1)	6(1)	**11(3)**
Continuity & Differentiability	--	2(1)	--	6(1)	**8(2)**
Applications of Derivatives	--	2(1)	8(2)	6(1)	**16(4)**
Integrals	--	--	4(1)	6(1)	**10(2)**
Applications of the Integrals	--	--	4(1)	--	**4(1)**
Differential Equations	--	2(1)	4(1)	--	**6(2)**
Vector Algebra	1(1)	--	4(1)	--	**5(2)**
Three-Dimensional Geometry	--	2(1)	4(1)	6(1)	**12(3)**
Linear Programming	--	2(1)	4(1)	--	**6(2)**
Probability	--	2(1)	8(2)	--	**10(3)**
Total	**4(4)**	**16(8)**	**44(11)**	**36(6)**	**100(29)**

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SUBJECT: MATHEMATICS **MAX. MARKS : 100**
CLASS : XII **DURATION : 3 HRS**

General Instruction:
(i) **All** questions are compulsory.
(ii) This question paper contains **29** questions.
(iii) Question **1- 4** in **Section A** are very short-answer type questions carrying **1** mark each.
(iv) Question **5-12** in **Section B** are short-answer type questions carrying **2** marks each.
(v) Question **13-23** in **Section C** are long-answer-I type questions carrying **4** marks each.
(vi) Question **24-29** in **Section D** are long-answer-II type questions carrying **6** marks each.

SECTION – A
Questions 1 to 4 carry 1 mark each.

1. Let f : R → R be defined by f(x) = x + 7 and g : R → R be defined by g(x) = x – 7. Find *fog(7)*

2. Find the value of $\sin^{-1}\left[\frac{\pi}{3}-\sin^{-1}\left(\frac{-1}{2}\right)\right]$?

3. If $A=\begin{bmatrix}5 & 6 & -3\\ -4 & 3 & 2\\ -4 & -7 & 3\end{bmatrix}$, then write the cofactor of the element a_{21} of its 2^{nd} row.

4. Find the area of a parallelogram whose adjacent sides are represented by the vectors $2\hat{i}-3\hat{k}$ and $4\hat{i}+2\hat{k}$.

SECTION – B
Questions 5 to 12 carry 2 marks each.

5. Let L be the set of all lines in a plane and R be the relation in L defined as R = {(L_1, L_2) : L_1 is perpendicular to L_2}. Show that R is symmetric but neither reflexive nor transitive.

6. Find X and Y, if $X+Y=\begin{bmatrix}5 & 2\\ 0 & 9\end{bmatrix}$ *and* $X+Y=\begin{bmatrix}3 & 6\\ 0 & -1\end{bmatrix}$

7. Form a differential equation representing the given family of curve $y = e^x\,(a\cos x + b\sin x)$ by eliminating arbitrary constants *a* and *b*.

8. Find $\frac{dy}{dx}$ of the function $xy = e^{(x-y)}$

9. If the radius of a sphere is measured as 9 cm with an error of 0.03 cm, then find the approximate error in calculating its volume.

10. In a hostel, 60% of the students read Hindi news paper, 40% read English news paper and 20% read both Hindi and English news papers. A student is selected at random. If she reads Hindi news paper, find the probability that she reads English news paper.

11. Find the vector and the Cartesian equations of the line through the point (5, 2, – 4) and which is parallel to the vector $3\hat{i}+2\hat{j}-8\hat{k}$

12. Solve the following Linear Programming Problem graphically:
Maximize Z = 4x + y; subject to $x+y\le 50; 3x+y\le 90, x\ge 0$ *and* $y\ge 0$

SECTION – C

Questions 13 to 23 carry 4 marks each.

13. Evaluate: $\int \frac{\sin(x-a)}{\sin(x+a)} dx$

14. In a parliament election, a political party hired a public relations firm to promote its candidates in three ways — telephone, house calls and letters. The cost per contact (in paise) is given in matrix A as

$$A = \begin{bmatrix} 140 \\ 200 \\ 150 \end{bmatrix} \begin{matrix} \text{Telephone} \\ \text{House Call} \\ \text{Letters} \end{matrix}$$

The number of contacts of each type made in two cities X and Y is given in the matrix B as

$$\begin{matrix} \text{Telephone} & \text{House Call} & \text{Letters} \end{matrix}$$
$$B = \begin{bmatrix} 1000 & 500 & 5000 \\ 3000 & 1000 & 10000 \end{bmatrix} \begin{matrix} \text{City X} \\ \text{City Y} \end{matrix}$$

Find the total amount spent by the party in the two cities.
What should one consider before casting his/her vote — party's promotional activity or their social activities?

15. Find whether the following function is differentiable at x = 1 and x = 2 or not :

$$f(x) = \begin{cases} x, & x < 1 \\ 2 - x, & 1 \le x \le 2 \\ -2 + 3x - x^2, & x > 2 \end{cases}$$

16. Find the intervals in which the function f given by $f(x) = \sin x + \cos x$, $0 \le x \le 2\pi$ is strictly increasing or strictly decreasing.

OR

Find the point on the curve $9y^2 = x^3$, where the normal to the curve makes equal intercepts on the axes.

17. Evaluate: $\int e^{2x} \sin(3x+1) dx$

OR

Evaluate: $\int_{-\pi/2}^{\pi/2} \frac{\cos x}{1+e^x} dx$

18. Solve the following differential equation :

$$\left[y - x\cos\left(\frac{y}{x}\right)\right]dy + \left[y\cos\left(\frac{y}{x}\right) - 2x\sin\left(\frac{y}{x}\right)\right]dx = 0$$

OR

Solve the following differential equation :

$$\left(\sqrt{1+x^2+y^2+x^2y^2}\right)dx + xydy = 0$$

19. Maximise z = 8x + 9y subject to the constraints given below :
$2x + 3y \le 6$; $3x - 2y \le 6$; $y \le 1$; $x, y \ge 0$

20. Three machines E_1, E_2 and E_3 in a certain factory producing electric bulbs, produce 50%, 25% and 25% respectively, of the total daily output of electric bulbs. It is known that 4% of the bulbs produced by each of machines E_1 and E_2 are defective and that 5% of those produced by machine E_3 are defective. If one bulb is picked up at random from a day's production, calculate the probability that it is defective.

21. Two numbers are selected at random (without replacement) from positive integers 2, 3, 4, 5, 6, and 7. Let X denote the larger of the two numbers obtained. Find the mean and variance of the probability distribution of X.

22. The two vectors $\hat{j}+\hat{k}$ and $3\hat{j}-\hat{j}+4\hat{k}$ represent the two side vectors $\overrightarrow{AB}$ and $\overrightarrow{AC}$ respectively of triangle ABC. Find the length of the median through A.

23. Find the equation of a plane which passes through the point (3, 2, 0) and contains the line $\frac{x-3}{1}=\frac{y-6}{5}=\frac{z-4}{4}$.

SECTION – D

Questions 24 to 29 carry 6 marks each.

24. Find the distance of the point (1, – 2, 3) from the plane x – y + z = 5 measured parallel to the line whose direction cosines are proportional to 2, 3, – 6.

25. If $\tan^{-1}\left(\frac{1}{1+1.2}\right)+\tan^{-1}\left(\frac{1}{1+2.3}\right)+......+\tan^{-1}\left(\frac{1}{1+n.(n+1)}\right)=\tan^{-1}\theta$, then find the value of θ.

OR

Let f : N $\rightarrow$ R be a function defined as f(x) = $4x^2 + 12x + 15$. Show that f : N $\rightarrow$ S, where S is the range of f, is invertible. Also find the inverse of f.

26. If A + B + C = π, prove that

$$\begin{vmatrix} \sin^2 A & \sin A \sin B & \cos^2 A \\ \sin^2 B & \sin B \sin B & \cos^2 B \\ \sin^2 C & \sin C \sin C & \cos^2 C \end{vmatrix} = -\sin(A-B)\sin(B-C)\sin(C-A)$$

OR

Solve for x: $\begin{vmatrix} x-2 & 2x-3 & 3x-4 \\ x-4 & 2x-9 & 3x-16 \\ x-8 & 2x-27 & 3x-64 \end{vmatrix} = 0$

27. Find $\frac{dy}{dx}$, if $(x\cos x)^x + (x\sin x)^{1/x}$.

28. Using integration, find the area of the region bounded by the line x – y + 2 = 0, the curve x = $\sqrt{y}$ and y-axis.

OR

Evaluate: $\int_0^1 x(\tan^{-1}x)^2 dx$.

29. An open topped box is to be constructed by removing equal squares from each corner of a 3 metre by 8 metre rectangular sheet of aluminium and folding up the sides. Find the volume of the largest such box.