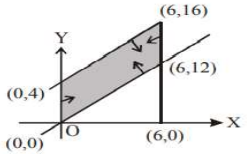
KENDRIYA VIDYALAYA SANGATHAN, BHOPAL REGION
FIRST PRE BOARD EXAMINATION: - 2025-2026

CLASS: XII **Maximum Marks: 80**
SUBJECT: MATHEMATICS **TIME ALLOWED: 3 Hours**
Set-1

General instruction

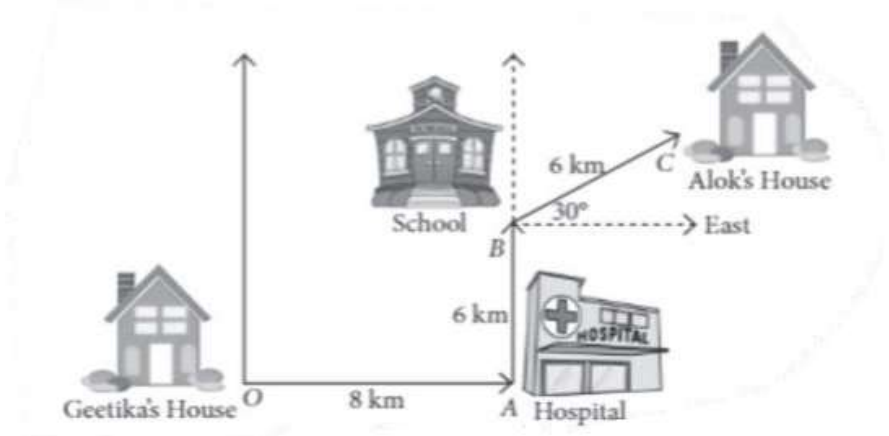
1 This question paper contains- five sections A, B, C, D and E. Each section is compulsory. However, there are internal choices in some questions.
2. Section A has18 MCQ's and 02 Assertion- Reason based question of 1 mark each.
3. Section B has 5 very short answer type questions (VSA) of 2 marks each.
4.Section C has 6 short answer type questions (SA) of 3 marks each.
5. Section D has 4 long answer type questions (LA) of 5 marks each.
6. Section E has 3 source base / case based/passage based / integrated units of aassessment 4 marks each with sub parts.

Q. No.	SECTION A (MULTIPLE CHOICE QUESTIONS)	Marks
1	If $x = \sqrt{a^{\sin^{-1} t}}$ and $y = \sqrt{a^{\cos^{-1} t}}$ then (a) $x\frac{dy}{dx} + y = 0$ (b) $x\frac{dy}{dx} = y$ (c) $y\frac{dy}{dx} = x$ (d) none of the above	1
2	$\int e^{2x}\left(\frac{1+\sin 2x}{1+\cos 2x}\right)dx$ is equal to (a) $e^{2x}\tan x + C$ (b) $e^{2x}\sec^2 x + C$ (c) $\frac{1}{2}e^{2x}\tan x + C$ (d) $e^{2x}\sec^2 x + C$	1
3	$\int e^{5logx}\,dx$ is equal to : (a) $x^5/5 + C$ (b) $x^6/6 + C$ (c) $5x^4 + C$ (d) $6x^5 + C$	1
4	A square matrix $A = [a_{ij}]_{n\times n}$ is called a diagonal matrix if $a_{ij} = 0$ for (a) i = j (b) i < j (c) i > j (d) i ≠ j	1
5	The feasible region for LPP is shown shaded in the figure. Let Z = 3 x – 4y be the objective function, then maximum value of Z is (a) 12 (b) 8 (c) 0 (d) –18 	1
6	The corner points of the feasible region determined by the following system of linear inequalities: $2x + y \le 10$; $x + 3y \le 15$; $x, y \ge 0$ are $(0,0), (5,0), (3,4)$ and $(0,5)$. Let $Z = px + qy$, where $p, q > 0$. Condition on p and q so that the maximum of Z occurs at both $(3,4)$ and $(0,5)$ is:	1

	(a) p = q (b) p = 2q (c) p = 3q (d) q = 3p	
7	The direction cosines of the line which makes equal angles with the coordinate axes are (a)$\left(\frac{1}{\sqrt{3}},\frac{1}{\sqrt{3}},\frac{1}{\sqrt{3}}\right)$ (b) $\left(-\frac{1}{\sqrt{3}},-\frac{1}{\sqrt{3}},-\frac{1}{\sqrt{3}}\right)$ (c) $\left(\pm\frac{1}{\sqrt{3}},\pm\frac{1}{\sqrt{3}},\pm\frac{1}{\sqrt{3}}\right)$ (d) none of the above	1
8	If $\lvert\vec{a}\rvert=\frac{\sqrt{3}}{2}, \lvert\vec{b}\rvert=4$ and angle between $\vec{a}$ and $\vec{b}$ is 60^0 then the value of $\vec{a}.\vec{b}$ is equal to (a) $\sqrt{3}$ (b) $\frac{1}{\sqrt{3}}$ (c) $-\sqrt{3}$ (d) none of the above	1
9	Order and degree of differential equation $\frac{d^2y}{dx^2}=\left[y+\left(\frac{dy}{dx}\right)^2\right]^{\frac{1}{4}}$ (a) 4 and 2 (b) 1 and 2 (c) 1 and 4 (d) 2 and 4	1
10	The number of all possible matrices of order 2x3 with each entry -1 or 1 is (a) 512 (b) 64 (c) 27 (d) 18	1
11	If the lines $\frac{x-1}{k}=\frac{y-3}{1}=\frac{z+6}{-2}$ and $\frac{x-1}{1}=\frac{y-3}{-2}=\frac{z+6}{k}$ are perpendicular, then k is equal to (a) 2 (b) 1 (c) -2 (d) 3	1
12	Integrating factor of the differential equation $(1-x^2)\frac{dy}{dx}-xy=1$ is (a) $-x$ (b) $\frac{x}{1+x^2}$ (c) $\sqrt{1-x^2}$ (d) $\frac{1}{2}\log(1-x^2)$	1
13	The solution of differential equation $2x\frac{dy}{dx}-y=3$ represents: (a). straight lines (b) circle (c) parabola (d) ellipse	1
14	If $\begin{vmatrix} x & 2 \\ 18 & x \end{vmatrix}=\begin{vmatrix} 6 & 9 \\ 4 & 6 \end{vmatrix}$ then x is equal (a) 6 (b) -6 (c) ± 6 (d) none of the above	1
15	Assume that in a family, each child is equally likely to be a boy or a girl. A family with three children is chosen at random. The probability that the eldest child is a girl given that the family has at least one girl is (a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{2}{3}$ (d) $\frac{4}{7}$	1
16	A unit vector perpendicular to both the vectors $\hat{\imath}-2\hat{\jmath}+3\hat{k}$ and $\hat{\imath}+2\hat{\jmath}-\hat{k}$ is (a) $\pm\frac{1}{\sqrt{3}}(\hat{\imath}+\hat{\jmath}+\hat{k})$ (b) $\pm\frac{1}{\sqrt{3}}(-\hat{\imath}+\hat{\jmath}+\hat{k})$ (c)$\pm\frac{1}{\sqrt{3}}(\hat{\imath}-\hat{\jmath}-\hat{k})$ (d) $\pm\frac{1}{\sqrt{3}}(\hat{\imath}-\hat{\jmath}+\hat{k})$	1
17	If $A=\begin{bmatrix} 1 & 2 \\ 4 & 2 \end{bmatrix}$, then find the value of |2A| (a) -6 (b) -24 (c) 12 (d) -12	1

18	if α is the angle between any two vectors $\vec{a}\ and\ \vec{b}\ , then\ \left\|\vec{a}.\vec{b}\right\| = \left\|\vec{a}\times\vec{b}\right\|$ when α is equal to (a) 0 (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{2}$ (d) π	1
	ASSERTION – REASON BASED QUESTIONS Directions: Each of these questions contains two statements, Assertion and Reason. Each of these questions also has four alternative choices, only one of which is the correct answer. You have to select one of the codes (a), (b), (c) and (d) given below. (a) Assertion is correct, reason is correct; reason is a correct explanation for assertion. (b) Assertion is correct, reason is correct; reason is not a correct explanation for assertion (c) Assertion is correct, reason is incorrect (d) Assertion is incorrect, reason is correct.	
19	**Assertion**: A relation R = {(a, b): |a-b|<2} defined on the set A = {1, 2, 3, 4, 5} is reflexive. **Reason**: A relation R on the set A is said to be reflexive if (a,b)$\epsilon\ R\ and\ (b,c)\epsilon R\ then\ (a,c)\epsilon R\ for\ all\ a,b,c\ \epsilon\ A$.	1
20	**Assertion**: The intervals in which f(x) = log sin x, $0 \le x \le \pi$ is Increasing is$\left(0,\frac{\pi}{2}\right)$. **Reason**: A function is increasing in (a, b) if f'(x) >0 for each x$\epsilon(a,b)$.	1
	SECTION B	
21	Find the value of $\tan^{-1}\left\{2\sin\left(4\cos^{-1}\frac{\sqrt{3}}{2}\right)\right\}$ **OR** $\tan^{-1}(\tan\frac{7\pi}{6})$	2
22	Evaluate the integral: $\int\frac{(x^2+1)}{(x^2+2)(x^2+3)}dx$	2
23	If function $f(x)=\begin{cases}x+k, if\ x<3\\ 4\ , x=3\\ 3x-5,\ \ x>3\end{cases}$ is continuous function at x=3, then find the value of k.	2
24	The volume of the cube is increasing at the rate of 9 cubic centimeters per second. How fast is the surface area increasing when the length of an edge is 10 centimeters? **OR** Find the maximum profit that a company can make, if the profit function is given by p(x) = 41-72x-18x^2	2
25	Find the intervals in which the function f is given by f(x) = $4x^3$ -$6x^2$ -72x +30 (a) Strictly increasing (b) strictly decreasing	2

	SECTION C	
26	Find $\frac{dy}{dx}$, $if\ \ y^x + x^y + x^x = a^b$ **OR** If x= a (cost + t sint) and y = a (sint - t cost), find $\frac{d^2y}{dx^2}$.	3
27	Given that the events A and B are such that P(A) = 1/2, P(AUB)= 3/5 and P(B) = p. Find p if they are (i) mutually exclusive (ii) independent events **OR** A die is thrown twice and the sum of the numbers appearing is observed to be 6. What is the conditional probability that the number 4 has appeared at least once?	3
28	Find a particular solution of the differential equation $\frac{dy}{dx} + y\cot x = 4x\,\mathrm{cosec}\,x, x \neq 0$, given that $y = 0$ when $x = \frac{\pi}{2}$ **OR** Find a general solution of the differential equation $e^x \tan y\,dx + (1-e^x)\sec^2 y\,dy = 0$	3
29	Evaluate the definite integrals $\int_1^4 [\|x-1\| + \|x-2\| + \|x-3\|]\,dx$	3
30	Evaluate: $\int \frac{6x+7}{\sqrt{(x-5)(x-4)}}\,dx$	3
31	Solve the following Linear Programming Problems graphically Maximise Z = 5x + 3y Subject to constrains :3x + 5y ≤ 15, 5x + 2y ≤ 10, x ≥ 0, y ≥ 0.	3
	SECTION D	
32	Using the method of integrals find the area of the region $\{(x, y): x^2 + y^2 \leq 9, 1 \leq x \leq 2\}$.	5
33	Let A be the set of all the triangles in a plane and R be the relation defined on R as R = {(T_1, T_2): T_1 is similar to T_2} 1. Show that the relation R is an equivalence relation. 2. Consider three right angle triangle T_1 with sides 3, 4, 5, T_2 with sides 5, 12, 13 and T_3 with sides 6,8,10. Which triangle among T_1, T_2, and T_3 are related? **OR** Show that f: R→ $\{x \epsilon R : -1 < x < 1\}\ defined\ by$ $f(x) = \frac{x}{1+\|x\|}$, xϵ R is one - one and onto function.	4 1 3 2
34	Two factories decided to award their employee for three values of (a) adaptable to new situation, (b) careful and alert in difficult situations and (c) keeping calm in tense situations, at the rate of ₹ x, ₹ y and ₹ z per person respectively. The first factory decided to honour respectively 2, 4 and 3 employees with total prize money of ₹ 29000. The second factory	

	decided to honour respectively 5, 2 and 3 employees with a total prize money of ₹ 30500. If three prizes per person together cost ₹ 9500 then (i) Represents the above situation by a matrix equation and form linear equations using matrix multiplication. (ii) Solve these equation using matrices.	 1 4
35	By computing the shortest distance determine whether the lines intersect or not. If not then find the shortest distance between the lines. $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$ *and* $\frac{x-2}{3}=\frac{y-4}{4}=\frac{z-5}{5}$ **OR** Find the vector equation of the line passing through the point (1, 2, – 4) and perpendicular to the two lines: $\frac{x-8}{3}=\frac{y+19}{-16}=\frac{z-10}{7}$ *and* $\frac{x-15}{3}=\frac{y-29}{8}=\frac{z-5}{-5}$	5
	SECTION E **This section comprises of 3 case study questions of 4 marks having sub parts**	
36	A doctor is to visit a patient. From the past experience, it is known that the probabilities that he will come by cab, metro, bike or by other means of transport are respectively 0.3, 0.2, 0.1 and 0.4. The probabilities that he will be late are 0.25, 0.3, 0.35 and 0.1 if he comes by cab, metro, bike and other means of transport respectively. (i)What is the probability that the doctor is late by other means? (ii)When the doctor arrives late, what is the probability that he comes by metro? (iii) When the doctor arrives late, what is the probability that he comes by bike or other means? **OR** When the doctor arrives late, what is the probability that he comes by cab or metro?	 1 1 2 2
37	 Gitika house is situated at Shalimar Bag at O, going to Alok's house she first	

	travels 8 km in the east, here at point A a hospital is situated. From the hospital she takes auto and goes 6 km in the north. Here at point B a school is situated. From school she travels by bus to reach Alok's house which is $30^0$of east and 6 km from point B. (i) What is vector distance from Gitika's house to school? (ii) What is vector distance from school to Alok's house? (iii)What is vector distance from Gitika's house to Alok's house? **OR** What is the total distance travel by Gitika from her house to Alok's house?	1 1 2 2
38	A telephone company in a town has 500 subscribers on its list and collect fixed charges of ₹ 300 per subscriberper per year. The company proposes to increase the annual subscription and it is believed that every increase of ₹1, one subscriber will discontinue the service. (i)Based on above information find out how much amount can be increased for maximum revenue. (ii)Find out maximum revenue received by the telephone company.	2 2

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