BAL BHARATI PUBLIC SCHOOL
PREBOARD EXAMINATION 2025-26
MATHEMATICS
CLASS XII
SET A

Read the following instructions very carefully and strictly follow them:

(i) This Question paper contains 38 questions. All questions are compulsory.
(ii) This Question paper is divided into five Sections - A, B, C, D and E.
(iii) In Section A, Questions no. 1 to 18 are multiple choice questions (MCQs) and Questions no. 19 and 20 are Assertion-Reason based questions of 1 mark each.
(iv) In Section B, Questions no. 21 to 25 are Very Short Answer (VSA)-type questions, carrying 2 marks each.
(v) In Section C, Questions no. 26 to 31 are Short Answer (SA)-type questions, carrying 3 marks each.
(vi) In Section D, Questions no. 32 to 35 are Long Answer (LA)-type questions, carrying 5 marks each.
(vii) In Section E, Questions no. 36 to 38 are Case study-based questions, carrying 4 marks each.
(viii) There is no overall choice. However, internal choices have been provided.
(ix) Use of calculators is not allowed

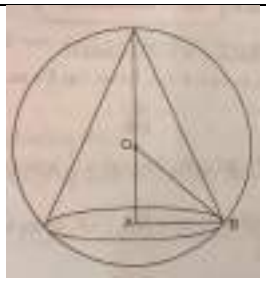
MAX. MARKS : 80		TIME : 3 HRS
	SECTION A (1 x 20 = 20)	Marks
Q1	Let the relation R in the set A = { x∈ Z : $0 \leq x \leq 12$ }, given R= { (a,b) : | a – b | is a multiple of 4 }. Then [1], the equivalence class of 1 is A. { 1,5,9} B. { 0,1,2,5 } C. ∅ D. set A	1
Q2	If $\sin^{-1}x > \cos^{-1}x$, then x should lie in the interval A. $(-1, -\frac{1}{\sqrt{2}})$ B. $(0, -\frac{1}{\sqrt{2}})$ C. $(\frac{1}{\sqrt{2}}, 1)$ D. $(\frac{1}{\sqrt{2}}, 0)$	1
Q3	If $A = \begin{bmatrix}1 & 0\\0 & 0\end{bmatrix}$ and B = $\begin{bmatrix}1 & 1\\0 & 0\end{bmatrix}$, then B'A' is equal to A. $\begin{bmatrix}1 & 1\\0 & 0\end{bmatrix}$ B. $\begin{bmatrix}1 & 0\\1 & 0\end{bmatrix}$ C. $\begin{bmatrix}1 & 1\\1 & 1\end{bmatrix}$ D. $\begin{bmatrix}0 & 0\\0 & 0\end{bmatrix}$	1
Q4	Given that A is a square matrix of order 2 and $\|A\| = 4$, then $\|4adj\ (A)\|$ is equal to: A. 16 B.64 C. 256 D. 512	1
Q5	If $[\,x\ \ 2\ \ 0\,]\begin{bmatrix}5\\-1\\x\end{bmatrix} = [\,3\ \ 1\,]\begin{bmatrix}-2\\x\end{bmatrix}$, then value of x is A. -1 B. 0 C. 1 D. 2	1
Q6	Total number of possible matrices of order 3x3 with each entry 2 or 0 is A. 9 B.27 C. 81 D. 512	1

Q7	$\int \frac{1}{x\,(logx)^2}\,dx$ is: A. 2log(logx) + c B. $\frac{-1}{logx}$ + c C. $\frac{(logx)^3}{3}$ + c D. $\frac{3}{(logx)^3}$ + c	1
Q8	The function f(x) = x|x| is A. Continuous and Differentiable at x = 0 B. Continuous but not Differentiable at x = 0 C. Not Continuous but Differentiable at x = 0 D. Neither Continuous nor Differentiable at x = 0	1
Q9	If siny = x cos(a+y), then $\frac{dy}{dx}$ is A. $\frac{\cos a}{cos^2(a+y)}$ B. $\frac{-\cos a}{cos^2(a+y)}$ C. $\frac{\cos a}{sin^2 y}$ D. $\frac{-\cos a}{sin^2 y}$	1
Q10	If $\vec{p}$ and $\vec{q}$ are unit vectors, then which of the following values of $\vec{p}\,.\,\vec{q}$ is not possible ? A. $\frac{-1}{2}$ B. $\frac{1}{\sqrt{2}}$ C. $\frac{\sqrt{3}}{2}$ D. $\sqrt{3}$	1
Q11	$\int tan^{-1}\sqrt{x}$ dx is equal to A. (x+1) $tan^{-1}\sqrt{x}$ - $\sqrt{x}$ + c B. x $tan^{-1}\sqrt{x}$ - $\sqrt{x}$ + c C. -x $tan^{-1}\sqrt{x}$ + $\sqrt{x}$ + c D. -(x+1) $tan^{-1}\sqrt{x}$ + $\sqrt{x}$ + c	1
Q12	If E and F are two independent events such that P(E) = $\frac{2}{3}$ and P(F) = $\frac{3}{7}$, the P($E/\bar{F}$) is equal to A. $\frac{1}{6}$ B. $\frac{1}{2}$ C. $\frac{2}{3}$ D. $\frac{7}{9}$	1
Q13	Derivative of $e^{sin^2 x}$ with respect to cos x is A. sinx$e^{sin^2 x}$ B. cosx$e^{sin^2 x}$ C. -2cosx$e^{sin^2 x}$ D. -2sin^{2}x cosx$e^{sin^2 x}$	1
Q14	If f(2a – x) = f(x) , then $\int_0^{2a} f(x)\,dx$ is A. $\int_0^{2a} f(\frac{x}{2})\,dx$ B. $\int_0^{a} f(x)\,dx$ C. $2\int_a^0 f(x)\,dx$ D. $2\int_0^a f(x)dx$	1
Q15	If $\overrightarrow{PQ}\ X\ \overrightarrow{PR}$ = $4\hat{\imath}$ + 8$\hat{\jmath}$ -8$\hat{k}$, then the area of ΔPQR is A. 2 sq units B. 4 sq units C. 6 sq units D. 12 sq units	1
Q16	If xe^y = 1 , then the value of $\frac{dy}{dx}$ at x= 1 is A. -1 B. 1 C. -e D. $\frac{-1}{e}$	
Q17	Differential of log [log(log (x^5)] wrt x is A. $\frac{5}{xlogx^5 \log(logx^5)}$ B. $\frac{5}{x\log(logx^5)}$ C. $\frac{5x^4}{logx^5 \log(logx^5)}$ D. $\frac{5x}{logx^5 \log(logx^5)}$	1
Q18	$\vec{a}$ and $\vec{b}$ are two non-zero vectors such that the projection of $\vec{a}$ on $\vec{b}$ is 0. The angle between $\vec{a}$ and $\vec{b}$ is A. $\frac{\pi}{2}$ B. π C. $\frac{\pi}{4}$ D. 0	1

	Assertion-Reason based questions (Q19, Q20) In the following questions a statement of assertion (A) followed by a statement of reason (R). Choose the correct answer out of the following choices A. Both A and R are true and R is the correct explanation of A B. Both A and R are true and R is not the correct explanation of A C. A is true but R is false D. A is false but R is true	
Q19	Assertion: The angle between the lines whose direction cosines are $\frac{-\sqrt{3}}{4}, \frac{1}{4}, \frac{-\sqrt{3}}{2}$; $\frac{-\sqrt{3}}{4}, \frac{1}{4}, \frac{\sqrt{3}}{2}$ is 120^0. Reason: The angle between two lines whose direction cosines are l_1, m_1, n_1 and l_2, m_2, n_2 is given by $\cos\theta = l_1l_2+m_1m_2+n_1n_2$.	1
Q20	Assertion: If A and B are symmetric matrices of same order then AB – BA is also a symmetric matrix. Reason: Any square matrix is said to be skew symmetric matrix if $A = -A^T$,where A^T is the transpose of a matrix A	1
	SECTION B (2 x 5 = 10)	
Q21	Find the value of $\sin^{-1}\left(cos\frac{43\pi}{5}\right)$	2
Q22	The side of an equilateral triangle is increasing at the rate of 2cm/sec, find the rate at which its area increases when side is 10cm long.	2
Q23	Find $\int cos^3 x e^{\log sinx}\ dx$ OR $\int \frac{1}{(5+4x-x^2)} dx$	2
Q24	Find the value of the constant k so that the function f, defined below, is continuous at $x = 3$, where $f(x) = \begin{cases} \frac{(x+3)^2-36}{x-3}, if\ x \neq 3 \\ k \qquad\quad , if\ x = 3 \end{cases}$. OR Prove that the greatest integer function defined by $f(x) = [x], 0 < x < 3$ is not differentiable at $x = 2$.	2
Q25	If vectors $\vec{a}$ and $\vec{b}$ are such that $\lvert\vec{a}\rvert = \frac{1}{2}$, $\lvert\vec{b}\rvert = \frac{4}{\sqrt{3}}$ and $\lvert \vec{a} \times \vec{b} \rvert = \frac{1}{\sqrt{3}}$, then find $\lvert \vec{a}.\vec{b} \rvert$	2
	SECTION C (3 x 6 = 18)	
Q26	Evaluate: $\int \frac{x^4}{(x-1)(x^2+1)} dx$	3
Q27	If x = a cosθ + b sinθ y = a sinθ – b cosθ show that $y^2\left(\frac{d^2y}{dx^2}\right) - x\frac{dy}{dx} + y = 0.$ OR Differentiate $\sin^{-1}\left[\frac{2^{x+1}3^x}{1+36^x}\right]$ with respect to x	3

Q28	Using integration find the area of the region bounded by the line y = $\sqrt{3}\,x$, the curve y = $\sqrt{4-x^2}$ and y axis in first quadrant.	3
Q29	Solve the differential equation x^2 dy + y (x + y) dx = 0	3
Q30	Find the shortest distance between the lines $\frac{x+1}{7} = \frac{y+1}{-6} = \frac{z+1}{1}$ and $\frac{x-3}{1} = \frac{y-5}{-2} = \frac{z-7}{1}$ 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 $\frac{x-15}{3} = \frac{y-29}{8} = \frac{z-5}{-5}$	3
Q31	A husband and a wife appear in an interview for two vacancies for the same post. The probability of husband's selection is $\frac{1}{7}$ and that of wife's selection is $\frac{1}{5}$. What is the probability that (i) Both will be selected ? (ii) Only one of them will be selected ? (iii) None will be selected ? OR The probabilities of A,B and C solving a problem are $\frac{1}{3}$, $\frac{2}{7}$, $\frac{3}{8}$ respectively. If all the three try to solve the problem simultaneously, find the probability that exactly one of them can solve the problem.	3
	SECTION D (5 x 4 = 20)	
Q32	If $A = \begin{bmatrix} -4 & 4 & 4 \\ -7 & 1 & 3 \\ 5 & -3 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -1 & 1 \\ 1 & -2 & -2 \\ 2 & 1 & 3 \end{bmatrix}$ then find AB and use it to solve the following system of equations: $x - y + z = 4; x - 2y - 2z = 9;\ 2x + y + 3z = 1.$ OR The sum of three numbers is 6. If we multiply third number by 3 and add second number to it, we get 11. By adding first and third numbers, we get double of the second number. Represent it algebraically and find the numbers using matrix method.	5
Q33	Evaluate: $\int_0^{\pi} \frac{x dx}{a^2 cos^2 x + b^2 sin^2 x}$ OR $\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} e^{2x} \left(\frac{1-sin2x}{1-cos2x} \right) dx$	5
Q34	A line passes through a point A with position vector $\vec{a}$ = $4\hat{\imath}$ + 2$\hat{\jmath}$ +2 $\hat{k}$ is parallel to the vector $\vec{b}$ = 2$\hat{\imath}$ + 3$\hat{\jmath}$ +6 $\hat{k}$. Find the length of the perpendicular drawn on this line from a point P with position vector $\vec{r}$ = 1$\hat{\imath}$ + 2$\hat{\jmath}$ +3 $\hat{k}$.	5
Q35	Solve the following problem graphically : Minimise and Maximise Z = 3x + 9y Subject to the constraints : x + 3y ≤ 60 x + y ≥ 10 x ≤ y x ≥ 0 , y ≥ 0	5

	SECTION E (4 x 3 = 12)	
Q36	Students of a school are taken to a railway museum to learn about railways heritage and its history.  An exhibition in the museum depicted many rail lines on the track near the railway station. Let L be the set of all rail lines on the railway track and R be the relation on L defined by $R = \{ (l_1 , l_2) : l_1 \text{ is parallel to } l_2 \}$ On the basis of the above information , answer the following questions : (i) Find whether the relation R is symmetric or not ? (ii) Find whether the relation R is transitive or not ? (iii) If one of the rail lines on the railway track is represented by the equation y= 3x + 2, then find the set of railway lines in R related to it. OR Let S be the relation defined by $\{ (l_1 , l_2) : l_1 \text{ is perpendicular to } l_2 \}$, check whether the relation S is symmetric and transitive.	4
Q37	 A bank offers loan to its customers on different types of interest namely, fixed rate, floating rate and variable rate. From the past data with the bank, it is known that a customer avails loan on fixed rate, floating rate and variable rate with probabilities 10%, 20% and 70% respectively. A customer after availing loan can pay loan or default the loan repayment. The bank data suggests that the probability that a person defaults on loan after availing it at fixed rate, floating rate and variable rate is 5%, 3% and 1% respectively Based on the above information, answer the following questions : (i) What is the probability that a customer after availing the loan will default on loan repayment ? (ii) A customer after availing the loan, defaults on loan repayment. What is the probability that he availed the loan at a variable rate of interest ?	4

Q38	 Read the following passage and answer the questions given below Innovative methods are adopted to present showpieces. In one such case a right circular cone is fixed into the sphere .So as to touch the boundaries of a sphere and on rotation, cone takes different colours. If radius of sphere is r and x is the radius of the base of cone and y is its height then (i) Write a relation between x,y and r. (ii) Write volume of the cone in terms of height y. (iii) Find the critical value for volume, with respect to y OR Find the height of cone so that volume is maximum	4