PSEB 12 Mathematics 2026 Sample Question Paper

Time Allowed :3 Hours	Maximum Marks :80	Total Questions :18

General Instructions

1. All questions are compulsory.
2. Question paper consists of 18 questions divided into 4 sections A, B, C and D.
3. Section A comprises of 1 question of 20 multiple choice type questions of 1 mark each.
4. Section B comprises of 7 questions of 2 marks each.
5. Section C comprises of 7 questions of 4 marks each.
6. Section D comprises of 3 questions of 6 marks each.
7. An internal choice is provided in 3 questions of Section C and D each. You have to attempt only one of the alternatives in all such cases.
8. Use of calculator is not allowed.

Section - A

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1. Choose the correct options in the following questions:
(i). Relation $R = \{(x, y) : x < y^2$ where $x, y \in \mathbb{R}\}$ is:

(A) Reflexive but not symmetric
(B) Symmetric and transitive but not Reflexive
(C) Reflexive and Symmetric
(D) Neither reflexive nor symmetric nor transitive

(ii). Range of function $\cos^{-1} x$ is:

(A) $[0, \pi] - \{\frac{\pi}{2}\}$
(B) $(0, \pi)$
(C) $(-\frac{\pi}{2}, \frac{\pi}{2}) - \{0\}$
(D) $[0, \pi]$

(iii). Principal value of $\sin^{-1}(1)$ is:

(A) $\frac{\pi}{2}$
(B) $\frac{\pi}{3}$

(C) $\frac{\pi}{4}$
(D) $\frac{\pi}{6}$

(iv). If A is a square matrix of order 2×2 and $|A| = 5$, then $|Adj(A)|$ is:

(A) 25
(B) 125
(C) 5
(D) 10

(v). If $\begin{bmatrix} x - 2y & 0 \\ 5 & x \end{bmatrix} = \begin{bmatrix} -5 & 0 \\ 5 & 3 \end{bmatrix}$, then y is equal to:

(A) 1
(B) 3
(C) 2
(D) 4

(vi). If the order of the matrix A is 3×2, then the order of the matrix $(A')'$ is:

(A) 2×3
(B) 3×2
(C) 2×2
(D) 3×3

(vii). If $f(x) = \begin{cases} \frac{\sin 8x}{5x}, & x \neq 0 \\ m + 1, & x = 0 \end{cases}$ is continuous at $x = 0$, then value of m is:

(A) $\frac{5}{8}$
(B) $\frac{8}{5}$
(C) $\frac{3}{5}$
(D) $\frac{5}{3}$

(viii). If $y = e^{\log x}$, then $\frac{dy}{dx}$ is:

(A) $\log x - x$
(B) $xe^{\log x}$
(C) 1
(D) $e^{\log x} \log x$

(ix). If $y = \tan x$, then at $x = \frac{\pi}{4}$, $\frac{dy}{dx}$ is equal to:

(A) 1
(B) $\sqrt{2}$
(C) 2
(D) 4

(x). Radius of a circle is increasing at the rate of 2 m/s. Rate of change of its circumference is:

(A) 4π m/s
(B) 2 m/s
(C) 2π m/s
(D) 4 m/s

(xi). $\int_{\pi/6}^{\pi/3} \frac{\sqrt{\cos x}}{\sqrt{\sin x}+\sqrt{\cos x}} dx$ is equal to:

(A) $\frac{\pi}{4}$
(B) $\frac{\pi}{6}$
(C) $\frac{\pi}{12}$
(D) $\frac{\pi}{2}$

(xii). $\int_0^1 \frac{dx}{1+x^2}$ is equal to:

(A) $\frac{\pi}{2}$
(B) $\frac{\pi}{4}$
(C) $\frac{\pi}{3}$
(D) $\frac{\pi}{6}$

(xiii). Order of differential equation $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 3y = 0$ is:

(A) 3
(B) 2
(C) 1
(D) 0

(xiv). If $\vec{a}$ is a non-zero vector then $|\vec{a} \times \vec{a}|$ is equal to:

(A) $|\vec{a}|$
(B) $|\vec{a}|^2$
(C) 1
(D) 0

(xv). Name of the inequality $|\vec{a} \cdot \vec{b}| \leq |\vec{a}||\vec{b}|$ is:

(A) Cauchy-Schwarz Inequality
(B) Triangle Inequality
(C) Rolle's Inequality
(D) Lagrange's Inequality

(xvi). Direction ratios of the straight line $\vec{r} = 2\hat{i} - 3\hat{j} + \hat{k} + m(9\hat{i} - 2\hat{j} + 5\hat{k})$ are:

(A) $< 2, -3, 1 >$
(B) $< 9, 2, 5 >$
(C) $< -2, 3, -1 >$
(D) $< 9, -2, 5 >$

(xvii). Vector equation of the line $\frac{x-5}{-4} = \frac{y-3}{5} = \frac{z+3}{-8}$ is:

(A) $\vec{r} = 4\hat{i} - 5\hat{j} - 8\hat{k} + \mu(5\hat{i} + 3\hat{j} - 3\hat{k})$
(B) $\vec{r} = -4\hat{i} + 5\hat{j} + 8\hat{k} + \mu(5\hat{i} + 3\hat{j} - 3\hat{k})$
(C) $\vec{r} = 5\hat{i} + 3\hat{j} - 3\hat{k} + \mu(4\hat{i} - 5\hat{j} - 8\hat{k})$
(D) $\vec{r} = 5\hat{i} + 3\hat{j} - 3\hat{k} + \mu(-4\hat{i} + 5\hat{j} - 8\hat{k})$

(xviii). Objective function of a linear programming problem is:

(A) Always quadratic
(B) Always linear
(C) May be linear or quadratic depending on the problem
(D) May be cubic some times

(xix). If $P(A) = \frac{1}{2}, P(B) = \frac{3}{8}$ and $P(A \cap B) = \frac{1}{5}$, then $P(A|B)$ is equal to:

(A) $\frac{2}{5}$
(B) $\frac{8}{15}$

(C) $\frac{2}{3}$
(D) $\frac{5}{8}$

(xx). Ram and Rahim are contesting for two vacancies in a company. Probability of selection of Ram is $\frac{7}{9}$ and that of Rahim is $\frac{4}{7}$. What is the probability that both will be selected?

(A) $\frac{61}{63}$
(B) $\frac{4}{9}$
(C) $\frac{8}{9}$
(D) $\frac{11}{16}$

Section - B

Q2. If $A = \begin{bmatrix} 2 & 1 & 3 \\ 4 & 1 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 1 & -1 \\ 0 & 2 \\ 5 & 0 \end{bmatrix}$ **then verify that** $(AB)' = B'A'$

(A) Verified
(B) Not Verified
(C) Information Incomplete
(D) Dimension Mismatch

Q3. Find $\frac{d}{dx}(x^x)$ **and evaluate whether this result is true** $\forall x \in \mathbb{R}$**.**

Q4. Evaluate $\int \frac{2x-3}{x^2+1}dx$**.**

Q5. Using integration, find the area bounded by the circle whose centre is at origin and radius is 4 units.

Q6. The volume of spherical balloon is increasing at the rate of 25 c.c./s. Find the rate of change of its surface area at the instant when its radius is 5cm.

Q7. Find the points on the curve $y = 2x^3 - 3x^2 - 12x + 15$ where rate of change of dependent variable with respect to the independent variable vanishes. What do we call these type of points?

Q8. Find the value of p if the vectors $p\hat{\imath} - 8\hat{\jmath} + 5\hat{k}$ and $5\hat{\imath} + 2\hat{\jmath} - 3\hat{k}$ are perpendicular to each other.

Section - C

Q9. Prove that the function, $f : \mathbb{R} \to \mathbb{R}, f(x) = \frac{5x+3}{4}$ is one-one and onto.

(A) One-one and onto
(B) One-one but not onto
(C) Onto but not one-one
(D) Neither one-one nor onto

Q10(a). Using determinants, find the value of k if the area of the triangle formed by the points $(-3, 6), (-4, 4)$ and $(k, -2)$ is 12 sq. units.

(A) $k = 5, -19$
(B) $k = 16, -8$
(C) $k = 10, -10$
(D) $k = 7, -21$

Q10(b). If $X = \begin{bmatrix} 3 & 1 \\ 2 & -1 \end{bmatrix}$ and $2X - Y = \begin{bmatrix} 5 & 10 \\ 3 & -5 \end{bmatrix}$ then find the matrix Y.

(A) $\begin{bmatrix} 1 & -8 \\ 1 & 3 \end{bmatrix}$
(B) $\begin{bmatrix} -1 & 8 \\ -1 & -3 \end{bmatrix}$
(C) $\begin{bmatrix} 11 & 12 \\ 7 & -7 \end{bmatrix}$
(D) $\begin{bmatrix} 1 & 8 \\ 1 & 3 \end{bmatrix}$

Q11. If $u = x^y, v = y^x$ and quantity y remains 3 times the quantity x then find that amongst quantities u and v, which changes more rapidly with respect to quantity x when $x = 1$. (Take $\log_e 3 = 1.09$)

(A) u changes more rapidly
(B) v changes more rapidly
(C) Both change at the same rate
(D) Cannot be determined

Q11 (OR). If $x = \frac{1-t^2}{1+t^2}, y = \frac{2t}{1+t^2}$ then prove that $\frac{dy}{dx} + \frac{x}{y} = 0$.

Q12. Evaluate $\int \frac{3x+2}{(x^2+1)(x-2)}dx$.

(A) $\frac{8}{5}\log|x-2| - \frac{4}{5}\log(x^2+1) + \frac{13}{5}\tan^{-1}x + C$
(B) $\frac{8}{5}\log|x-2| - \frac{4}{5}\log(x^2+1) + \frac{26}{5}\tan^{-1}x + C$
(C) $\log|x-2| + \tan^{-1}x + C$
(D) $\frac{3}{5}\log|x-2| - \frac{3}{5}\log(x^2+1) + \tan^{-1}x + C$

Q13. Solve the following linear programming problem graphically: Maximize and minimize $Z = 4x + 2y - 7$ subject to the constraints $x + 3y \leq 60, x + y \geq 10, x - y \leq 0, x \geq 0, y \geq 0$.

Q14. Solve: $x \log x \frac{dy}{dx} + y = \frac{2}{x}\log x$.

(A) $y \log x = -\frac{2}{x}(1 + \log x) + C$
(B) $y \log x = -\frac{2}{x} + C$
(C) $y \log x = \frac{2}{x}\log x + C$
(D) $y = x \log x + C$

Q15. A laboratory blood test is 99% effective in detecting a certain disease when it is in fact present. However, the test also yields a false positive result for 0.5% of the healthy person tested. If 0.1% of the population actually has the disease, what is the probability that a person has the disease given that his test result is positive?

(A) 0.22
(B) 0.165

(C) 0.50
(D) 0.001

Section - D

Q16. Ajay, Sameer and Meenal have Rs. 20/- each and some footballs, basketballs and volleyballs in their shops. In a week, Ajay sold 3 footballs and a volleyball but he bought 2 basketballs for his shop and he has Rs. 35/- now. In same duration, Sameer sold 2 basketballs and 2 volleyballs but he bought a football for his shop and he has Rs. 95/- now. Similarly, Meenal sold 2 footballs and a basketball but she bought 3 volleyballs for her shop and she has Rs. 15/- now. Find the cost of a football, a basketball and a volleyball by the help of matrices.

(A) Football: Rs. 15, Basketball: Rs. 25, Volleyball: Rs. 20
(B) Football: Rs. 10, Basketball: Rs. 20, Volleyball: Rs. 30
(C) Football: Rs. 20, Basketball: Rs. 15, Volleyball: Rs. 25
(D) Football: Rs. 25, Basketball: Rs. 20, Volleyball: Rs. 15

16(a). Express $\begin{bmatrix} 5 & 1 \\ 3 & 7 \end{bmatrix}$ as the sum of a symmetric matrix and a skew-symmetric matrix.

(A) $\begin{bmatrix} 5 & 2 \\ 2 & 7 \end{bmatrix} + \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$
(B) $\begin{bmatrix} 5 & 1 \\ 1 & 7 \end{bmatrix} + \begin{bmatrix} 0 & 0 \\ 2 & 0 \end{bmatrix}$
(C) $\begin{bmatrix} 0 & 2 \\ 2 & 0 \end{bmatrix} + \begin{bmatrix} 5 & -1 \\ 1 & 7 \end{bmatrix}$
(D) $\begin{bmatrix} 5 & 3 \\ 3 & 7 \end{bmatrix} + \begin{bmatrix} 0 & -2 \\ 2 & 0 \end{bmatrix}$

16(b). If $A = \begin{bmatrix} 3 & 2 \\ 4 & 7 \end{bmatrix}$ and $f(x) = x^2 - 10x + 13$, then show that $f(A) = O$ and using this result find A^{-1}.

(A) $A^{-1} = \frac{1}{13}\begin{bmatrix} 7 & -2 \\ -4 & 3 \end{bmatrix}$
(B) $A^{-1} = \frac{1}{13}\begin{bmatrix} 3 & 2 \\ 4 & 7 \end{bmatrix}$

(C) $A^{-1} = \begin{bmatrix} 7 & -2 \\ -4 & 3 \end{bmatrix}$
(D) $A^{-1} = \frac{1}{10}\begin{bmatrix} 7 & -2 \\ -4 & 3 \end{bmatrix}$

17(a). Prove that for any two non-zero vectors $\vec{a}$ and $\vec{b}$, $|\vec{a}+\vec{b}| \leq |\vec{a}| + |\vec{b}|$. Also write the name of this inequality.

17(b). Adjacent sides of a parallelogram are given by $6\hat{i}-\hat{j}+5\hat{k}$ and $\hat{i}+5\hat{j}-2\hat{k}$. Find the area of parallelogram.

(A) $\sqrt{1779}$ sq. units
(B) $\sqrt{1850}$ sq. units
(C) 45 sq. units
(D) $\sqrt{1600}$ sq. units

17(OR)(a). Find the shortest distance between the following pairs of lines: $\vec{r} = \hat{i} - 4\hat{j} + 5\hat{k} + \mu(5\hat{i} + 9\hat{j} + \hat{k})$ and $\vec{r} = 2\hat{i} + 8\hat{j} - 6\hat{k} + \lambda(3\hat{i} - 2\hat{j} + \hat{k})$.

17(OR)(b). Find the angle between the lines $\vec{r} = 3\hat{i} + 8\hat{j} + 3\hat{k} + \mu(\hat{i} + 2\hat{j} - \hat{k})$ and $\vec{r} = -3\hat{i} + 9\hat{j} - \hat{k} + \lambda(5\hat{i} + 3\hat{j} + 4\hat{k})$.

Q18. Find the height of the right circular cone of maximum volume, which is inscribed in a sphere of radius 12cm.

(A) 16 cm
(B) 12 cm
(C) 18 cm
(D) 20 cm

18(OR). Evaluate $\int \frac{x^2}{x^4+1} dx$.
