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PLEASURE TEST SERIES PTS-35

For CBSE 2026 Board Exams - Class 12

MATHEMATICS

SUBJECT CODE - 041

a compilation by

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General Instructions : Same as given in PTS-01.

SECTION A

*(Question numbers 01 to 20 carry **1 mark** each.)*

*Followings are **multiple choice questions**. Select the correct option in each one of them.*

01. Let $A=\left[a_{ij}\right]_{2\times 3}$ be such that $a_{ij}=\begin{cases} i+2j, \text{ if } i\neq j \\ j-i, \text{ if } i=j \end{cases}$. Then, $(a_{21})^{a_{11}+a_{22}}=$

(a) 0 (b) 3 (c) 6 (d) 1

02. The function $f:\mathbb{R}\to\mathbb{R}$ defined by $f(x)=4+3\cos x$ is

(a) one-one and onto both (b) one-one but not onto

(c) onto but not one-one (d) neither one-one nor onto

03. A relation R is defined on N. Which of the following is the reflexive relation?

(a) $R=\{(x, y): x>y,\ x, y\in N\}$

(b) $R=\{(x, y): x+y=10,\ x, y\in N\}$

(c) $R=\{(x, y): xy \text{ is the square number},\ x, y\in N\}$

(d) $R=\{(x, y): x+4y=10;\ x, y\in N\}$

04. If $A=\begin{bmatrix} 1 & 2 & 0 \\ -2 & 3 & -1 \\ 4 & 5 & -4 \end{bmatrix}$, then $A'=$

(a) $\begin{bmatrix} 1 & 2 & 0 \\ -2 & 3 & -1 \\ 4 & 5 & -4 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & -2 & 4 \\ 2 & 3 & 5 \\ 0 & -1 & -4 \end{bmatrix}$ (c) $\begin{bmatrix} -1 & 2 & -4 \\ -2 & -3 & -5 \\ 0 & 1 & 4 \end{bmatrix}$ (d) $\begin{bmatrix} -1 & -2 & 0 \\ 2 & -3 & 1 \\ -4 & -5 & 4 \end{bmatrix}$

05. If $A=\begin{bmatrix} 1 & 2 \\ 1 & 3 \end{bmatrix}$, then $A^{-1}+A=$

(a) I_2 (b) $4A$ (c) $4I_2$ (d) $-4I_2$

06. If A is a square matrix of order 3 such that $|A|=-2$ then, which of the following is correct?

(a) $|\text{adj.}A|=-2$ (b) $|A'|=2$ (c) $|\text{adj.}A|=4$ (d) $|A^{-1}|=\frac{1}{2}$

07. If the function $f(x)=\begin{cases} 3x-8, \text{ if } x\leq 5 \\ 2k, \text{ if } x>5 \end{cases}$ is continuous, then the value of $2k$ is

(a) $\frac{7}{2}$ (b) 7 (c) $\frac{2}{7}$ (d) $\frac{4}{7}$

08. The derivative of an odd function

(a) is always an even function (b) is always an odd function

(c) does not exist (d) is always 0

09. The value of x for which $y=(x-x^2)$ is maximum is

(a) $\frac{3}{4}$ (b) $\frac{1}{2}$ (c) $\frac{1}{3}$ (d) $\frac{1}{4}$

10. The length 'x' of a rectangle is decreasing at the rate of 3 cm per minute and the width 'y' is increasing at the rate of 2 cm per minute. When $x = 10$ cm and $y = 6$ cm then, the rate of change of the perimeter of the rectangle is

(a) 2 cm/minute (b) -2 cm/minute (c) -1 cm/minute (d) -3 cm/minute

11. The function $f(x) = 2x^2 - 3x$ decreases strictly for

(a) all $x \in R$ (b) $x \in \left(\frac{3}{4}, \infty\right)$ (c) $x \in \left(-\infty, \frac{3}{4}\right)$ (d) no value of x

12. $\int 2^x dx$ equals

(a) $\frac{\log 2}{2^x} + C$ (b) $2^x \times \log 2 + C$ (c) $\frac{2^x}{\log 2} + C$ (d) $\frac{2^{x+1}}{x+1} + C$

13. $\int \frac{1}{(x-1)(x+2)} dx =$

(a) $\frac{1}{3}\log\left|\frac{x+2}{x-1}\right| + C$ (b) $\frac{1}{3}\log\left|\frac{x-1}{x+2}\right| + C$ (c) $\log\left|\frac{x-1}{x+2}\right| + C$ (d) $\frac{1}{2}\log\left|\frac{x+2}{x-1}\right| + C$

14. Value of $\int \frac{\sec^2\sqrt{x}\,dx}{\sqrt{x}\tan\sqrt{x}}$ is

(a) $-2\log\left|\tan\sqrt{x}\right| + C$ (b) $2\tan\sqrt{x} + C$ (c) $\frac{2}{\tan\sqrt{x}} + C$ (d) $2\log\left|\tan\sqrt{x}\right| + C$

15. The value of $\int_0^{\frac{\pi}{2}} \sin 2x \log\tan x\,dx$ is

(a) $\frac{\pi}{4}$ (b) π (c) $\frac{\pi}{2}$ (d) 0

16. For $\frac{dy}{dx} + y = \sin x$, the integration factor is given by $f(x)$, then $f'(0) =$

(a) e^x (b) e (c) 1 (d) e^{-1}

17. Maximum value of $f(x) = \sin(\sin x)$, $x \in \mathbb{R}$ is

(a) 1 (b) 0 (c) $-\sin(1)$ (d) $\sin(1)$

18. If A and B are events such that $P(A|B) = P(B|A)$, then

(a) $A \subset B$ but $A \neq B$ (b) $A = B$ (c) $A \cap B = \phi$ (d) $P(A) = P(B)$

Followings are ***Assertion-Reason based questions.***

In the following questions, a statement of Assertion (A) is 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.

19. **Assertion (A) :** The value of $\sin^{-1}\left(\cos\frac{13\pi}{5}\right)$ is $-\frac{21\pi}{10}$.

Reason (R) : For $y = \sin^{-1} x$, we always have $x \in [-1, 1]$.

20. **Assertion (A) :** If $x = a\sin t$ and $y = b\cos t$, then $\frac{dy}{dx} = -\frac{b^2x}{a^2y}$.

Reason (R) : The derivative of $\frac{dy}{dx}$ with respect to x is denoted by $\frac{d}{dx}\left(\frac{dy}{dx}\right) = \frac{d^2y}{dx^2}$.

SECTION B

*(Question numbers 21 to 25 carry **2 marks** each.)*

21. Simplify : $\sin^{-1}\left[2x\sqrt{1-x^2}\right], -\frac{1}{\sqrt{2}} \le x \le \frac{1}{\sqrt{2}}$.

22. A circular disc of radius 3 cm is being heated. Due to expansion, its radius increases at the rate of 0.05 cm/s. Find the rate at which its area is increasing when radius is 3.2 cm.

23. Dot product of a vector with vectors $\hat{i}-\hat{j}+\hat{k}$, $2\hat{i}+\hat{j}-3\hat{k}$ and $\hat{i}+\hat{j}+\hat{k}$ are respectively 4, 0 and 2. Find the vector.

24. If $A = \begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$ and I is the identity matrix of order 2, then show that $A^2 = 4A - 3I$.

OR

If $X\begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{pmatrix} = \begin{pmatrix} -7 & -8 & -9 \\ 2 & 4 & 6 \end{pmatrix}$, then find the matrix X.

25. Find $\int \frac{e^x}{\sqrt{5-4e^x-e^{2x}}}dx$.

OR

Find $\int \frac{\sin(x-a)}{\sin(x+a)}dx$.

SECTION C

*(Question numbers 26 to 31 carry **3 marks** each.)*

26. Let $f : N \to \mathbb{R}$ be a function defined as $f(x) = 4x^2 + 12x + 15$.
Show that the function f(x) is one-one. Is f onto?

OR

Consider a relation R in the set A of people living in a colony defined as x R y iff x and y are members of joint family. Check if R is an equivalence relation. Give reason (s) to justify.

27. Find the interval in which the function $f(x) = x^2e^{-x}$ is increasing and/or decreasing.

28. Find the particular solution of the following differential equation, given that $y = 0$ when $x = 1$:
$(x^2 + xy)dy = (x^2 + y^2)dx$.

OR

Find the particular solution of the differential equation $e^x\sqrt{1-y^2}\,dx + \frac{y}{x}dy = 0$, given that $y = 1$ when $x = 0$.

29. Let P(3, 2, 6) be a point in the space and Q be a point on the line $\vec{r} = (\hat{i}-\hat{j}+2\hat{k}) + \mu(-3\hat{i}+\hat{j}+5\hat{k})$ then, find the value of μ, for which the vector $\overrightarrow{PQ}$ is perpendicular to the line $\vec{r} = (2\hat{i}-\hat{j}+\hat{k}) + \lambda(\hat{i}-4\hat{j}+3\hat{k})$.

30. Out of a group of 30 people, 20 always speak the truth, and 10 always lie. If Miss Shreya selects two people at random, one after the other without replacement, and asks them the same yes/no question. Assume each person answers independently.

(i) What is the probability that one tells the truth and the other lies?

(ii) What is the probability that both lie?

31. If $y = (\sec^{-1} x)^2$, $x > 0$, show that $x^2(x^2-1)\frac{d^2y}{dx^2} + (2x^3 - x)\frac{dy}{dx} - 2 = 0$.

OR

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

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

SECTION D

*(Question numbers 32 to 35 carry **5 marks** each.)*

32. Use integration to find the area of the region in the first quadrant enclosed by the x-axis, the line $y = x$ and the circle $x^2 + y^2 = 32$.

33. Show that the lines $\frac{x+1}{3} = \frac{y+3}{5} = \frac{z+5}{7}$ and $\frac{x-2}{1} = \frac{y-4}{3} = \frac{z-6}{5}$ intersect.

Also, find their point of intersection.

34. Find graphically, the maximum value of $z = 2x + 5y$, subject to constraints given below :

$2x + 4y \le 8,\ 3x + y \le 6,\ x + y \le 4,\ x \ge 0,\ y \ge 0$.

OR

Maximise $z = 8x + 9y$, subject to the constraints given below :

$2x + 3y \le 6,\ 3x - 2y \le 6,\ y \le 1;\ x, y \ge 0$.

Also, write the point at which z is maximum.

35. Show that the semi-vertical angle of the cone of the maximum volume and of given slant height is $\cos^{-1}\frac{1}{\sqrt{3}}$.

OR

Let x and y be the sides of two squares such that $y = x - x^2$. Find the rate of change of the area of second square with respect to the area of first square.

SECTION E

*(Question numbers 36 to 38 carry **4 marks** each.)*

*This section contains **three Case-study / Passage based questions**.*

*First two questions have **three sub-parts** (i), (ii) and (iii) of **marks 1, 1 and 2** respectively.*

*Third question has **two sub-parts** of **2 marks** each.*

36. **CASE STUDY I :** Read the following passage and then answer the questions given below.

Bank A Bank B Bank C

A family decides to deposit a total amount of ₹7000/- in three different savings bank accounts in the - Bank A, Bank B and Bank C - with annual interest rates of 5%, 8% and $8\frac{1}{2}$% respectively.

The total annual interest from these three accounts is ₹550/-.

Equal amounts have been deposited in Bank A and Bank B savings accounts.

(i) If the amount deposited by the family in the Bank A, Bank B and Bank C be x, y and z (in ₹) respectively, then express the above information in terms of three linear equations.

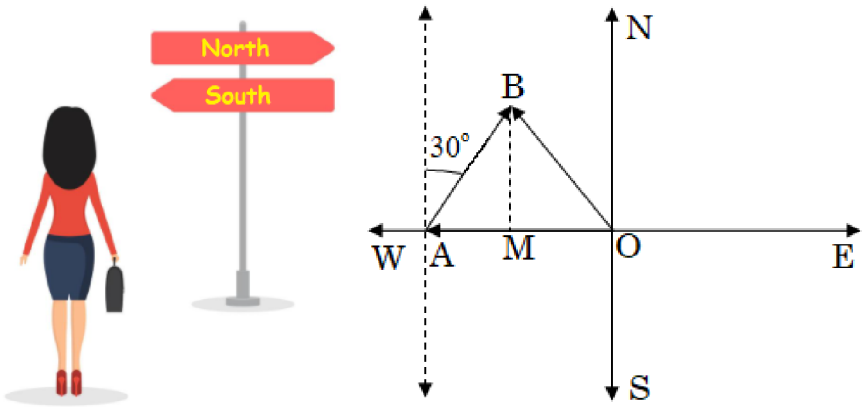
(ii) Using matrices, represent the system of three linear equations obtained above in **(i)**.

(iii) Is the system of linear equations obtained above in **(i)**, consistent? What will be the number of solutions of system of linear equations? Use concept of matrices and determinants, to justify your answer.

OR

(iii) Find the amount deposited in the Bank A and Bank C. Use matrices.

37. **CASE STUDY II :** Read the following passage and then answer the questions given below.



Anjani walks 4 km towards west, then 3 km in a direction 30° east of north and then, she stops. The situation has been depicted in the diagram as shown above, assuming that the girl starts her walk from O.

In the diagram, ON represents positive y-axis and North direction, OE represents positive x-axis and East direction. Similarly, OW is representing negative x-axis and West direction, whereas OS represents negative y-axis and South direction.

Also, $OA = 4$ km, $AB = 3$ km.

(i) What is the vector $\overrightarrow{OA}$?

(ii) What is the position vector of point B?

(iii) What is the vector $\overrightarrow{AB}$? Also, what is the value of $\overrightarrow{AB} \times \overrightarrow{OA}$?

OR

(iii) What is the area of ΔOAB? Use vector method.

38. **CASE STUDY III :** Read the following passage and then answer the questions given below.

A factory has three machines A, B and C to manufacture bolts.

- Machine A manufactures 30% of the bolts.
- Machine B manufactures 20% of the bolts.
- Machine C manufactures 50% of the bolts.

Out of their respective output 5%, 2% and 4% are defective bolts.

A bolt is drawn at random from total production and it is found to be defective.

Let E_1, E_2 and E_3 be the events of drawing a bolt manufactured by machine A, B and C respectively. Also assume that E be the event that a defective bolt is drawn.

(i) Find the probability that a defective bolt is drawn.

(ii) Find the probability that defective bolt drawn is manufactured by machine A.

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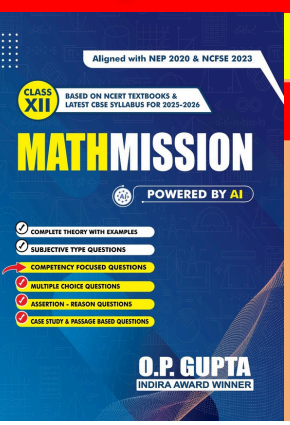

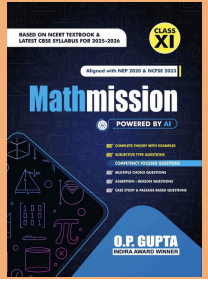

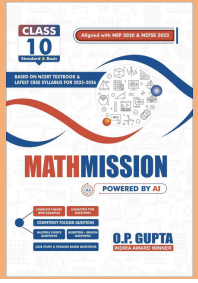

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ABOUT THE AUTHOR

O.P. GUPTA having taught math passionately over a decade, has devoted himself to this subject. Every book, study material or practice sheets, tests he has written, tries to teach serious math in a way that allows the students to learn math without being afraid. Undoubtedly his mathematics books are best sellers on Amazon and Flipkart. His resources have helped students and teachers for a long time across the country. He has contributed in CBSE Question Bank (issued in April 2021). Mr Gupta has been invited by many educational institutions for hosting sessions for the students of senior classes. Being qualified as an electronics & communications engineer, he has pursued his graduation later on with mathematics from University of Delhi due to his passion towards mathematics. He has been honored with the prestigious INDIRA AWARD by the Govt. of Delhi for excellence in education.

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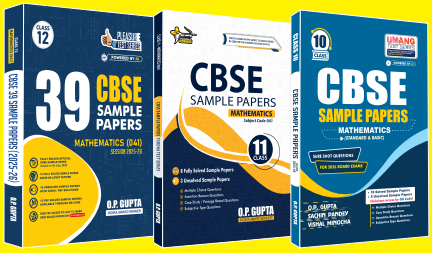

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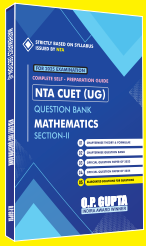

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