Aakash + BYJU'S

Mock Test Paper

for

CBSE Board Exam.-2024

MATHEMATICS

INSTRUCTIONS FOR CANDIDATES

1. This Question paper contains - **five sections** A, B, C, D and E. Each section is compulsory. However, there is some internal choice in some questions.
2. **Section-A** has 18 MCQ's and 2 Assertion Reason based questions of 1 mark each.
3. **Section-B** has 5 Very Short Answer(VSA) questions of 2 marks each.
4. **Section-C** has 6 Short Answer(SA) questions of 3 marks each.
5. **Section-D** has 4 Long Answer(LA) questions of 5 marks each.
6. **Section-E** has 3 source based/case based/passage based/integrated units of assessment (4 marks each) with sub parts.
7. Internal Choice is provided in 2 questions in Section-B, 3 questions in Section-C, 2 Questions in Section-D. You have to attempt only one alternatives in all such questions.

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MM : 80 **Time : 3 Hrs.**

Mock Test Paper

CBSE Board Exam.-2024

Class-XII

MATHEMATICS

Complete Syllabus of Class XII

SECTION-A

Q1. If $A=\begin{bmatrix}\cos\alpha & -\sin\alpha\\ \sin\alpha & \cos\alpha\end{bmatrix}$ and $B=\begin{bmatrix}\cos\beta & -\sin\beta\\ \sin\beta & \cos\beta\end{bmatrix}$, then the correct relation is **[1]**

(1) $A^2 = B^2$
(2) $A + B = B - A$
(3) $AB = BA$
(4) $A = B$

Q2. The roots of the equation $\begin{vmatrix}1 & 4 & 20\\ 1 & -2 & 5\\ 1 & 2x & 5x^2\end{vmatrix}=0$ are **[1]**

(1) –1, –2
(2) –1, 2
(3) 1, –2
(4) 1, 2

Q3. If $f(x)=\begin{cases}\dfrac{x^2-4x+3}{x^2-1}, & \text{for } x\neq 1\\ 2, & \text{for } x=1\end{cases}$, then **[1]**

(1) $\lim_{x\to 1^+} f(x)=2$
(2) $\lim_{x\to 1^-} f(x)=3$
(3) $f(x)$ is discontinuous at $x = 1$
(4) $f(x)$ is continuous at $x = 1$

Q4. If $|\vec{a}| = 3$, $|\vec{b}| = 4$ and $|\vec{a}+\vec{b}| = 5$, then $|\vec{a}-\vec{b}| =$ **[1]**

(1) 6
(2) 5
(3) 4
(4) 3

Q5. Equation of x-axis is **[1]**

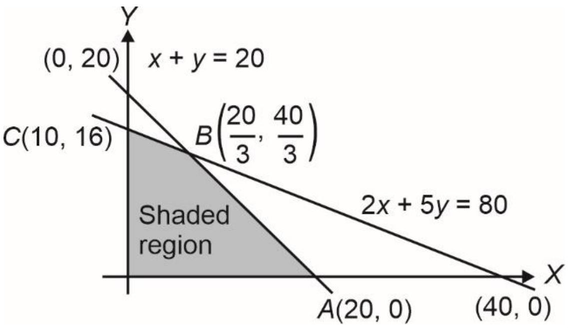
(1) $\dfrac{x}{1}=\dfrac{y}{1}=\dfrac{z}{1}$
(2) $\dfrac{x}{0}=\dfrac{y}{1}=\dfrac{z}{1}$
(3) $\dfrac{x}{1}=\dfrac{y}{0}=\dfrac{z}{0}$
(4) $\dfrac{x}{0}=\dfrac{y}{0}=\dfrac{z}{1}$

Q6. $y = 4\sin 3x$ is a solution of the differential equation **[1]**

(1) $\frac{dy}{dx}+8y=0$ (2) $\frac{dy}{dx}-8y=0$

(3) $\frac{d^2y}{dx^2}+9y=0$ (4) $\frac{d^2y}{dx^2}-9y=0$

Q7. Shaded region is represented by **[1]**



(1) $2x + 5y \geq 80$, $x + y \leq 20$, $x \geq 0$, $y \leq 0$

(2) $2x + 5y \geq 80$, $x + y \geq 20$, $x \geq 0$, $y \geq 0$

(3) $2x + 5y \leq 80$, $x + y \leq 20$, $x \geq 0$, $y \geq 0$

(4) $2x + 5y \leq 80$, $x + y \leq 20$, $x \leq 0$, $y \leq 0$

Q8. If $\int(\sin 2x-\cos 2x)dx=\frac{1}{\sqrt{2}}\sin(2x-a)+C$, then **[1]**

(1) $a=\frac{5\pi}{4}, C\in R$ (2) $a=-\frac{5\pi}{4}, C\in R$

(3) $a=\frac{\pi}{4}, C\in R$ (4) $a=\frac{\pi}{2}, C\in R$

Q9. If one side of a square be represented by the vector $3i + 4j + 5k$, then the area of the square is **[1]**

(1) 12 (2) 13

(3) 25 (4) 50

Q10. If k is a scalar and I is a unit matrix of order 3, then adj(kI) = **[1]**

(1) k^3I (2) k^2I

(3) $-k^3I$ (4) $-k^2I$

Q11. If $P(A\cup B)=\frac{2}{3}, P(A\cap B)=\frac{1}{6}$ and $P(A)=\frac{1}{3}$, then **[1]**

(1) A and B are independent events (2) A and B are dependent events

(3) A and B are disjoint events (4) A and B are equiprobable events

Q12. Consider the points $O(0, 0)$ and $P(2, -2)$. Let R denotes the region in cartesian plane represented by the graph of inequation $2x - 3y < 5$. Which of the following is correct about location of O and P w.r.t. region R? **[1]**

(1) O inside and P outside
(2) O and P both inside
(3) O and P both outside
(4) O outside and P inside

Q13. The order and degree of the differential equation $\left[4+\left(\frac{dy}{dx}\right)^2\right]^{2/3} = \frac{d^2y}{dx^2}$ are **[1]**

(1) 2 and 2 respectively
(2) 3 and 3 respectively
(3) 2 and 3 respectively
(4) 3 and 2 respectively

Q14. If $y = x\sin x$, then **[1]**

(1) $\frac{1}{y}\frac{dy}{dx} = \frac{1}{x} + \cot x$
(2) $\frac{dy}{dx} = \frac{1}{x} + \cot x$
(3) $\frac{1}{y}\frac{dy}{dx} = \frac{1}{x} - \cot x$
(4) $y.\frac{dy}{dx} = \frac{1}{x} - \cot x$

Q15. The relation $R = \{(1,1), (2, 2), (3, 3), (1, 2), (2, 3), (1, 3)\}$ on set $A = \{1, 2, 3\}$ is **[1]**

(1) Reflexive but not symmetric
(2) Reflexive but not transitive
(3) Symmetric and transitive
(4) Neither symmetric nor transitive

Q16. The principal value of $\cos^{-1}\left(\cos\frac{7\pi}{6}\right)$ is equal to **[1]**

(1) $\frac{7\pi}{6}$
(2) $\frac{5\pi}{6}$
(3) $\frac{\pi}{6}$
(4) π

Q17. Let $f(x) = x - [x]$, for every real number x, where $[x]$ is integral part of x. Then $\int_{-1}^{1} f(x)\,dx$ is **[1]**

(1) 1
(2) 2
(3) 0
(4) $\frac{1}{2}$

Q18. If $OP = 8$ and $\overrightarrow{OP}$ makes angles 45° and 60° with OX-axis and OY-axis respectively, then $\overrightarrow{OP} =$ **[1]**

(1) $8\left(\sqrt{2}i + j \pm k\right)$
(2) $4\left(\sqrt{2}i + j \pm k\right)$
(3) $\frac{1}{4}\left(\sqrt{2}i + j \pm k\right)$
(4) $\frac{1}{8}\left(\sqrt{2}i + j \pm k\right)$

Q19. Assertion (A) : The relation $f : \{1, 2, 3, 4, 5\} \to \{a, b, c, d, e\}$ defined by $f = \{(1, a), (2, b), (3, c), (4, d), (5, d)\}$ is a bijective function. **[1]**

Reason (R) : The function $f : \{1, 2, 3, 4\} \to \{a, b, c, d, e\}$ such that $f = \{(1, a), (2, b), (3, c), (4, d)\}$ is one-one.

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.

(1) Both (A) & (R) are true & (R) is correct explanation of A.

(2) Both (A) & (R) are true but (R) is not the correct explanation of A.

(3) (A) is true but (R) is false.

(4) (A) is false but (R) is true.

Q20. Assertion (A) : The maximum value of the function $f(x) = x^3$, $x \in [-1, 1]$ is attained at, $x = 0$. **[1]**

Reason (R) : The derivative of function $f(x) = x^3$ at $x = 0$ is zero.

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.

(1) Both (A) & (R) are true & (R) is correct explanation of A.

(2) Both (A) & (R) are true but (R) is not the correct explanation of A.

(3) (A) is true but (R) is false.

(4) (A) is false but (R) is true.

SECTION-B

Q21. Find the value of $\sin^{-1}\left(\sin\frac{\pi}{4}\right)+\tan^{-1}\left(\tan\frac{3\pi}{4}\right)$. **[2]**

OR

The value of $\cos^{-1}\left(\cos\frac{3\pi}{4}\right)+\cos^{-1}\left(\cos\frac{4\pi}{3}\right)$ is equal to $\frac{25\pi}{12}$.

Q22. Find the maximum and minimum values, if any of the functions given by $f(x) = (2x - 1)^2 + 3$ **[2]**

Q23. Radius of a circle is increasing uniformly at the rate of 3 cm/sec. Find the rate of increasing of area when radius is 10 cm. **[2]**

OR

A man with height equal to 2 meters, walks at a uniform speed 5 meter/hour away from a lamp post 6 meter high. Find the rate at which the length of his shadow increases.

Q24. The value of the integral $\int_{-\pi/2}^{\pi/2} \sin^5 x\,dx$ is equal to zero. **[2]**

Q25. Show that $f(x) = 6x + 1$ is increasing for all $x \in R$. **[2]**

SECTION-C

Q26. A coin is tossed 7 times. Each time a man calls head. Find the probability that he wins the toss on more occasions. **[3]**

Q27. Evaluate: $\int_{0}^{\pi/2} x^2\cos 2x dx$ **[3]**

OR

Show that : $\int_{0}^{\pi/4} 2\tan^3 x dx = 1 - \log 2$ **[3]**

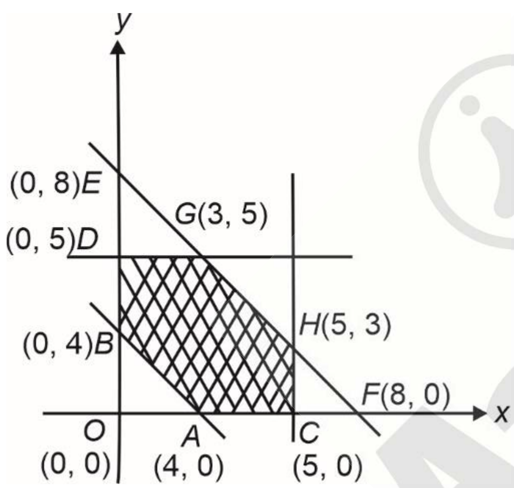
Q28. Find an integrating factor for the differential equation $\left(1+y^2\right)dx - \left(\tan^{-1}y - x\right)dy = 0$. **[3]**

OR

Find an integrating factor of the differential equation $(1-x^2)\frac{dy}{dx} - xy = 1$. **[3]**

Q29. Evaluate: $\int_{1}^{2} \frac{1}{x(1+\log x)^2}dx$ **[3]**

Q30. Find the maximum and minimum value of $z = x - 7y + 190$ for which the shaded area in the figure below is the solution set. **[3]**



OR

Find the maximum value of $z = 3x + 4y$ subject to the constraints $x + y \leq 40$, $x + 2y \leq 60$, $x \geq 0$ and $y \geq 0$. **[3]**

Q31. If $y = \ln(1 + \cos x)^2$, then find the value of $\frac{d^2y}{dx^2} + \frac{2}{e^{y/2}}$. **[3]**

SECTION-D

Q32. Show that the function $f : R - \{-1\} \to R - \{1\}$ given that $f(x) = \frac{x-3}{x+1}$ is a bijective function. **[5]**

Q33. The curve $y = a\sqrt{x} + bx$ passes through the point (1,2) and the area enclosed by the curve, the axis of x and the line $x = 4$ is 8 square units. Determine a, b, where a and b are positive. **[5]**

OR

Compute the area of the figure bounded by the parabolas $x = -2y^2$, $x = 1 - 3y^2$ **[5]**

Q34. If $A=\begin{bmatrix}3 & 1\\ -1 & 2\end{bmatrix}$, show that $A^2 - 5A + 7I = 0$. Use this result to find A^4. **[5]**

Q35. Find the image of the point (1, 6, 3) in the line $\frac{x}{1}=\frac{y-1}{2}=\frac{z-2}{3}$. Also write the equation of the line joining the given point and its image and find the length of the segment joining the given point and its image. **[5]**

OR

Show that the lines $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$ and $\frac{x-4}{5}=\frac{y-1}{2}=z$ intersect. Also find the point of intersection

SECTION-E

Q36. *X* and *Y* are two candidates who appeared for the first round of an interview for two vacancies. The probability of *X*'s selection is 1/6 and that of *Y*'s selection is 1/4. **[4]**

Based on the above information, answer the following questions:

(i) Find the probability that both are selected.

(ii) Find the probability that none of them is selected.

(iii) The probability that only one of them is selected.

OR

(iii) The probability that at least one of them is selected.

Q37. A tank initially contains 100 litres of brine in which 50 gms of salt dissolved. A brine containing 2 gm/ litre of salt runs into the tank at the rate of 5 litre/min. The mixture is kept stirring and flows out of the tank at the rate of 4 litres /min then **[4]**

(i) At what rate (gms/min) does salt enter the tank at time *t*?

(ii) What is the volume of the brine in the tank at time *t*?

(iii) At what rate (gms/min) does salt leave the tank at time *t*?

OR

(iii) Form the differential equation of the process and solve it to find an expression for the amount of salt present at time *t*.

Q38. Inverse trigonometric functions are simplified as different inverse trigonometric functions depending on the value of the variables involved. For example, for x ∈ (–1, 0) we can write $\cos^{-1}\frac{1-x^2}{1+x^2}=-2\tan^{-1}x$. Hence some equations give different solutions in different intervals of *x*. **[4]**

Consider the functions $f(x)=\sin^{-1}\left(\frac{2x}{1+x^2}\right)$, $g(x)=\cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)$ and $h(x)=\tan^{-1}\left(\frac{2x}{1-x^2}\right)$.

(i) If $x \in (0,1)$, then find the solution of the equation $f(x)+g(x)+h(x)=\frac{\pi}{2}$.

(ii) If $x \in (-1, 0)$, then find the solution of the equation $f(x)+g(x)+h(x)=\frac{\pi}{2}$.

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CBSE Class XII Board Exam Result 2023

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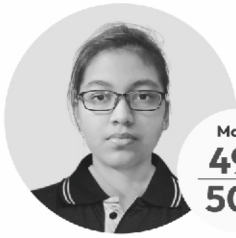
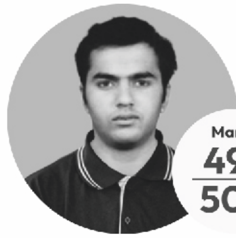


Marks 498/500

Pratistha Pal



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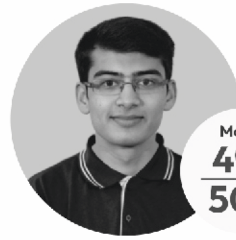
Kabir



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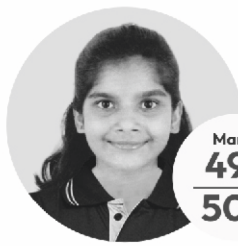
Dhruv Advani

Marks 495/500

Aadya Roy



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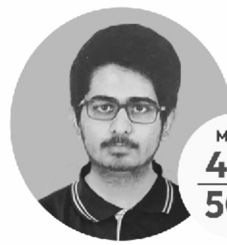

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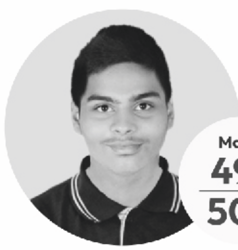
Soumil Kaul



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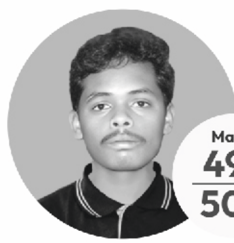
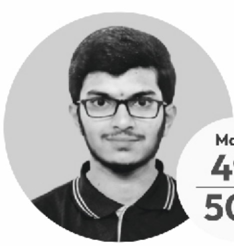


Marks 492/500

Alex Singh

Marks 492/500

Sneha Ray



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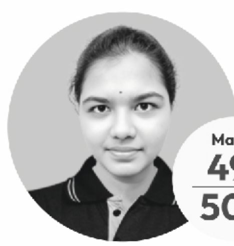
Vijay Kulkarni



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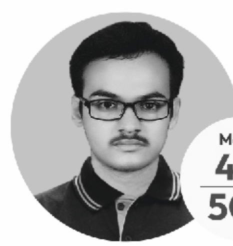
Sravani Reddy



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