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FOR MAHARASHTRA BOARD (MSBSHSE) CLASS 12 EXAM PREPARATION

Maharashtra Board (MSBSHSE) Class 12 2026 March Session Question Paper · Maths (Arts & Science)

EXAM
Maharashtra Board (MSBSHSE) Class 12

YEAR
2026

TYPE
March Session Question Paper

SUBJECT
Maths (Arts & Science)

DAY — 09 SEAT NUMBER | | | | | | | |

2026	II	21	1100	J-165	(E)

MATHEMATICS & STATISTICS (40)
(ARTS & SCIENCE)

Time : 3 Hrs. **(8 Pages)** **Max. Marks : 80**

General instructions :

*The question paper is divided into **FOUR** sections.*

(1) ***Section A :*** *Q. 1 contains **Eight** multiple choice type questions, each carrying **Two** marks.*

*Q. 2 contains **Four** very short answer type questions, each carrying **One** mark.*

(2) ***Section B :*** *Q. 3 to Q. 14 contain **Twelve** short answer type questions, each carrying **Two** marks.*
*(Attempt any **Eight**)*

(3) ***Section C :*** *Q. 15 to Q. 26 contain **Twelve** short answer type questions, each carrying **Three** marks.*
*(Attempt any **Eight**)*

(4) ***Section D :*** *Q. 27 to Q. 34 contain **Eight** long answer type questions, each carrying **Four** marks.*
*(Attempt any **Five**)*

(5) *Use of log table is allowed. Use of calculator is not allowed.*

(6) *Figures to the right indicate full marks.*

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(7) Use of graph paper is <u>not</u> necessary. Only rough sketch of graph is expected.

(8) For each multiple choice type of question, only the first attempt will be considered for evaluation.

(9) Start answer to each section on a new page.

SECTION – A

Q. 1. Select and write the correct answer of the following multiple choice type of questions : **[16]**

(i) The converse of contrapositive of $\sim p \rightarrow q$ is _____.

(a) $q \rightarrow p$ (b) $\sim q \rightarrow p$

(c) $p \rightarrow \sim q$ (d) $\sim q \rightarrow \sim p$ (2)

(ii) If $A = \begin{bmatrix} 2 & -4 \\ 3 & 1 \end{bmatrix}$, then the adjoint of matrix A is _____.

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

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

(iii) If $\tan^{-1}(2x) + \tan^{-1}(3x) = \frac{\pi}{4}$, then x = _____.

(a) -1 (b) $\frac{1}{6}$

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

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(iv) The angle between the line $\bar{r} = (\hat{i}+2\hat{j}+\hat{k})+\lambda(\hat{i}+\hat{j}+\hat{k})$ and the plane $\bar{r}\cdot(2\hat{i}-\hat{j}+\hat{k})=8$ is _____.

(a) $\sin^{-1}\left(\frac{\sqrt{2}}{3}\right)$ (b) $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)$

(c) $\sin^{-1}\left(\frac{1}{2}\right)$ (d) $\sin^{-1}\left(\frac{1}{\sqrt{2}}\right)$ (2)

(v) If $y=\sec(\tan^{-1}x)$, then $\frac{dy}{dx}$ at $x=1$ is _____.

(a) $\frac{1}{2}$ (b) 1

(c) $\frac{1}{\sqrt{2}}$ (d) $\sqrt{2}$ (2)

(vi) The approximate value of the function $f(x)=x^3-3x+5$ at $x=1.99$ is _____.

(a) 6.09 (b) 6.91

(c) 7.09 (d) 7.91 (2)

(vii) $\int_1^2 \frac{1}{x^2}\cdot e^{\frac{1}{x}}dx =$ _____.

(a) $\sqrt{e}+1$ (b) $\sqrt{e}-1$

(c) $\sqrt{e}(\sqrt{e}-1)$ (d) $\frac{\sqrt{e}-1}{e}$ (2)

(viii) If the p.d.f. of a continuous r.v. X is

$f(x) = \frac{x+2}{18}$, for $-2 < x < 4$

$= 0$, otherwise

then $P(|X| < 1) =$ _____

(a) $\frac{1}{9}$ (b) $\frac{2}{9}$

(c) $\frac{1}{27}$ (d) $\frac{2}{27}$ (2)

Q. 2. Answer the following questions : **[4]**

(i) Write the dual of $(p \vee q) \vee r \equiv p \vee (q \vee r)$ (1)

(ii) Evaluate : $\cos^{-1}\left(\frac{1}{2}\right) + 2\sin^{-1}\left(\frac{1}{2}\right)$ (1)

(iii) Evaluate : $\int \frac{2x}{1+x^2} dx$ (1)

(iv) Write the degree of the differential equation

$(y''')^2 + 3(y'')^3 + 3xy' + 5y = 0$ (1)

SECTION – B

Attempt any EIGHT of the following questions : **[16]**

Q. 3. Construct the switching circuit of the statement pattern $(\sim p \wedge q) \vee (p \wedge \sim r)$. (2)

Q. 4. In ΔABC, prove that $a(b\cos C - c\cos B) = b^2 - c^2$. (2)

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Q. 5. Find the general solution of $4\cos^2\theta = 3$. (2)

Q. 6. Find k, if the sum of the slopes of the lines represented by $x^2 + kxy - 3y^2 = 0$ is twice their product. (2)

Q. 7. Find the value of p, for which the vectors $\bar{a} = 3\hat{i} + 2\hat{j} + 9\hat{k}$ and $\bar{b} = \hat{i} + p\hat{j} + 3\hat{k}$ are perpendicular to each other. (2)

Q. 8. Find the vector equation of the line passing through the points $A(1,2,3)$ and $B(2,3,4)$. (2)

Q. 9. Find $\frac{dy}{dx}$, if $\sqrt{x} + \sqrt{y} = \sqrt{a}$. (2)

Q. 10. Find $\frac{d^2y}{dx^2}$, if $y = x^3 + 7x^2 - 2x - 9$. (2)

Q. 11. Test whether the function $f(x) = x^3 + 6x^2 + 12x - 7$ is increasing or decreasing for all $x \in R$. (2)

Q. 12. A stone is dropped into a quiet lake and waves in the form of circles are generated. Radius of the circular wave increases at the rate of 3 cm/sec. How fast the area enclosed is increasing when the radius is 8 cm? (2)

Q. 13. Evaluate : $\int \sqrt{1 + \sin 2x} \cdot dx$ (2)

Q. 14. Given that, $X \sim B(n, p)$, if $n = 10, E(X) = 8$ then find Var(X). (2)

SECTION – C

Attempt any EIGHT of the following questions : **[24]**

Q. 15. Examine whether the statement pattern $(p \wedge q) \wedge (\sim p \vee \sim q)$ is a tautology or contradiction or contingency. (3)

Q. 16. In ΔABC, if $A = 45^\circ$, $B = 60^\circ$ then find the ratio of its sides. (3)

Q. 17. If two vertices of a triangle are $A(3,1,4)$ and $B(-4,5,-3)$ and the centroid of the triangle is $G(-1,2,1)$, then find the coordinates of the third vertex C of the triangle. (3)

Q. 18. If D, E, F are the mid-points of the sides BC, CA, AB respectively of ΔABC, then prove that $\overline{AD} + \overline{BE} + \overline{CF} = \overline{0}$. (3)

Q. 19. Show that the lines $\bar{r} = (\hat{i} + \hat{j} - \hat{k}) + \lambda(2\hat{i} - 2\hat{j} + \hat{k})$ and $\bar{r} = (4\hat{i} - 3\hat{j} + 2\hat{k}) + \mu(\hat{i} - 2\hat{j} + 2\hat{k})$ intersect each other. (3)

Q. 20. Find the cartesian equation of the plane $\bar{r} = (\hat{i} - \hat{j}) + \lambda(\hat{i} + \hat{j} + \hat{k}) + \mu(\hat{i} - 2\hat{j} + 3\hat{k})$. (3)

Q. 21. If $y = f(u)$ is a differentiable function of u and $u = g(x)$ is a differentiable function of x then prove that y is a differentiable function of x and $\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$. (3)

Q. 22. Verify LMVT for the function $f(x) = \log x$, on [1, e]. (3)

Q. 23. Evaluate : $\int \frac{\sin x}{\sin 3x} dx$ (3)

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Q. 24. Solve the D.E. $3e^x \tan y\,dx + (1+e^x)\sec^2 y\,dy = 0$. (3)

Q. 25. Find $E(X)$ and $V(X)$, where X is the number obtained on uppermost face, when a fair die is thrown. (3)

Q. 26. A pair of dice is thrown 4 times. If getting a doublet is considered as success, find the probability of two successes. (3)

SECTION – D

Attempt any FIVE of the following questions : **[20]**

Q. 27. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, prove that $A \cdot (\text{adj } A) = (\text{adj } A) \cdot A = |A| \cdot I$ (4)

Q. 28. Show that every homogeneous equation of degree two in x and y i.e. $ax^2 + 2hxy + by^2 = 0$, represents a pair of lines passing through the origin, if $h^2 - ab \geq 0$ (4)

Q. 29. If $A(\bar{a})$ and $B(\bar{b})$ are any two points in space and $R(\bar{r})$ be a point on the line segment AB dividing internally in the ratio $m : n$ then prove that $\bar{r} = \frac{m\bar{b} + n\bar{a}}{m+n}$. (4)

Q. 30. Solve the L.P.P. graphically :

Minimize : $z = 5x + 2y$,

Subject to , $5x + y \geq 10,\ x + y \geq 6,$

$x \geq 0,\ y \geq 0$ (4)

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Q. 31. Evaluate : $\int \frac{3x^2+4x-5}{(x^2-1)(x+2)} \cdot dx$ (4)

Q. 32. Prove that : $\int_a^b f(x)\,dx = \int_a^b f(a+b-x) \cdot dx$

Hence, find $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \sin^2 x \cdot dx$ (4)

Q. 33. Find the area enclosed between the circle $x^2+y^2=1$ and the line $x+y=1$ lying in the first quadrant. (4)

Q. 34. Solve the differential equation $x^2 \cdot \frac{dy}{dx} = x^2 + xy + y^2$. (4)

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