MAHARASHTRA BOARD · CLASS 12 · MATHEMATICS AND STATISTICS (COMMERCE)

Maharashtra Board Class 12 Mathematics and Statistics (Commerce) Important Questions 2027

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Mathematical Logic

1. Determine whether a statement pattern is a tautology, contradiction or contingen

Asked 5× · Board 2022, Board 2024, Board 2025, Board 2026 · 3/4 marks

Attempt any TWO (3 marks each): Determine whether the following statement pattern is tautology, contradiction or contingency. [p ^ (~p v q)]

2. Write the converse, inverse and contrapositive of a conditional statement

Asked 5× · Board 2022, Board 2024, Board 2025, Board 2026 · 3 marks

Attempt any TWO (3 marks each): Write the converse, inverse and contrapositive of the following statement. 'If a man is rich, then he is happy.'

3. Write the dual of a logical statement

Asked 2× · Board 2023, Board 2026 · 1 marks

Fill in the blank: The dual of (p ^ ~q) v t is _____.

Matrices

4. Find the inverse of a 3x3 matrix by the adjoint method

Asked 5× · Board 2022, Board 2024, Board 2025, Board 2026 · 3/4 marks

Attempt any TWO (3 marks each): Find the inverse of matrix [1 2 3; 1 1 5; 2 4 7] by adjoint method.

5. Solve a system of linear equations by the method of reduction

Asked 3× · Board 2023, Board 2025, Board 2026 · 4 marks

Attempt any ONE (4 marks each): Solve the following equation by method of reduction: x - y + z = 4, 2x + y - 3z = 0, x + y + z = 2

6. Solve a system of linear equations by the method of inversion

Asked 2× · Board 2024, Board 2025 · 4 marks

Attempt any TWO (4 marks each): Solve the following equations by the method of inversion: 2x - y + z = 1, x + 2y + 3z = 8, 3x + y - 4z = 1

7. Find an unknown entry so that a matrix is singular

Asked 2× · Board 2022, Board 2026 · 1 marks

If A = [4 x; 6 3] is a singular matrix then x is (a) 2 (b) -2 (c) 3 (d) -3

8. Find unknowns from a matrix equation involving matrix operations

Asked 2× · Board 2022, Board 2025 · 3 marks

Attempt any TWO (3 marks each): Find x, y, z if {5[0 1; 1 0; 1 1] - [2 1; 3 -2; 1 3]}[2; 1] = [x - 1; y + 1; 2z]

Differentiation

9. Differentiate a function of the form y = f(x)^g(x) using logarithmic differentia

Asked 4× · Board 2024, Board 2025 · 3 marks

Attempt any TWO (3 marks each): Find dy/dx if $y = (\log x)^x + x^5$

10. Differentiate an implicit function and prove a relation

Asked 3× · Board 2023, Board 2025, Board 2026 · 3 marks

Attempt any TWO (3 marks each): If $e^x + e^y = e^{(x + y)}$ then show that $dy/dx = -e^{(y - x)}$.

11. Find dy/dx for a parametrically defined function

Asked 3× · Board 2022, Board 2024 · 1/3 marks

If $x = 2at^2$, $y = 4at$ then dy/dx = ____. (a) $-1/(2at^2)$ (b) $1/(2at^3)$ (c) 1/t (d) $1/(4at^3)$

12. Differentiate a composite/simplifiable function

Asked 2× · Board 2025, Board 2026 · 1 marks

If $y = e^{(\log x)}$ then dy/dx is (a) $e^{(\log x)}/x$ (b) 1/2 (c) 1 (d) both (a) and (c)

13. Differentiate a logarithmic/composite function

Asked 2× · Board 2024, Board 2026 · 1 marks

If $y = \log(e^x / x^2)$ then dy/dx = _____. (a) (2 - x)/x (b) (x - 2)/x (c) $(e - x)/(e^x)$ (d) (x - e)/(ex)

14. Differentiate a given function

Asked 2× · Board 2023, Board 2024 · 1 marks

If $y = 2x^2 + \log 2 + 5$ then dy/dx = ____. (a) x (b) 4x (c) 2x + log 2 (d) -4x

Applications of Derivatives

15. Classify the nature of demand from the value of elasticity

Asked 2× · Board 2023, Board 2026 · 1 marks

If $0 < \text{eta} < 1$, then the demand is (a) elastic (b) unitary elastic (c) relatively elastic (d) relatively inelastic

16. Find dimensions that maximise area using derivatives

Asked 2× · Board 2023, Board 2024 · 3 marks

Attempt any TWO (3 marks each): A metal wire of 36 cm length is bent to form a rectangle. Find its dimensions when its area is maximum.

Integration

17. Evaluate an indefinite integral using substitution

Asked 4× · Board 2024, Board 2025, Board 2026 · 1/3/4 marks

integral $x^2\ (3)^{(x^3)}\ dx$ = _____ (a) $(3)^{(x^3)}/(3 \log 3) + c$ (b) $(3)^{(x^3)} + c$ (c) $(\log 3)(3)^{(x^3)} + c$ (d) $x^2\ (3)^{(x^3)} + c$

18. Evaluate an indefinite integral of a standard form

Asked 3× · Board 2022, Board 2024, Board 2025 · 1 marks

integral $(1 - x)^{(-3)}\ dx$ = _____. (a) $(1/2)(1 - x)^{(-2)} + c$ (b) $(1/2)(1 + x)^{(-2)} + c$ (c) $(1/2)(1 - x)^{(-2)} + x/2 + c$ (d) $(1/2)(1 - x)^{(-2)} - x/2 + c$

19. Evaluate an integral of the form integral e^x[f(x)+f'(x)]dx

Asked 2× · Board 2025, Board 2026 · 1 marks

Fill in the blank: integral $e^x\ (1/x - 1/x^2)\ dx$ = _____.

20. State whether a standard integral result is true or false

Asked 2× · Board 2023, Board 2026 · 1 marks

State whether true or false: integral 1/(2x + 3) dx = log|2x + 3| + c

21. Evaluate an indefinite integral by completing the square

Asked 2× · Board 2023, Board 2026 · 3 marks

Attempt any TWO (3 marks each): Evaluate: integral $1/(4x^2 - 20x + 17)$ dx

22. State whether a given integral result of the form integral $e^x[f(x)+f'(x)]dx$ is

Asked 2× · Board 2024, Board 2025 · 1 marks

State whether true or false: For integral $((x - 1)/(x + 1)^3)$ e^x dx = e^x . f(x) + c, where f(x) = $(x + 1)^2$

23. Evaluate an indefinite integral using substitution and completing the square

Asked 2× · Board 2022, Board 2026 · 4 marks

Attempt any TWO (4 marks each): Evaluate: integral e^x/sqrt(e^(2x) + $4e^x$ + 13) dx

24. Evaluate an indefinite integral using integration by parts

Asked 2× · Board 2023, Board 2025 · 3/4 marks

Attempt any ONE (4 marks each): Evaluate: integral x^2 . e^(3x) dx

Definite Integration

25. Evaluate a definite integral using its properties

Asked 5× · Board 2023, Board 2025, Board 2026 · 1/4 marks

Attempt any TWO (4 marks each): Evaluate: integral from 2 to 5 of sqrt(x)/(sqrt(x) + sqrt(7 - x)) dx

26. Evaluate a definite integral

Asked 3× · Board 2022, Board 2023, Board 2024 · 1/4 marks

Attempt any TWO (4 marks each): Evaluate: integral from 1 to 3 of log x dx

27. Find an unknown limit given the value of a definite integral

Asked 2× · Board 2025, Board 2026 · 1 marks

If integral from 0 to a of $3x^2$ dx = 8 then a = _____. (a) 2 (b) 0 (c) 8/3 (d) 1

Applications of Definite Integration

28. Find the area bounded by a curve and a line using definite integration

Asked 5× · Board 2023, Board 2024, Board 2025, Board 2026 · 3/4 marks

Attempt any ONE (4 marks each): Find the area of the region bounded by the curve x^2 = 16y and the line y = 4.

29. Find the area under a curve bounded by given lines

Asked 3× · Board 2022, Board 2024, Board 2025 · 1 marks

Area of the region bounded by the curve y = x^2, the X-axis and the lines x = 1 and x = 3 is _____. (a) 3/26 sq. units (b) 3 sq. units (c) 26 sq. units (d) 26/3 sq. units

Differential Equations and Applications

30. Determine the order and degree of a differential equation

Asked 4× · Board 2022, Board 2024, Board 2025 · 1 marks

The order and degree of $(d^2y/dx^2)^2 + (dy/dx)^2 = a^x$ are respectively ____ (a) 1, 1 (b) 1, 2 (c) 2, 1 (d) 2, 2

31. State whether a statement about order and degree is true or false

Asked 3× · Board 2024, Board 2026 · 1 marks

State whether true or false: Order and degree of a differential equation are always positive integers.

32. Find the integrating factor of a linear differential equation

Asked 3× · Board 2023, Board 2025, Board 2026 · 1 marks

Fill in the blank: The integrating factor of the differential equation dy/dx - y = x is _____.

33. Solve a homogeneous differential equation

Asked 3× · Board 2022, Board 2025, Board 2026 · 3/4 marks

Attempt any ONE (4 marks each): Solve the following differential equation $(x^2 - y^2)\,dx + 2xy\,dy = 0$

34. State whether the integrating factor of a linear differential equation is correc

Asked 3× · Board 2022, Board 2024, Board 2025 · 1 marks

State whether true or false: The integrating factor (I.F.) of dy/dx + y = e^(-x) is e^x

35. Solve a growth problem using a differential equation (growth and decay)

Asked 2× · Board 2024, Board 2026 · 4 marks

Attempt any ONE (4 marks each): In a certain culture of bacteria, the rate of increase is proportional to the number present. If it is found that the number doubles in 4 hours, find the number of times the bacteria increased in 12 hours by using the concept of application of differential equations.

36. Solve a differential equation by the variable separable method (activity)

Asked 2× · Board 2024, Board 2025 · 4 marks

Attempt any ONE (Activity, 4 marks each): Solve the following differential equation $(x^2 - yx^2)\,dy + (y^2 + xy^2)\,dx = 0$. Solution: separating the variables, $((1/y^2) - 1/y)\,dy + ((1/x) + 1)\,dx = 0$; integrate to get -1/y - log y + log x + x = c is the required solution.

37. Form the differential equation from a given general solution

Asked 2× · Board 2022, Board 2024 · 1 marks

The differential equation of $y = k1\,e^x + k2\,e^{(-x)}$ is : (a) $d^2y/dx^2 - y = 0$ (b) $d^2y/dx^2 + dy/dx = 0$ (c) $d^2y/dx^2 + y\,(dy/dx) = 0$ (d) $d^2y/dx^2 + y = 0$

38. Solve a growth problem using a differential equation (growth and decay activity)

Asked 2× · Board 2022, Board 2023 · 4 marks

Attempt any ONE (Activity, 4 marks each): In a certain culture of bacteria, the rate of increase is proportional to the number present. If it is found that the number doubles in 4 hours, find the number of times the bacteria are increased in 12 hours. Solution: dN/dt = KN, integrate to get log N = Kt + C, use conditions to find bacteria increase 8 times in 12 hours.

Commission, Brokerage and Discount

39. Identify the correct term in discount terminology

Asked 5× · Board 2022, Board 2023, Board 2024, Board 2025, Board 2026 · 1 marks

The difference between face value and present worth is called _____. (a) Banker's discount (b) True discount (c) Banker's gain (d) Cash value

40. Identify the correct term in bill discounting

Asked 2× · Board 2024, Board 2026 · 1 marks

The date on which period of the bill expires is called ____. (a) Legal due date (b) Date of discounting (c) Nominal due date (d) Date of drawing

41. State whether a statement about banker's discount is true or false

Asked 2× · Board 2023, Board 2025 · 1 marks

State whether true or false: The banker's discount is also called as commercial discount.

42. Find the period of a bill from banker's discount data

Asked 2× · Board 2022, Board 2024 · 4 marks

Attempt any TWO (4 marks each): A bill was drawn on 14th April for Rs 7,000 and was discounted on 6th July at 5% p.a. The banker paid Rs 6,930 for the bills. Find the period of the bill.

Insurance and Annuity

43. Compute insurance premium and agent's commission from policy value and rates

Asked 2× · Board 2025, Board 2026 · 3 marks

Attempt any TWO (3 marks each): A shop is valued at Rs 3,60,000 and is insured for 75% of its value. If the rate of premium is 0.9%, find the premium paid by the owner of the shop. Also find the agent's commission if the agent gets commission at 15% of the premium.

44. Identify a property of a type of annuity

Asked 2× · Board 2024, Board 2025 · 1 marks

In an ordinary annuity, payments or receipts occur at (a) Beginning of each period (b) End of each period (c) Mid of each period (d) Quarterly basis

Linear Regression

45. Find the line of regression from given bivariate data

Asked 3× · Board 2025, Board 2026 · 3/4 marks

Attempt any TWO (3 marks each): For the following bivariate data obtain equation of regression line Y on X: X 1 2 3 4 5; Y 5 7 9 11 13

46. State the relationship between regression coefficients and correlation

Asked 3× · Board 2022, Board 2025, Board 2026 · 1 marks

In regression analysis $b_{yx} \cdot b_{xy}$ = _____. (a) V(x) (b) sigma_x (c) $(\text{sigma}_y)^2$ (d) r^2

47. Find the line of regression from means, standard deviations and correlation, and

Asked 2× · Board 2025, Board 2026 · 3 marks

Attempt any TWO (3 marks each): Given the following information about the production (X) and demand (Y) of a commodity, obtain the regression line of X on Y. Production (X): Mean 85, S.D. 5; Demand (Y): Mean 90, S.D. 6. Coefficient of correlation between X and Y is 0.6. Also estimate the production when demand is 100.

Time Series

48. Compute trend values of a time series using moving averages

Asked 8× · Board 2022, Board 2023, Board 2024, Board 2025, Board 2026 · 3/4 marks

Attempt any TWO (3 marks each): Obtain the 4-yearly centered moving averages for the following data: Years 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982; Production 1 0 1 2 3 2 3 6 5 1 4 10

49. Fit a trend line by least squares to a time series

Asked 4× · Board 2024, Board 2025, Board 2026 · 3/4 marks

Attempt any TWO (3 marks each): Following table shows the number of traffic fatalities (in a state) resulting from drunken driving from years 1975 to 1983: Years 1975 1976 1977 1978 1979 1980 1981 1982 1983; No. of deaths 0 6 3 8 2 9 4 5 10. Fit a trend line by least square method.

50. Identify which time series component a method measures

Asked 2× · Board 2025, Board 2026 · 1 marks

Moving averages are useful in identifying ____. (a) Trend component (b) Irregular component (c) Seasonal component (d) Cyclical component

51. Fit a trend line to a time series by the graphical method

Asked 2× · Board 2023, Board 2026 · 3 marks

Attempt any TWO (3 marks each): Following data shows the number of bags of cereals sold in years 1977 to 1984. Years 1977 1978 1979 1980 1981 1982 1983 1984; No. of bags (in ten thousands) 1 0 3 8 10 4 5 8. Fit a trend line to the above data by graphical method.

Index Numbers

52. Compute Fisher's index from Laspeyre's and Paasche's index numbers

Asked 3× · Board 2022, Board 2026 · 1 marks

Fill in the blank: If P01(L) = 225, P01(P) = 144 then P01(F) = _____.

53. Identify the correct formula for a weighted price index number

Asked 3× · Board 2022, Board 2024 · 1 marks

Paasche's Price Index Number is given by ____. (a) (sum p0 q0/sum p1 q0) x 100 (b) (sum p0 q1/sum p1 q1) x 100 (c) (sum p1 q0/sum p0 q0) x 100 (d) (sum p1 q1/sum p0 q1) x 100

Linear Programming

54. Solve an LPP graphically

Asked 8× · Board 2022, Board 2023, Board 2024, Board 2025, Board 2026 · 3/4 marks

Attempt any TWO (4 marks each): Minimize: z = 4x + 2y Subject to: 3x + y >= 27, x + y >= 21, x + 2y >= 30, x >= 0, y >= 0. Solve the above L.P.P. by graphical method.

55. Identify the definition of a component of a linear programming problem

Asked 2× · Board 2024, Board 2026 · 1 marks

Objective function of LPP is (a) a constraint (b) a function to be maximized or minimized (c) a relation between the decision variables (d) a feasible region

56. Find the corner point that optimises the objective function

Asked 2× · Board 2023, Board 2026 · 1 marks

If the corner points of the feasible region are (0, 10), (2, 2) and (4, 0) then the point of minimum z = 3x + 2y is _____. (a) (2, 2) (b) (0, 10) (c) (4, 0) (d) (2, 4)

57. Fill in the blank identifying the region of inequalities

Asked 2× · Board 2023, Board 2026 · 1 marks

Fill in the blank: Graphical solution set of the inequations x >= 0, y >= 0 lies in _____ quadrant.

58. State whether a statement about the optimum of an LPP is true or false

Asked 2× · Board 2024, Board 2025 · 1 marks

State whether true or false: The optimum value of the objective function of L.P.P. occurs at the centre of the feasible region.

Assignment Problem and Sequencing

59. Find the optimal sequence, total elapsed time and idle time for jobs on two mach

Asked 2× · Board 2025, Board 2026 · 3/4 marks

Attempt any TWO (3 marks each): Find the sequence that minimizes the total elapsed time to complete the following jobs. Each job is processed in order AB. Also find the idle time for machine B. Jobs (processing times in minutes) I II III IV V VI VII; Machine A 12 6 5 11 5 7 6; Machine B 7 8 9 4 7 8 3

60. Find the assignment that minimises cost (Hungarian method) with prohibited assig

Asked 2× · Board 2024, Board 2025 · 4 marks

Attempt any TWO (4 marks each): Four new machines M1, M2, M3 and M4 are to be installed in a machine shop. There are five vacant places A, B, C, D and E available. Because of limited space, machine M2 cannot be placed at C and M3 cannot be placed at A. The cost matrix is: M1: A=4 B=6 C=10 D=5 E=6; M2: A=7 B=4 C=- D=5 E=4; M3: A=- B=6 C=9 D=6 E=2; M4: A=9 B=3 C=7 D=2 E=3. Find the optimal assignment schedule.

61. State whether a statement about converting an assignment problem is true or fals

Asked 2× · Board 2022, Board 2026 · 1 marks

State whether true or false: To convert an assignment problem into a minimization problem, the smallest element in the matrix is deducted from all other elements.

62. State whether a statement about balancing an assignment problem is true or false

Asked 2× · Board 2023, Board 2024 · 1 marks

State whether true or false: In an assignment problem, if the number of columns are greater than number of rows, then a dummy column is added.

63. Find the assignment that minimises cost (Hungarian method)

Asked 2× · Board 2022, Board 2023 · 3/4 marks

Attempt any TWO (4 marks each): A marketing manager has list of salesmen and territories. The total cost per month (in thousand rupees) for each salesman in each territory is: Salesman A: I=11 II=16 III=18 IV=15 V=15; B: 7 19 11 13 17; C: 9 6 14 14 7; D: 13 12 17 11 13. Find the assignment of salesman to territories that will result in minimum cost.

Probability Distributions

64. Find the constant k and probabilities from a discrete probability distribution

Asked 5× · Board 2022, Board 2023, Board 2024, Board 2026 · 4 marks

Attempt any TWO (4 marks each): A random variable X has the following probability distribution: x 1 2 3 4 5 6 7; P[X = x] k 2k 2k 3k k^2 $2k^2$ $7k^{2+}$k. Determine (a) k (b) P(X < 3) (c) P(X > 6) (d) P(0 < X < 1)

65. Find a probability using the binomial distribution

Asked 3× · Board 2024, Board 2025 · 3/4 marks

Attempt any TWO (3 marks each): A pair of dice is thrown 3 times. If getting a doublet is considered a success, find the probability of two successes.

66. Find probabilities using the binomial distribution

Asked 2× · Board 2025, Board 2026 · 4 marks

Attempt any ONE (4 marks each): A die is thrown 4 times. If 'getting an odd number' is a success, find the probability of (a) 2 successes (b) at least 3 successes (c) at the most 2 successes.

67. Find the expected value of a discrete random variable

Asked 2× · Board 2024, Board 2025 · 1 marks

The expected value of the sum of two numbers obtained when two fair dice are rolled is _____.
(a) 5 (b) 6 (c) 7 (d) 8

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