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CLASS 12

Mathematics

Sample Paper 3 - Questions

38 questions | 80 marks | 2026-27

Time: 3 hours. Answer all questions and subparts unless a choice is stated. Marks are shown on the right. Write answers on separate sheets. Independently prepared practice paper.

Section A - Objective questions

1. Calculate the determinant of [[23,1],[1,24]]. **1**
(A) 553 (B) 552 (C) 551 (D) 550

2. A bag contains 23 red and 24 blue balls. Two are drawn without replacement. Given the first was red, find the probability the second is blue. **1**
(A) -11/23 (B) 35/23 (C) 58/23 (D) 12/23

3. For cost $C(x) = x^2 + 46x + 100$, find marginal cost C'(5). **1**
(A) 57 (B) 56 (C) 55 (D) 58

4. Calculate the dot product of (20,2,1) and (2,20,3). **1**
(A) 84 (B) 85 (C) 83 (D) 82

5. How many ordered pairs belong to A x A if set A has 24 elements? **1**
(A) 577 (B) 576 (C) 575 (D) 578

6. Given dy/dx = 40x and y(0) = 19, find y(1). **1**
(A) 41 (B) 39 (C) 40 (D) 38

7. For $f(x) = 24x^3$, calculate f'(2). **1**
(A) 287 (B) 289 (C) 290 (D) 288

8. Calculate the area of the parallelogram spanned by (25,0,0) and (0,27,0). **1**
(A) 677 (B) 676 (C) 674 (D) 675

9. Determine the value of the integral from 0 to 1 of $78x^2$ dx. 1

(A) 26 (B) 28 (C) 27 (D) 25

10. f(x) = cx + 1 for x < 2 and f(x) = 41 for x >= 2. Calculate c for continuity at x = 2. 1

(A) 19 (B) 20 (C) 21 (D) 22

11. A line has direction ratios 1, 2, 2. Calculate the cosine of its acute angle with the x-axis. 1

(A) 1/3 (B) 4/3 (C) -2/3 (D) 7/3

12. A and B produce equal quantities. Their defect probabilities are 0.01 and 0.03 respectively. Given an item is defective, find the probability it came from B. 1

(A) -1/4 (B) 7/4 (C) 11/4 (D) 3/4

13. Determine the value of sin inverse(0) + cos inverse(1) + tan inverse(0), using principal values. 1

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

14. How many ordered pairs belong to A x A if set A has 26 elements? 1

(A) 678 (B) 675 (C) 677 (D) 676

15. Given dy/dx = 42x and y(0) = 20, find y(1). 1

(A) 43 (B) 41 (C) 42 (D) 40

16. Calculate the area of the parallelogram spanned by (22,0,0) and (0,24,0). 1

(A) 527 (B) 530 (C) 528 (D) 529

17. Calculate the determinant of [[24,1],[1,25]]. 1

(A) 598 (B) 601 (C) 600 (D) 599

18. Determine the value of the integral from 0 to 1 of $69x^2$ dx. 1

(A) 24 (B) 23 (C) 25 (D) 22

19. A bag contains 27 red and 28 blue balls. Two are drawn without replacement. Given the first was red, find the probability the second is blue. 1

(A) 41/27 (B) 14/27 (C) -13/27 (D) 68/27

20. f(x) = cx + 1 for x < 2 and f(x) = 39 for x >= 2. Calculate c for continuity at x = 2. 1

(A) 20 (B) 21 (C) 18 (D) 19

Section B - Short responses

21. Calculate the dot product of (19,2,1) and (2,19,3). 2

22. For $f(x) = 23x^3$, calculate f'(2). 2

23. For cost $C(x) = x^2 + 36x + 100$, find marginal cost C'(5). 2

24. How many ordered pairs belong to A x A if set A has 25 elements? 2

25. Determine the value of the integral from 0 to 1 of $75x^2$ dx. 2

Section C - Short responses

26. Calculate the area of the parallelogram spanned by (21,0,0) and (0,23,0). Hence find the area of the corresponding triangle and give a unit vector perpendicular to both vectors. 3

27. A bag contains 21 red and 22 blue balls. Two are drawn without replacement. Calculate P(second blue | first red) and P(first red and second blue), explaining the denominators. 3

28. For u=(18,2,1) and v=(2,18,3), find u·v, both magnitudes and the cosine of their included angle. 3

29. Solve dy/dx=44x with y(0)=21. State y(1) and verify the equation and initial condition. 3

30. For A=[[26,1],[1,27]], calculate det(A). Hence find A inverse and justify why the inverse exists. 3

31. f(x) = cx + 1 for x < 2 and f(x) = 47 for x >= 2. Calculate c for continuity at x = 2. For the resulting value of c, test differentiability at x=2 using the one-sided derivatives. **3**

Section D - Extended responses

32. Calculate and classify the stationary points of $f(x) = x^3 - 3x^2 - 9x + 5$. Give both coordinates. **5**

33. Derive the total-probability expression P(D) = P(A)P(D|A) + P(B)P(D|B) when A and B form a partition with positive probabilities. **5**

34. For A = [[2, 1], [1, 3]], find det(A) and A inverse. Use the inverse to solve 2x + y = 7 and x + 3y = 11. **5**

35. Demonstrate that if A is invertible and AX = B, then X = A inverse B. Explain why multiplication order matters. **5**

Section E - Case and application questions

36. A production model has cost $C(x)=x^2-14x+79$, $x \geq 0$.

(a) Find C(0). **1**

(b) Find marginal cost. **1**

(c) Determine and justify the minimum-cost output and minimum cost. **2**

37. Adjacent displacement vectors are u=(5,0,0) and v=(0,7,0).

(a) Find u·v. **1**

(b) Find |u|. **1**

(c) Find the area of the triangle they form, explaining the factor used. **2**

38. A factory receives 65% of items from A and the rest from B. Their defect rates are 2% and 5% respectively.

(a) Find P(A and defective). **1**

(b) Find the overall defect probability. **1**

(c) Given an item is defective, find the probability it came from B. **2**

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