CBSE Class 12 Mathematics · Sample Paper 1 (2026-27 pattern)

Time: 3 hours · Maximum marks: 80 · CBSE Math Revision (not an official CBSE paper)

General instructions

1. This question paper contains 38 questions. All questions are compulsory.
2. The paper is divided into five sections: A, B, C, D and E.
3. Section A: questions 1–18 are MCQs and questions 19–20 are Assertion–Reason based, 1 mark each.
4. Section B: questions 21–25 are very short answer (VSA) questions of 2 marks each.
5. Section C: questions 26–31 are short answer (SA) questions of 3 marks each.
6. Section D: questions 32–35 are long answer (LA) questions of 5 marks each.
7. Section E: questions 36–38 are case study based questions of 4 marks each, with sub-parts of 1, 1 and 2 marks.
8. There is no overall choice. Internal choice is provided in 2 questions of Section B, 2 of Section C, 2 of Section D and in the 2-mark sub-part of each case study in Section E.
9. Use of calculators is not allowed.

Section A

20 marks

Questions 1 to 20 carry 1 mark each. Questions 1 to 18 are multiple choice questions (MCQs); questions 19 and 20 are Assertion–Reason based questions.

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

(a) reflexive, but neither symmetric nor transitive
(b) an equivalence relation
(c) symmetric and transitive but not reflexive
(d) transitive but not reflexive

2. The value of $\cos^{-1}\left(\cos\dfrac{4\pi}{3}\right)$ is **1**

(a) $\dfrac{4\pi}{3}$
(b) $\dfrac{2\pi}{3}$
(c) $-\dfrac{2\pi}{3}$
(d) $\dfrac{\pi}{3}$

3. If A is a square matrix of order 3 with $|A| = 4$, then $|\text{adj } A|$ is **1**

(a) 4
(b) 8
(c) 16
(d) 64

4. The matrix $\begin{bmatrix} 2 & 3 \\ -1 & x \end{bmatrix}$ is singular when x equals **1**

(a) $\dfrac{3}{2}$
(b) $-\dfrac{3}{2}$
(c) $-\dfrac{2}{3}$
(d) 3

5. If A and B are symmetric matrices of the same order, then $AB - BA$ is **1**

(a) symmetric
(b) skew-symmetric
(c) the zero matrix
(d) the identity matrix

6. For the 2×3 matrix $A = [a_{ij}]$ with $a_{ij} = i - 2j$, the element a_{23} is **1**

(a) -4 **(b)** 4

(c) -1 **(d)** -5

7. The system $x + 2y = 3$, $2x + ky = 6$ has infinitely many solutions when k equals **1**

(a) 2 **(b)** 3

(c) 4 **(d)** 6

8. The function $f(x) = \dfrac{1 - \cos 4x}{8x^2}$ for $x \neq 0$, $f(0) = k$, is continuous at $x = 0$ when k equals **1**

(a) $\dfrac{1}{2}$ **(b)** 1

(c) 2 **(d)** $\dfrac{1}{4}$

9. $\dfrac{d}{dx}[\log(\sec x + \tan x)]$ equals **1**

(a) $\tan x$ **(b)** $\sec x$

(c) $\sec^2 x$ **(d)** $\sec x \tan x$

10. If $y = Ae^{3x} + Be^{-3x}$, then $\dfrac{d^2y}{dx^2}$ equals **1**

(a) $3y$ **(b)** $-9y$

(c) $9y$ **(d)** y

11. The function $f(x) = x^3 - 3x^2 + 3x + 7$ is **1**

(a) increasing on $\mathbb{R}$ **(b)** decreasing on $\mathbb{R}$

(c) decreasing on $(0, 1)$ only **(d)** neither increasing nor decreasing on $\mathbb{R}$

12. $\displaystyle\int e^x \left(x^2 + 2x\right) dx$ equals **1**

(a) $2xe^x + C$ **(b)** $(x^2 + 2x)e^x + C$

(c) $x^2e^x + C$ **(d)** $(x^2 - 2x)e^x + C$

13. If $|\vec{a}| = 3$, $|\vec{b}| = 4$ and $\vec{a} \cdot \vec{b} = 6$, the angle between $\vec{a}$ and $\vec{b}$ is **1**

(a) $\dfrac{\pi}{6}$ **(b)** $\dfrac{\pi}{4}$

(c) $\dfrac{\pi}{3}$ **(d)** $\dfrac{\pi}{2}$

14. The direction cosines of the line joining $(1, -2, 3)$ and $(3, 0, 4)$, directed from the first point to the second, are **1**

(a) $\dfrac{2}{3}, \dfrac{2}{3}, \dfrac{1}{3}$ **(b)** $2, 2, 1$

(c) $\dfrac{2}{5}, \dfrac{2}{5}, \dfrac{1}{5}$ **(d)** $-\dfrac{2}{3}, -\dfrac{2}{3}, -\dfrac{1}{3}$

15. If $|\vec{a}| = 2$ and $|\vec{b}| = 5$, then $|\vec{a} \times \vec{b}|^2 + (\vec{a} \cdot \vec{b})^2$ equals **1**

(a) 49 **(b)** 100

(c) 10 **(d)** 29

16. The corner points of the feasible region of an LPP are $(0, 4)$, $(2, 1)$ and $(5, 0)$. The objective function $Z = px + qy$ $(p, q > 0)$ takes its minimum value at both $(0, 4)$ and $(2, 1)$ if **1**

(a) $p = \dfrac{3q}{2}$ **(b)** $q = \dfrac{3p}{2}$

(c) $p = q$ **(d)** $p = 2q$

17. If the feasible region of a linear programming problem is bounded (and non-empty), then the objective function $Z = ax + by$ **1**

(a) has a maximum but may not have a minimum **(b)** has both a maximum and a minimum, each at a corner point

(c) has neither a maximum nor a minimum **(d)** has its optimum only at an interior point

18. If A and B are independent events with $P(A) = 0.4$ and $P(B) = 0.5$, then $P(A \cup B)$ is **1**

(a) 0.9 **(b)** 0.2

(c) 0.7 **(d)** 0.3

19. In the following question, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option. **1**

Assertion (A): The lines $\vec{r} = (\hat{i} + \hat{j}) + \lambda(2\hat{i} - \hat{j} + \hat{k})$ and $\vec{r} = (2\hat{i} + \hat{k}) + \mu(-4\hat{i} + 2\hat{j} - 2\hat{k})$ are parallel.

Reason (R): Two lines are parallel if their direction vectors are collinear.

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

(c) Assertion (A) is true but Reason (R) is false.

(d) Assertion (A) is false but Reason (R) is true.

20. In the following question, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option. **1**

Assertion (A): If $P(A) = 0.3$ and $P(B \mid A) = 0.4$, then $P(A \cap B) = 0.12$.

Reason (R): For any two events A and B, $P(A \cap B) = P(A)P(B)$.

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

(c) Assertion (A) is true but Reason (R) is false.

(d) Assertion (A) is false but Reason (R) is true.

Section B

10 marks

Questions 21 to 25 are very short answer (VSA) type questions carrying 2 marks each. Internal choice is provided in 2 questions.

21. Find the value of $\cot^{-1}\left(-\frac{1}{\sqrt{3}}\right) + \operatorname{cosec}^{-1}(2)$. **2**

OR

Find the domain of the function $f(x) = \sin^{-1}(2x - 3)$.

22. If $x^3 + xy^2 = 10$, find $\frac{dy}{dx}$ at the point $(1, 3)$. **2**

23. Find the intervals in which $f(x) = 2x^3 - 15x^2 + 36x + 1$ is strictly increasing and strictly decreasing. **2**

OR

Find $\int \frac{dx}{x^2 - 4x + 13}$.

24. Find a unit vector perpendicular to both $\vec{a} = \hat{i} + 2\hat{j} - \hat{k}$ and $\vec{b} = 3\hat{i} - \hat{j} + 2\hat{k}$. **2**

25. Two cards are drawn one after the other, without replacement, from a well-shuffled pack of 52 cards. Find the probability that both are kings. **2**

Section C

18 marks

Questions 26 to 31 are short answer (SA) type questions carrying 3 marks each. Internal choice is provided in 2 questions.

26. Find the values of a and b for which the function $f(x) = \begin{cases} ax^2 + b, & x < 2 \\ 3x - 1, & x \geq 2 \end{cases}$ is differentiable at $x = 2$. **3**

27. Find $\int \frac{3x + 1}{x^2 + 4x + 8}\, dx$. **3**

28. Solve the differential equation $x\frac{dy}{dx} - 3y = x^5 e^x$, $x > 0$, given that $y = 2$ when $x = 1$. **3**

OR

Solve the differential equation $x\frac{dy}{dx} = y + xe^{-y/x}$, given $y = 0$ when $x = 1$.

29. Evaluate $\int_0^3 x^2\sqrt{3 - x}\, dx$. **3**

30. Find the coordinates of the foot of the perpendicular drawn from the point $P(2, 3, 5)$ to the line $\frac{x - 1}{1} = \frac{y + 1}{2} = \frac{z - 2}{-1}$. Hence find the perpendicular distance of P from the line. **3**

OR

Find the shortest distance between the lines $\vec{r} = (\hat{i} + 2\hat{k}) + \lambda(\hat{i} + 2\hat{j} - \hat{k})$ and $\vec{r} = (3\hat{i} + \hat{j}) + \mu(2\hat{i} - \hat{j} + \hat{k})$.

31. Solve the following linear programming problem graphically: maximise $Z = 4x + 5y$ subject to $2x + y \le 14$, $x + 3y \le 12$, $x \ge 0$, $y \ge 0$. **3**

Section D

20 marks

Questions 32 to 35 are long answer (LA) type questions carrying 5 marks each. Internal choice is provided in 2 questions.

32. Using matrices, solve the system of equations: $2x - y + z = 3$, $x + 3y - 2z = 1$, $3x + y + 2z = 11$. **5**

OR

Given $A = \begin{bmatrix} 2 & -4 & 2 \\ 1 & 2 & -1 \\ -1 & 2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 & 0 \\ 0 & 1 & 1 \\ 1 & 0 & 2 \end{bmatrix}$, find AB. Hence solve $x + 2y = 5$, $y + z = 5$, $x + 2z = 7$.

33. Find the area of the region bounded by the parabola $y^2 = 4x$ and the line $y = x - 3$. **5**

34. Find $\displaystyle\int \frac{3x^2 + 2x - 1}{(x - 1)(x^2 + 3)}\, dx$. **5**

OR

Evaluate $\displaystyle\int_0^{\pi/2} \frac{x}{1 + \sin x \cos x}\, dx$.

35. Consider the lines $L_1 : \dfrac{x-1}{2} = \dfrac{y+1}{3} = \dfrac{z-2}{k}$ and $L_2 : \dfrac{x+2}{1} = \dfrac{y-3}{-2} = \dfrac{z-1}{2}$. (a) Find k if $L_1 \perp L_2$. (b) For this k, find the shortest distance between L_1 and L_2. (c) Do the lines intersect? Justify. **5**

Section E

12 marks

Questions 36 to 38 are case study based questions carrying 4 marks each (1 + 1 + 2). Internal choice is provided in the 2-mark sub-part of each case study.

36. **Screening test.** A diagnostic lab in Pune uses a quick screening test for a viral infection. In the population tested, 2% have the infection. The test is positive for 95% of infected people and also (falsely) for 10% of uninfected people. A person is tested at random. **4**

i. Find the probability that the person is infected and tests positive. *[1 mark]*

ii. Find the probability that the test is positive. *[1 mark]*

iii. The test is positive. Find the probability that the person is actually infected, and comment on the result. *[2 marks]*

OR

The test is negative. Find the probability that the person is not infected. *[2 marks]*

37. **Mall parking.** A mall in Noida finds that if it charges ₹p per hour for parking, about $200 - 8p$ cars use the parking each hour $(0 \le p \le 25)$. **4**

i. Write the hourly revenue $R(p)$. *[1 mark]*

ii. Find the interval of p on which R is increasing. *[1 mark]*

iii. Find the charge that maximises the revenue, and the maximum revenue. Justify that it is a maximum. *[2 marks]*

OR

The city levies a tax of ₹2.50 on every car parked. Find the charge p that maximises the mall's hourly profit $(p - 2.5)(200 - 8p)$, and the maximum profit. *[2 marks]*

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38. **Smart-card batches.** A metro rail office issues smart cards numbered $1, 2, \dots, 12$. For audit, cards are grouped by the relation $R = \{(a, b) : a + 2b \text{ is divisible by } 3\}$ on $S = \{1, 2, \dots, 12\}$. **4**

i. Write the equivalence class of card 1. *[1 mark]*

ii. How many distinct equivalence classes are there? *[1 mark]*

iii. Show that R is an equivalence relation. *[2 marks]*

OR

Define $f : S \to \{0, 1, 2\}$ by $f(a) =$ remainder when a is divided by 3. Is f one-one? Is it onto? Justify. *[2 marks]*