CBSE Class 12 Mathematics · Sample Paper 6 (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. On $A = \{1, 2, 3, 4, 5, 6\}$, the relation $R = \{(a, b) : |a - b| \text{ is a multiple of } 4\}$ is an equivalence relation. The number of distinct equivalence classes of R is **1**

(a) 2 **(b)** 3
(c) 4 **(d)** 6

2. If $A = \begin{bmatrix} 1 & 2 \\ -3 & 1 \end{bmatrix}$, then $A^2 - 2A$ equals **1**

(a) $7I$ **(b)** $-7I$
(c) O **(d)** $-5I$

3. $A = [a_{ij}]$ is a skew-symmetric matrix of order 3 with $a_{12} = 4$. Then $a_{21} + a_{33}$ equals **1**

(a) 4 **(b)** 0
(c) 8 **(d)** -4

4. A is a square matrix of order 2 with $|A| = -3$. The value of $|-2A|$ is **1**

(a) -12 **(b)** 12
(c) 6 **(d)** 24

5. The value of $\begin{vmatrix} 2 & -1 & 3 \\ 0 & 4 & 1 \\ 0 & 0 & -5 \end{vmatrix}$ is **1**

(a) 40 **(b)** -40
(c) -30 **(d)** 0

6. A has 3 rows and 2 columns, and B has 2 rows and 5 columns. The product $B'A'$ is a matrix with **1**

(a) 3 rows and 5 columns
(b) 5 rows and 3 columns
(c) 2 rows and 2 columns
(d) no meaning (it is not defined)

7. For $|x| < 1$, $\frac{d}{dx}\left[\sin^{-1}\left(x^2\right)\right]$ equals **1**

(a) $\frac{1}{\sqrt{1-x^4}}$
(b) $\frac{2x}{\sqrt{1-x^2}}$
(c) $\frac{2x}{1+x^4}$
(d) $\frac{2x}{\sqrt{1-x^4}}$

8. For $x > 0$, the least value of $f(x) = x^2 + \frac{16}{x}$ is **1**

(a) 8
(b) 12
(c) 16
(d) 20

9. $\int_0^{\pi} |\cos x|\, dx$ equals **1**

(a) 0
(b) 1
(c) 2
(d) π

10. The general solution of $\frac{dy}{dx} = y\tan x \left(-\frac{\pi}{2} < x < \frac{\pi}{2}\right)$ is **1**

(a) $y = C\sec x$
(b) $y = C\cos x$
(c) $y = C + \sec x$
(d) $y = C\tan x$

11. The projection of $\vec{a} = 2\hat{i} + 3\hat{j} - \hat{k}$ on $\vec{b} = \hat{i} - 2\hat{j} + 2\hat{k}$ is **1**

(a) 2
(b) $-\frac{6}{\sqrt{14}}$
(c) -2
(d) -6

12. The unit vector in the direction of $\vec{a} + \vec{b}$, where $\vec{a} = 2\hat{i} - \hat{j} + 2\hat{k}$ and $\vec{b} = -\hat{i} + \hat{j} + 3\hat{k}$, is **1**

(a) $\frac{\hat{i} + 5\hat{k}}{\sqrt{26}}$
(b) $\frac{\hat{i} + 5\hat{k}}{26}$
(c) $\frac{\hat{i} + 5\hat{k}}{\sqrt{6}}$
(d) $\hat{i} + 5\hat{k}$

13. A line makes angles of 60° with both the x-axis and the y-axis. The acute angle it makes with the z-axis is **1**

(a) 30°
(b) 45°
(c) 60°
(d) 90°

14. The Cartesian equation of the line through $(1, -2, 3)$ parallel to the vector $2\hat{i} - \hat{j} + 4\hat{k}$ is **1**

(a) $\frac{x+1}{2} = \frac{y-2}{-1} = \frac{z+3}{4}$
(b) $\frac{x-2}{1} = \frac{y+1}{-2} = \frac{z-4}{3}$
(c) $\frac{x-1}{2} = \frac{y+2}{-1} = \frac{z-3}{4}$
(d) $\frac{x-1}{2} = \frac{y+2}{1} = \frac{z-3}{4}$

15. A shop's LPP has a bounded feasible region with corner points $(0, 0)$, $(8, 0)$, $(6, 3)$ and $(0, 5)$. The maximum value of $Z = 3x + 5y$ is **1**

(a) 25 **(b)** 24

(c) 40 **(d)** 33

16. The feasible region of the constraints $x + y \geq 4$, $x \geq 0$, $y \geq 0$ is **1**

(a) a bounded triangle **(b)** unbounded

(c) empty **(d)** a single point

17. In a class, 70% of students revise daily (event A), 40% attend extra classes (event B) and 28% do both. For a student chosen at random, $P(A \mid B)$ is **1**

(a) 0.4 **(b)** 0.7

(c) 0.28 **(d)** 0.57

18. The number X of goals a school team scores in a match is 1, 2 or 3, with $P(X = 1) = k$, $P(X = 2) = 2k$ and $P(X = 3) = 2k$. The mean of X is **1**

(a) 2 **(b)** $\frac{11}{5}$

(c) $\frac{12}{5}$ **(d)** $\frac{9}{5}$

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 domain of the function $f(x) = \cos^{-1}(2x - 1)$ is $[0, 1]$.

Reason (R): $\cos^{-1} t$ is defined (as a real number) only for $-1 \leq t \leq 1$.

(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): The function $f(x) = x^2 - 4x + 7$ is strictly decreasing on $(-\infty, 2)$.

Reason (R): $f'(x) < 0$ for every $x < 2$.

(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 $\tan^{-1}(-1) + \cos^{-1}\left(-\frac{\sqrt{3}}{2}\right) + \sin^{-1}\left(\frac{1}{2}\right)$. **2**

OR

For $-1 \leq x \leq 1$, find the greatest and the least values of $2\sin^{-1}x + \frac{\pi}{2}$, and the values of x at which they occur.

22. If $x = e^{2t}$ and $y = te^{2t}$, find $\frac{dy}{dx}$ in terms of t, and its value at $t = 1$. **2**

OR

If $y = e^{2x}\sin x$, find the value of $\frac{d^2y}{dx^2}$ at $x = 0$.

23. Gas is pumped into a spherical balloon so that its volume increases at $20\pi\ \text{cm}^3/\text{s}$. Find the rate at which the radius is increasing when the radius is 5 cm. **2**

24. The points A and B have position vectors $2\hat{i} + \hat{j} - \hat{k}$ and $5\hat{i} - 2\hat{j} + 8\hat{k}$. Find the position vector of the point C that divides AB internally in the ratio $1:2$, and the distance of C from the origin. **2**

25. A and B are independent events with $P(A) = 0.3$ and $P(A \cup B) = 0.65$. Find $P(B)$. **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. If $y = xe^{2x}$, show that $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = 0$. **3**

27. Find $\int (x+1)\log x\, dx$, $x > 0$. **3**

28. Find the particular solution of $\frac{dy}{dx} = (y+1)\cos x$, given that $y = 1$ when $x = 0$. **3**

OR

Solve the differential equation $\frac{dy}{dx} + \frac{2y}{x} = x^2\ (x > 0)$, given that $y = \frac{1}{4}$ when $x = 1$.

29. Evaluate $\int_1^4 (|x-2| + |x-3|)dx$. **3**

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

OR

Find the vector equation of the line through the point $(2, -1, 3)$ that is perpendicular to both the lines $\frac{x-1}{1} = \frac{y+2}{2} = \frac{z-3}{-1}$ and $\frac{x+1}{2} = \frac{y-4}{1} = \frac{z}{3}$.

31. Solve graphically: minimise $Z = 4x + 3y$ subject to $x + 2y \geq 8$, $3x + 2y \geq 12$, $x \geq 0$, $y \geq 0$. **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: $x + y + 2z = 9$, $2x - y + z = 3$, $3x + 2y - z = 4$. **5**

33. Using integration, find the area of the region bounded by the curve $y = x^2 - 2x$ and the line $y = x$. **5**

OR

Using integration, find the area of the region $\left\{(x, y) : 0 \leq y \leq \sqrt{16 - x^2},\ 0 \leq x \leq 2\right\}$.

34. Evaluate $\displaystyle\int_0^{\pi/2} x^2 \cos x \, dx$. **5**

35. Consider the lines $L_1 : \dfrac{x-1}{2} = \dfrac{y-2}{-1} = \dfrac{z+1}{1}$ and $L_2 : \dfrac{x-2}{1} = \dfrac{y}{1} = \dfrac{z-2}{-2}$. (a) Show that L_1 and L_2 intersect, and find their point of intersection. (b) Find the acute angle between them. (c) Find the vector equation of the line through the point of intersection that is perpendicular to both L_1 and L_2. **5**

OR

Find the coordinates of the foot of the perpendicular from the point $Q(2, 4, 3)$ to the line $\dfrac{x+1}{2} = \dfrac{y-3}{-1} = \dfrac{z-1}{2}$. Hence find the perpendicular distance of Q from the line and the image of Q in the line.

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. **Parcel delivery.** An online store in Hyderabad hands its parcels to three delivery partners: 50% to partner A, 30% to partner B and 20% to partner C. From past records, 2% of A's parcels, 5% of B's and 4% of C's arrive late. A parcel is chosen at random. **4**

i. Find the probability that the parcel was delivered by C and arrived late. *[1 mark]*

ii. Find the probability that the parcel arrived late. *[1 mark]*

iii. The parcel arrived late. Find the probability that it was delivered by B. *[2 marks]*

OR

The parcel arrived late. Find the probability that it was *not* delivered by B. *[2 marks]*

37. **Reaction temperature.** In a school chemistry lab, the temperature T (in °C) of a mixture t minutes after a reaction starts is modelled by $T(t) = t^3 - 12t^2 + 36t + 20$, for $0 \le t \le 8$. **4**

i. Find $T'(t)$ and the times at which $T'(t) = 0$. *[1 mark]*

ii. During which time intervals is the temperature rising? *[1 mark]*

iii. Find the highest and the lowest temperature of the mixture during the 8 minutes. *[2 marks]*

OR

Use the second derivative test to find the local maximum and local minimum values of T in $(0, 8)$. *[2 marks]*

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38. **Auto fares.** An auto-rickshaw app in Kochi charges a fixed ₹25 plus ₹14 per kilometre. The fare for a ride of x km is $f(x) = 25 + 14x$, where $x \ge 0$ (fractions of a kilometre allowed). **4**

i. Is $f : [0, \infty) \to \mathbb{R}$ one-one? Justify. *[1 mark]*

ii. Is $f : [0, \infty) \to \mathbb{R}$ onto? Justify. *[1 mark]*

iii. Show that $f : [0, \infty) \to [25, \infty)$ is a bijection. *[2 marks]*

OR

A rival app charges for every started kilometre: the fare is $g(x) = 25 + 14n$, where n is x rounded up to a whole number. Show that $g : [0, \infty) \to [25, \infty)$ is neither one-one nor onto. *[2 marks]*