

O. P. JINDAL SCHOOL, SAVITRI NAGAR
Annual Examination - (2023 – 2024)

Class: XI

MM: 80

Subject: Mathematics

Time: 3 Hrs.

(Fifteen Minutes Extra will be given for reading the Question Paper.)

General Instructions:

- i. This question paper has 5 sections A-E.
- ii. Section A has 20 MCQs carrying 1 mark each.
- iii. Section B has 5 questions carrying 2 mark each.
- iv. Section C has 6 questions carrying 3 mark each.
- v. Section D has 4 questions carrying 5 mark each.
- vi. Section E has 3 case based integrated units of assessment (04 marks each) with 4 sub-parts of 1 mark each.
- vii. All the questions are compulsory. However an internal choice in 2 Qs of 5 marks, 3 Qs of 3 marks, 2 Qs of 2 marks has been provided.
- viii. Draw neat figures wherever required. Take $\pi = 22/7$ wherever required if not stated.

SECTION A

1. The centre of the circle $x^2 + y^2 - 6x + 4y - 12 = 0$ is
a) (-3, 2) b) (3, 2) c) (3, -2) d) (-3, -2)
2. If $(k - 1)$, $(2k + 1)$ and $(6k + 3)$ are in GP then $k = ?$
a) 7 b) 4 c) -2 d) 0
3. How many different teams of 7 players can chosen out of 10 players?
a) 720 b) 70 c) 120 d) 360
4. The slope of the line AB passing through the points A(-2, 3) and B(8, -5) is
a) $\frac{4}{5}$ b) $-\frac{4}{5}$ c) $\frac{5}{4}$ d) $-\frac{5}{4}$
5. A die is rolled, the probability that a number 1 or 6 may appear is
a) $\frac{2}{3}$ b) $\frac{5}{6}$ c) $\frac{1}{3}$ d) $\frac{1}{2}$
6. The coordinate of the foot of perpendicular drawn from a point (6, 7, 8) on x-axis are
a) (6, 0, 0) b) (0, 7, 0) c) (0, 0, 8) d) (0, 7, 8)
7. The value of $\sin 105^\circ$ is
a) $\frac{\sqrt{3}+1}{2\sqrt{2}}$ b) $\frac{\sqrt{3}-1}{2\sqrt{2}}$ c) $\sqrt{3}-1$ d) $\frac{2-\sqrt{3}}{2\sqrt{2}}$
8. The distance of the point P(4, 1) from the line $3x - 4y + 12 = 0$ is
a) 4 units b) 5 units c) 6 units d) 3 units

9. Let A and B be two sets then $A \cap (A \cup B)$ is equal to
a) A b) B c) ϕ d) $(A \cap B)$

10. Value of i^{-38} is
a) i b) -i c) 1 d) -1

11. The domain of the function f given by $f(x) = \frac{x^2 + 2x + 1}{x^2 - x - 6}$ is
a) $\mathbf{R} - \{2, -3\}$ b) $\mathbf{R} - \{-3, 2\}$ c) $\mathbf{R} - \{3, -2\}$ d) $\mathbf{R} - \{-3, -2\}$

12. If $y = 2\tan x + 5x$, then $\frac{dy}{dx}$ at $x = \frac{\pi}{4}$ is equal to
a) 9 b) 4 c) 5 d) 3

13. The 4th term in the expansion of $(x - 2y)^{12}$ is
a) $1760x^8y^6$ b) $-440x^7y^5$ c) $-1760x^9y^3$ d) none of these

14. Given $P(A) = \frac{2}{5}$ and $P(B) = \frac{1}{4}$, then $P(A \text{ and } B)$, if A and B are mutually exclusive events is
a) $\frac{13}{20}$ b) $\frac{3}{5}$ c) $\frac{4}{5}$ d) 0

15. If ${}^n P_5 = 20 \cdot {}^n P_3$, then n = ?
a) 8 b) 9 c) 10 d) 11

16. The mean deviation of the data 2, 9, 9, 3, 6, 9, 4 from the mean is
a) 2.23 b) 2.57 c) 3.23 d) 3.57

17. If $|x - 3| < 2$ and $x \in \mathbf{R}$, then its solution set is:
a) $1 < x < 5$ b) $-2 < x < 2$ c) $2 < x < -2$ d) $-1 < x < 5$

18. For the parabola $x^2 = -16y$, the focus and the equation of directrix are respectively
a) F(0, 4), $y = 4$ b) F(0, -4), $y = 4$ c) F(0, 4), $y = -4$ d) F(0, -4), $y = -4$

DIRECTIONS: In the question number 19 and 20, a statement of **Assertion(A)** is followed by a statement of **Reason(R)**. Choose the correct option

- (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 and 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.

19. **Assertion(A):** x - coordinate of any point lie on yz plane is 0.

Reason(R): Distance of any point $P(x_1, y_1, z_1)$ from origin is $\sqrt{x_1^2 + y_1^2 + z_1^2}$.

20. **Assertion(A):** The value of $\lim_{x \rightarrow 3} 2(x^2 - x + 1)$ is 3.

Reason(R): $\lim_{x \rightarrow a} [f(x) \cdot g(x)] = \lim_{x \rightarrow a} f(x) \cdot \lim_{x \rightarrow a} g(x)$

SECTION B

21. Find the conjugate of $(6 + 5i)^2$.

22. If $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{2, 4, 6, 8\}$, $B = \{2, 3, 5, 7\}$, verify that $(A \cup B)' = (A' \cap B')$

23. Find the point on the y axis which is at a distance of $\sqrt{10}$ units from the point $(1, 2, 3)$.

24. Prove that $\frac{\sin 2\theta}{1 + \cos 2\theta} = \tan \theta$.

OR

Find the value of $\sin(-\frac{11\pi}{3})$.

25. Find the equation of ellipse whose vertices are at $(\pm 6, 0)$ and foci at $(\pm 4, 0)$.

OR

Find the equation of the circle with centre at $(-2, 3)$ and radius is $\sqrt{5}$ units.

SECTION C

26. Find the ratio in which YZ- plane divides the line segment formed by joining the points $(-2, 4, 7)$ and $(3, -5, 8)$.

27. Differentiate $\left(\frac{5x^2 - 3x}{x + 5}\right)$ with respect to x .

28. Find the mean deviation about the mean for the following data.

x_i	10	30	50	70	90
f_i	4	24	28	16	8

29. Prove that $\sin 3x + \sin 2x - \sin x = 4 \sin x \cos \frac{x}{2} \cos \frac{3x}{2}$.

OR

Prove that $\cot 4x(\sin 5x + \sin 3x) = \cot x(\sin 5x - \sin 3x)$.

30. Find the equation of line parallel to the line $3x - 4y + 2 = 0$ and passing through the point $(-2, 3)$.

OR

Find the angle between the lines $\sqrt{3}x + y = 1$ and $x + \sqrt{3}y = 1$.

31. Find the coefficient of x^{18} in the expansion of $\left(x^2 + \frac{3a}{x}\right)^{15}$.

SECTION D

32. A rod of length 12 cm moves with its ends always touching the coordinate axes. Determine the equation of locus of a point P on the rod, which is 3 cm from the end in contact with the x axis.

OR

An arc is in the form of a semi ellipse. It is 8 m wide and 2 m high at the centre. Find the height of the arch at a point 1.5 m from one end.

33. Find the derivative of $\cos(x + 1)$ from first principle.

34. If a, b, c, d are in G.P, show that : $(a^2 + b^2 + c^2)(b^2 + c^2 + d^2) = (ab + bc + cd)^2$.

OR

Find the sum of the following series upto n terms.

$$0.6 + 0.66 + 0.666 + \dots$$

35. Find the coordinate of the foot of the perpendicular from the point (-1, 3) to the line $3x - 4y - 16 = 0$.

SECTION E

36. Five students Ajay, Shyam, Yojana, Rahul and Vijay are sitting in a playground in a line.

Based on the above information, answer the following questions

- (i) Find the total number of ways of sitting arrangement of five students. **1**
(ii) Find the number of arrangements if Ajay and Shyam sits together. **2**

OR

Find the number of arrangements if Shyam sits in the middle.

- (iii) Find the number of arrangements if Ajay sits in the first position and vijay sits at last. **1**

37. A company produces 500 computers in the third year and 600 computers in the seventh year. Assuming that the production increases uniformly by a constant number every year.

Based on the above information answer the following questions:

- (i) Find the value of the fixed number by which the production is increasing every year. **1**
(ii) Find the production in first year. **1**
(iii) Find the total production in 10 years. **2**

OR

Find the number of production in 21st year.

38. If $P(A) = 0.1$, $P(B) = 0.3$ and $P(A \cap B) = 0.05$ then find,

- (i) $P(A \cup B)$ **1**
(ii) $P(A' \cup B')$ **2**

OR

$P(A-B)$

- (iii) $P(A' \cap B')$. **1**
