

MATHEMATICS

CBSE Class XI | Vacation Assignment | Set 1

Time Allowed: 3 Hours	Maximum Marks: 80
-----------------------	-------------------

General Instructions

1. All questions are compulsory. Show complete working.
2. Calculators are not permitted.
3. Draw diagrams where useful. Use exact values unless otherwise stated.

Section A — Objective / Very Short Answer (20 marks)

Q1–Q10. Choose the correct answer. ($10 \times 1 = 10$)

1. If $A = \{1, 2, 3\}$, the number of subsets of A is: (a) 3 (b) 6 (c) 8 (d) 9
2. The domain of $f(x) = \sqrt{x-2}$ is: (a) $x < 2$ (b) $x \leq 2$ (c) $x \geq 2$ (d) all real x
3. $\sin^2\theta + \cos^2\theta$ equals: (a) 0 (b) 1 (c) $\tan \theta$ (d) 2
4. The value of i^2 is: (a) 1 (b) -1 (c) i (d) $-i$
5. The number of ways to arrange 4 distinct objects is: (a) 8 (b) 12 (c) 16 (d) 24
6. The coefficient of x^2 in $(1+x)^4$ is: (a) 4 (b) 6 (c) 8 (d) 12
7. The slope of a line parallel to the x -axis is: (a) 0 (b) 1 (c) undefined (d) -1
8. The mean of 2, 4, 6, 8 is: (a) 4 (b) 5 (c) 6 (d) 20
9. The derivative is defined as a limit of: (a) area (b) average rate of change (c) slope of a secant only (d) sum
10. If $P(A) = 0.3$, then $P(A')$ is: (a) 0.3 (b) 0.7 (c) 1.3 (d) 1

Q11–Q20. Answer briefly. ($10 \times 1 = 10$)

11. Write the interval represented by $x \in \mathbb{R}$ and $-2 < x \leq 5$.
12. Find the principal value of $\cos^{-1}(0)$.
13. Express $(3 + 2i) + (1 - 5i)$ in $a + ib$ form.
14. Find $5!$.
15. Write the equation of a circle with centre at origin and radius 4.
16. Find the common difference of 7, 3, -1 , -5 , ...
17. State the formula for the sum of the first n natural numbers.
18. Find the distance between $(0, 0)$ and $(3, 4)$.
19. What is the probability of an impossible event?
20. Find the derivative of x^2 with respect to x .

Section B — Short Answer (20 marks)

- Q21. Let $A = \{1, 2, 3, 4\}$ and $B = \{3, 4, 5, 6\}$. Find $A \cup B$, $A \cap B$ and $A - B$. (3)
- Q22. Solve $2 \sin x = 1$ for $x \in [0, 2\pi]$. (3)
- Q23. Solve $x^2 - 6x + 13 = 0$ and express the roots in complex form. (3)
- Q24. How many 4-digit numbers can be formed from digits 1, 2, 3, 4, 5 without repetition? (3)
- Q25. Find the equation of the line passing through $(2, -1)$ with slope 3. (3)

Q26. Find the mean and variance of the data 2, 4, 4, 6, 9. (5)

Section C — Long Answer (24 marks)

Q27. Prove that $(1 - \cos 2x) / \sin 2x = \tan x$, wherever both sides are defined. (4)

Q28. Using the binomial theorem, expand $(2x - 1)^4$. (4)

Q29. Find the sum of the first 20 terms of the arithmetic progression 3, 7, 11, ... (4)

Q30. Find the equation of the circle passing through (0, 0), (4, 0) and (0, 6). (4)

Q31. Differentiate $y = (x^2 + 1)(3x - 2)$ using the product rule. (4)

Q32. A committee of 3 is to be chosen from 5 boys and 4 girls. In how many ways can it be formed if it must include at least one girl? (4)

Section D — Case-based / Higher Order Thinking (16 marks)

Q33. A school canteen records the number of reusable bottles sold over five days: 12, 15, 10, 18, 20. (a) Find the mean. (2) (b) Find the range. (2)

Q34. A circular garden has centre O and radius 7 m. (a) Write its equation if O is the origin. (2) (b) Find its area in terms of π . (2)

Q35. A student randomly selects one card from cards numbered 1 to 10. (a) Find the probability of selecting an even number. (2) (b) Find the probability of selecting a prime number. (2)

Q36. The height of a ball after t seconds is $h(t) = 20t - 5t^2$. (a) Find the time when its height is maximum. (2) (b) Find the maximum height. (2)