JB ACADEMY, AYODHYA

HALF YEARLY EXAMINATION (2025-26)

CLASS – XI, SUB: MATHEMATICS

Time – 3 Hours **Marks: 80**

General Instructions:

1. *All questions are compulsory.*
2. *This question paper contains 38 questions.*
3. *This question paper is divided into five Sections – A, B, C, D and E.*

Section – A (1 mark each)

Choose the correct option:

Q1) The number of subsets of a set containing n elements is

a) n b) 2^n c) n^2 d) none of these

Q2) If A={1,2,3,4,5} then the number of proper subsets of A is

a) 120 b) 30 c) 31 d) None of these

Q3) Let R be a relation on N defined by x+2y=8 the domain of R is

a) {2,4,6} b) {2,4,8} c) {2,4,6,8} d) None of these

Q4) If the set A has p elements, B has q elements, then the number of elements in A×B is

a) p+q b) pq c) p^2 d) None of these

Q5) If A={1,2,4} B={2,4,5} C={2,5} then (A-B)×(B-C) is

a) {(1,2)(1,5)(2,5)} b) (1,4) c) {(1,4)} d) None of these

Q6) If $\tan x = -\frac{1}{\sqrt{5}}$ and x lies in the 4^{th} quadrant, then the value of $\cos x$ is

a) $\frac{2}{\sqrt{6}}$ b) $\frac{1}{2}$ c) $\frac{1}{\sqrt{6}}$ d) None of these

Q7) The value of (tan15°.tan30°.tan45°.tan60°.tan75°)

a) 1 b) 2 d) 3 d) None of these

Q8) The value of $(1+i)(1+i^2)(1+i^3)(1+i^4)$

a) 2 b) 0 c) 1 d) None of these

Q9) If $z=(\frac{1+i}{1-i})$ then z^4 equals

a) 1 b) -1 c) 0 d) None of these

Q10) $\frac{1+2i+3i^2}{1-2i+3i^2}$ equals

a) I b) -1 c) –I d) None of these

Q11) If -3x+17<-13 then

a) $x \in [10, \infty)$ b) $x \in (-\infty, 10]$ c) $x \in [-10,10]$ d) None of these

Q12) If x<7 then

a) –x<-7 b) -x≤-7 c) –x>-7 d) None of these

Q13) The number of ways to arrange the letters of the word CHEESE are

a) 240 b) 120 c) 720 d) None of these

Q14) The number of different four digit numbers that can be formed with the digits 2,3,4,7 and using each digit exactly once is

a) 120 b) 24 c) 96 d) None of these

Q15) If $^{20}C_r = {}^{20}C_{r-10}$ then $^{18}C_r$ is equal to

a) 816 b) 1632 c) 4896 d) None of these

Q16) Total number of words formed by 2 vowels and 3 consonants taken from 4 vowels and 5 consonants is equal to

a) 60 b) 120 c) 720 d) None of these

Q17) The two geometric means between the numbers 1 and 64 are

a) 4 and 16 b) 2 and 16 c) 16 and 32 d) None of these

Q18) If x, 2x+2, 3x+3 are in GP then the 4^{th} term is

a) 27 b) -27 c) 13.5 d) None of these

Q19) 6^{th} term of a GP 1,3,9,---- is

a) 243 b) 81 c) 729 d) None of these

Q20) The n^{th} term of a GP is 128 and the sum of its n terms is 225. If its common ratio is 2, then its first term is

a) 3 b) 8 c) 1 d) None of these

Section – B (2 marks each)

Q21) Write all possible subsets of {a,b,c}

Q22) If A={1,2,3} , B={$x: x \in N, x$ is a prime number less than 5}, Find A×B and B×A

Q23) Find the radian measure into degree measure of the following

a) -47°30’ b) 240°

Q24) Express ($i^9 + i^{19}$) in the form of a+ib

Q25) Which term of the GP 2, 1, 1/2, 1/4,---- is 1/128?

OR

The third term of a GP is 4. Find the product of its first five terms.

Section – C (3 marks each)

Q26) Let $A = \{x: x \in N\}$, $B = \{x: x = 2n, n \in N\}$, $C = \{x: x = 2n - 1, n \in N\}$ and $D = \{x: x \text{ is a prime natural number}\}$. Find:

a) $A \cap B$ b) $A \cap D$ c) $B \cap C$

Q27)Find the domain and the range of the function $f(x) = \sqrt{4 - x^2}$

Q28) Prove that : $\cos 6x = 32\ cos\ 6x - 48\cos 4x + 18\cos 2x - 1$

OR

Prove that: $\cos\left(\frac{\pi}{4} - A\right).\cos\left(\frac{\pi}{4} - B\right) - \sin\left(\frac{\pi}{4} - A\right)\text{Sin}\left(\frac{\pi}{4} - B\right) = \sin(A + B)$

Q29) Express the following in the form of a+ib

a) $\frac{2-\sqrt{-7}}{1-\sqrt{-3}}$ b) $\frac{3-\sqrt{-11}}{1-\sqrt{-5}}$

Q30) If ${}^{2n}C_3 : {}^{n}C_3 = 12 : 1$, find r.

Q31) Find the sum to n terms of sequence 8,88,888……..

Section – D (5 marks each)

Q32) Prove that: $\frac{cos8A.cos5A - cos12A.cos9A}{sin8A.cos5A + cos12A.sin9A} = tan4A$

Q33) IQ of a person is given by the formula $IQ = \frac{MA}{CA} \times 100$, where MA is mental age and CA is chronological age. If $80 \leq IQ \leq 140$ for a group of 12 year children, find the range of their mental age.

Q34) How many different words can be formed by using all the letters of the word ALLAHABAD? In how many of them vowels occupy the even positions?

OR

Find the number of arrangements of the letters of the word INDEPENDENCE. In how many of these arrangements

a) Do the words start with P? b) Do all the vowels always occur together?

Q35) Find the value of n so that $\frac{a^{n+1} + b^{n+1}}{a^n + b^n}$ may be the geometric mean between a and b.

Section – E (4 marks each)

CASE STUDY Type Questions:

Q36) A man wants to cut three length from a single piece of board of length 91cm. The second length is to be 3cm longer than the shortest and third length is to be twice as long as the shortest.

Based on above information answer the following question:

a) What are the possible lengths for the shortest board if third piece is to be atleast 5cm longer than the second.
b) What are the possible lengths If the third piece is to be at least 11cm longer than the second.

Q37) A committee of 5 is to be formed out of 6 gents and 4 ladies. In how many ways this can be done when

Based on above information answer the following question:

a) At least 3 ladies are included
b) At most 2 gets are included

Q38) A manufacturer reckons that the value of a machine, which cost him Rs 15625, will depreciate each year by 20%.

Answer the following questions which are based on word "REPUBLIC"

a) Find the estimated value at the end of 5 years.
b) At the end of 10 years