

Red Rose Convent School
SA- I Examination (2025-26)
Class: XI Science Subject: Mathematics (Set- I)

Time: 3:00 Hrs

M.M. : 80

(Section: A Carries One mark)

- Q1- If $A = \{1, 2, 4\}$, $B = \{2, 4, 5\}$, $C = \{2, 5\}$, then $(A-B) \times (B-C)$ is:
a) $\{(1,2), (1,5), (2,5)\}$ b) $\{(1,4)\}$ c) $(1,4)$ d) None of these
- Q2- Conjugate of complex number $i^3 - 4$ is
a) $i^3 + 4$ b) $4 - i$ c) $-4 + i$ d) $-4 - i$
- Q3- For any two set A and B, $A \cap (A \cup B)'$ is equal to:
a) A b) B c) Φ d) $A \cap B$
- Q4- The minute hand of a watch is 1.5 cm long. The distance by the minute hand in 40 minutes is equal to.
a) 3.28 cm b) 4.28 cm c) 5.28 cm d) 6.28 cm
- Q5- The domain of the function $f(x) = \sqrt{a^2 - x^2}$, $a > 0$ is:
a) $(-a, a)$ b) $[-a, a]$ c) $[0, a]$ d) $(-a, 0]$
- Q6- If $\frac{\pi}{2} < x < \frac{3\pi}{2}$, then $\sqrt{\frac{1-\sin x}{1+\sin x}}$ is equal to:
a) $\sec x - \tan x$ b) $\sec x + \tan x$ c) $\tan x - \sec x$ d) None of these
- Q7- The value of $\cot\left(\frac{\pi}{4} + x\right) \cot\left(\frac{\pi}{4} - x\right)$ is:
a) -1 b) 0 c) 1 d) not defined
- Q8- If m,n,p,q are consecutive integers then the value of $i^m + i^n + i^p + i^q$ is:
a) 1 b) -1 c) 0 d) None of these
- Q9- If $i^2 = -1$, then the sum $i + i^2 + i^3 + \dots$ up to 1000 terms is equal to:
a) 1 b) -1 c) i d) 0
- Q10- The solution set of the in equation $\frac{x+1}{x+2} > 1$ is:
a) $(-2, \infty)$ b) $(-\infty, -2]$ c) $(-\infty, -2)$ d) $[-2, \infty)$
- Q11- If $-3x + 17 < -13$, then
a) $x \in (10, \infty)$ b) $x \in [10, \infty)$ c) $x \in (-\infty, 10)$ d) $x \in [-10, 10]$
- Q12- The total number of terms in the expansion of $(x+a)^{51} - (x-a)^{51}$ after simplification is:
a) 102 b) 25 c) 26 d) none of these
- Q13- The value of $\{(\sqrt{2} + 1)^5 + (\sqrt{2} - 1)^5\}$, is:
a) 58 b) $58\sqrt{2}$ c) 42 d) $42\sqrt{2}$
- Q14- The third term of a G.P is 4. The product of first five terms:
a) 4^3 b) 4^5 c) 4^4 d) none of these

Q15- If $n_{Pr} = 840$, and $n_{Cr} = 35$, then $r =$

- a) 7 b) 4 c) 11 d) 14

Q16- The number of permutations of n different objects, taken r at a time, when repetitions are allowed, is :

- a) n_{p_r} b) $n!$ c) n^r d) r^n

Q17- If a, b, c in A.P and x, y, z are in G.P. then the value of $x^{a-c}y^{c-a}z^{a-b}$ is:

- a) 0 b) 1 c) xyz d) $x^a y^b z^c$

Q18- Everybody in a room shakes hand with everybody else. The total number of hand shakes is 66. The total number of persons in the room:

- a) 11 b) 12 c) 13 d) 14

Q19- Assertion: Let A be a finite set containing of n elements, then the number of relation of A is 2^{n^2} .

Reason: A relation on a set A is a subset of set A.

- (a) Both (A) and (R) are true and (R) is the correct explanation of (A).
(b) Both (A) and (R) are true but (R) is not the correct explanation of (A).
(c) (A) is true but (R) is false.
(d) (A) is false but (R) is true.

Q20- Assertion: If $\tan x = \frac{m}{m-1}$ and $\tan y = \frac{1}{2m-1}$, then $x - y = \frac{\pi}{4}$.

Reason: $\tan (x-y)=\frac{\tan x-\tan y}{1+\tan x \tan y}$.

- (a) Both (A) and (R) are true and (R) is the correct explanation of (A).
(b) Both (A) and (R) are true but (R) is not the correct explanation of (A).
(c) (A) is true but (R) is false.
(d) (A) is false but (R) is true.

Section: B (Carries 2 marks)

✓ 4. In a group of 800 people, 550 can speak Hindi and 450 can speak English. How many can speak both Hindi and English.

Q22 Find the domain and range of the function $f(n)$ given by $f(n) = \frac{x-2}{3-x}$

Or

Draw graph of modulus functions with domain and range.

Q23- Find the value of x and y , if $(3x - 2iy)(2 + i)^2 = 10(1 + i)$

Q24- Solve the inequality $\frac{x-2}{x+5} > 2$. Also, represent the solution on the number line.

Q25- Find the n^{th} term and the 12th term the sequence $-6, 18, -54, \dots$

Section : C (Carries 3 marks)

Q26- Find the sum of the sequence 7, 77, 777, 7777, to n terms

Q27- If $f = (x) = \begin{cases} x^2, & x < 0 \\ x, & 0 \leq x < 1 \\ \frac{1}{x}, & x \geq 1 \end{cases}$

Find (i) $f\left(\frac{1}{2}\right)$ (ii) $f(-2)$ (iii) $f(1)$, (iv) $f(\sqrt{3})$ (v) $f(-5)$ (vi) $f(12)$

Q28- Prove that: $\sin 2x + 2\sin 4x + \sin 6x = 4 \cos 2x \sin 4x$

Q29- How many numbers greater than 1000000 can be formed by using the digits 1, 2, 0, 2, 4, 2, 4?

Q30- Using binomial theorem, expand $(x^2 + 2y)^5$

Q31- Find two positive numbers whose difference is 12 and whose AM exceeds the GM by 2.

Or

If $(x + iy)^{\frac{1}{2}} = a + ib$, where $x, y, a, b \in R$, then show that.

$$\frac{x}{a} - \frac{y}{b} = -2(a^2 + b^2)$$

Section : D (Carries 5 marks)

Q32- (i) Prove that:

$$\tan 4x = \frac{4 \tan x (1 - \tan^2 x)}{1 - 6 \tan^2 x + \tan^4 x}$$

(ii) Find the value of $\sin 18^\circ$

Q33- Evaluate: $(x^2 - \sqrt{1 - x^2})^4 + (x^2 + \sqrt{1 - x^2})^4$

Q34- There are 10 professors and 20 students out of whom a committee of 2 professors and 3 students is to be formed. Find the number of ways in which this can be done. Find how many of these committees.

- A particular professor is included?
- a particular students is included?
- a particular student is excluded?

Q35- Three numbers whose sum is 15 are in A.P. If 1, 4, 19 be added to them respectively, then they are in G.P. Find the numbers.

Section: E (Carries 4 marks)

Case Base Study

Q36- IQ of a person is given by the formula $IQ = \frac{MA}{CA} \times 100$ where MA is the mental age and CA is chronological age. Based on this information, answer the following questions:

- (i) For an individual, if $2MA \geq 3CA$, then what is his (her) minimum IQ?
- (ii) If for an individual $MA \leq CA$, then find the greatest value of his IQ.
- (ii) If $80 \leq IQ \leq 140$ for a group of 12 year old children, find the range of their mental age.
- (iv) If $CA \leq 3MA \leq 2CA$ for a group of persons, then find the range of their IQ.

Q37- Given $\cos x = -\frac{5}{13}$ and $\sin y = \frac{4}{5}$ where x and y are angles in the second quadrant.

Based on the above information, answer the following questions:

- (i) Find the value of $\sin(x + y)$
- (ii) Find the value of $\cos(x + y)$
- (iii) Find the value of $\sin(x - y)$
- (iv) Find the value of $\cos(x - y)$

Q38- The number of linear arrangements of n distinct items is $n!$. Every linear arrangement has a beginning and an end, but there is nothing like beginning or end in a circular arrangement. The number of circular arrangements of n distinct items is $(n - 1)!$. In a circular arrangement, we consider one object as fixed and the remaining objects are arranged in anticlockwise and clockwise order. If anticlockwise and clockwise arrangements are identical, then the number of circular arrangements of n distinct items is $\frac{1}{2}(n - 1)!$

Based on the above information, answer the following questions:

- (i) Find the number of ways in which 10 persons can sit around a round table.
- (ii) Find the number of ways in which 5 gentlemen and 4 ladies can dine at a round table, if no two ladies sit together.
- (iii) Find the number of ways in which seven persons can sit around a round table so that all shall not have the same neighbours in any two arrangements.
- (iv) 20 persons were invited for a party. Find the number of ways they and the host be seated at a circular table if two particular persons sit on either side of the host.