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Section _____

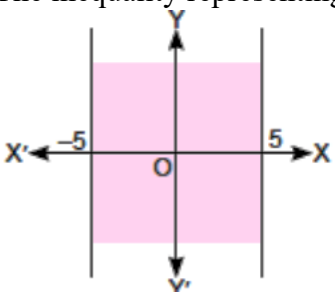
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CRPF PUBLIC SCHOOL, ROHINI, DELHI
MID TERM EXAMINATION (2026-27)
CLASS XI
MATHEMATICS (SET-A)

Time Allowed: 3 hours**Maximum Marks: 80****General Instructions:**

1. This Question paper contains - **Five sections** A, B, C, D and E. Each section is compulsory.
However, there are internal choices in some questions.
2. **Section A** has **18 MCQ's** and **02 Assertion Reasoning based questions** of 1 mark each.
3. **Section B** has **5 Very Short Answer (VSA)-type questions** of 2 marks each.
4. **Section C** has **6 Short Answer (SA)-type questions** of 3 marks each.
5. **Section D** has **4 Long Answer (LA)-type questions** of 5 marks each.
6. **Section E** has **3 source based/case based/passage based/integrated units of assessment** (4 marks each) with sub parts.

SECTION – A (MCQ) 1 Mark Questions	
Q1	For the function $f(x) = - x - 2 $, the range is: (A) $[0, \infty)$ (B) $(-\infty, 0)$ (C) $(0, \infty)$ (D) $(-\infty, 0]$
Q2	Let $S = \{x x \text{ is a positive multiple of 3 less than 30}\}$, $P = \{x x \text{ is a prime number less than 20}\}$. Then $n(S) + n(P)$ is: (A) 17 (B) 18 (C) 19 (D) 16
Q3	Let $A = \{1, 2, 3\}$, $B = \{2, 3, 4\}$, then which of the following is a function from A to B ? (A) $\{(1, 2), (1, 3), (2, 3), (3, 3)\}$ (B) $\{(1, 3), (2, 4)\}$ (C) $\{(1, 3), (2, 2), (3, 3)\}$ (D) $\{(1, 2), (2, 3), (3, 2), (3, 4)\}$
Q4	If $10^n + 3 \times 4^{n+2} + \lambda$ is divisible by 9 for all $n \in N$, then the least integral value of λ is: (A) -2 (B) -1 (C) -4 (D) -3
Q5	If $\cos x = -\frac{1}{2}$ and $0 < x < 2\pi$, then the solutions are : (A) $x = \frac{\pi}{3}, \frac{4\pi}{3}$ (B) $x = \frac{2\pi}{3}, \frac{4\pi}{3}$ (C) $\frac{2\pi}{3}, \frac{7\pi}{3}$ (D) $x = \frac{2\pi}{3}, \frac{5\pi}{3}$
Q6	The radius of the circle in which a central angle of 30° intercepts an arc of length 22cm is: (use $\pi = 22/7$) (A) 43 cm (B) 41 cm (C) 42 cm (D) 40 cm
Q7	The value of $\operatorname{cosec} 390^\circ$ is : (A) $\frac{2}{\sqrt{3}}$ (B) $\frac{\sqrt{3}}{2}$ (C) $\frac{1}{2}$ (D) 2

Q8	Which term of the sequence $8 - 6i, 7 - 4i, 6 - 2i, \dots$ is a real number? (A) 7 th (B) 6 th (C) 5 th (D) 4 th
Q9	Additive inverse of $\sqrt{3} - \sqrt{2}i$ is: (A) $\sqrt{3} + \sqrt{2}i$ (B) $-\sqrt{3} + \sqrt{2}i$ (C) $-\sqrt{3} - \sqrt{2}i$ (D) $\sqrt{2} + \sqrt{3}i$
Q10	If $\tan A = \frac{1}{2}$ and $\tan B = \frac{1}{3}$ then the value of $A + B$ is : (A) π (B) $\frac{\pi}{6}$ (C) $\frac{\pi}{2}$ (D) $\frac{\pi}{4}$
Q11	The binomial expansion of $(x + 4y)^{23}$ has (A) 23 terms (B) 24 terms (C) 25 terms (D) 22 terms
Q12	If $3x - 1 < 5 + x$, $6 - 5x \leq 1$, then $x \in$ (A) $[1,3]$ (B) $[-1,3]$ (C) $[1,3)$ (D) $(1,3)$
Q13	The inequality representing the following graph is:  (A) $ x < 5$ (B) $ x \leq 5$ (C) $ x > 5$ (D) $ x \geq 5$
Q14	If the third term of G.P. is 4, then the product of its first 5 terms is: (A) 4^3 (B) 4^4 (C) 4^5 (D) 4^2
Q15	If nth term of G.P. is 2^n , then the sum of its first 6 terms is : (A) 126 (B) 124 (C) 190 (D) 154
Q16	If the sum of n terms of an A.P. is given by $S_n = 3n + 2n^2$, then the common difference of A.P. is : (A) 3 (B) 2 (C) 6 (D) 4
Q17	If $\left \frac{z-2}{z-4} \right = 1$, then $Re(z)$ is equal to: (A) 2 (B) 4 (C) 3 (D) 8
Q18	For the quadratic equation $x^2 - 5ix - 6 = 0$, the value of x is: (A) 3,2 (B) $-3i, -2i$ (C) $3i, 2i$ (D) -3,-2
Assertion Reasoning Based Questions Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R. In the light of the above statements, choose the most appropriate answer from the options given below (A) Both A and R are correct and R is the correct explanation of A (B) Both A and R are correct but R is NOT the correct explanation of A (C) A is correct but R is not correct	

(D) A is not correct but R is correct	
Q19	Assertion(A): The set $\{1,8,27, \dots, 1000\}$ in set builder form is $\{x: x = n^3, \text{ where } n \in \mathbb{N} \text{ and } 1 \leq n \leq 10\}$ Reason(R): In roster form, the order in which the elements are listed doesn't make any difference
Q20	Assertion(A): $\sin(x+y) \cos(x-y) - \cos(x+y) \sin(x-y) = \sin 2x$ Reason(R): $\sin A \cos B - \cos A \sin B = \sin(A-B)$
SECTION – B (Very Short Answer (VSA)-type questions) 2 Marks Each	
Q21	Find the real numbers x and y if $(x - iy)(3 + 5i)$ is the conjugate of $-6 - 24i$.
Q22	If $X = \{5,6,7,8\}, Y = \{7,8,9,10\}, Z = \{3,4,5,6\}$. Find $(X \cap Y) \cup Z$. OR If $U = \{x: x \leq 10, x \in \mathbb{N}\}$, $A = \{x: x \in \mathbb{N}, x \text{ is prime}\}$, $B = \{x: x \in \mathbb{N}, x \text{ is even}\}$, write $A \cap B'$ in roster form.
Q23	Find the sixth term in the binomial expansion of $(2 - 3y)^9$. (Leave the answer in factorial)
Q24	Find the middle term in expansion of: $\left(\frac{2x^2}{3} - \frac{3}{2x}\right)^{12}$
Q25	A function f is defined as $f(x) = \begin{cases} x^2 + 1 & ; x < 0 \\ 2x & ; 0 < x \leq 1 \\ \frac{1}{x} & ; x > 1 \end{cases}$. Find: $f(2), f(-4), f(\sqrt{3})$ and $f(0.5)$.
SECTION – C (Short Answer (SA)-type questions) 3 Marks Each	
Q26	Prove the following by the principle of mathematical induction for all $n \in \mathbb{N}$: $\frac{1}{3.7} + \frac{1}{7.11} + \frac{1}{11.15} + \dots + \frac{1}{(4n-1)(4n+3)} = \frac{n}{3(4n+3)}$
Q27	Find the value of $\tan \frac{13\pi}{12}$. OR Find the general solution of the following equation: $\sin 2x + \cos x = 0$
Q28	Find the value of: $\cos\left(\frac{3\pi}{2} + x\right) \cos(2\pi + x) \left[\cot\left(\frac{3\pi}{2} - x\right) + \cot(2\pi + x)\right]$ OR If $\tan x = -\frac{4}{3}$, find the value of $\sin \frac{x}{2}$ and $\cos \frac{x}{2}$ where x lies in second quadrant.
Q29	Express the following number in polar form: $-1 + i$

Q30	Solve graphically: $3x + 4y \leq 60$, $x + 3y \leq 30$, $x \geq 0$ and $y \geq 0$.
Q31	If A.M. and G.M. of two positive numbers a and b are 10 and 8 respectively, find the numbers. OR If $x = 1 + a + a^2 + \dots \infty$; $a < 1$ and $y = 1 + b + b^2 + \dots \infty$; $b < 1$, prove that $1 + ab + a^2b^2 + \dots \infty = \frac{xy}{x+y-1}$.
SECTION – D (Long Answer (LA)-type questions) 5 Marks Each	
Q32	Attempt any two: (i) Find the domain and range of the following function: $f(x) = \frac{3}{2-x^2}$ (ii) If $f(x) = x^2 - 3x + 4$, then find the values of x satisfying the equation $f(x) = f(2x + 1)$. (iii) Draw the graph of following function: $y = \cos x$, when $-\pi \leq x \leq \pi$. Write its range and periodicity.
Q33	Attempt any two: (i) Prove that: $\frac{1+\sin \theta - \cos \theta}{1+\sin \theta + \cos \theta} = \tan \left(\frac{\theta}{2} \right)$ (ii) Prove that $\sqrt{2 + \sqrt{2 + 2 \cos 4\theta}} = 2 \cos \theta$ (iii) Prove that: $\sin x + \sin 3x + \sin 5x + \sin 7x = 4 \cos x \cos 2x \sin 4x$
Q34	Solve the following in equations: (i) $\frac{2x^2+x-15}{2x^2+5x-12} > 0$ (ii) $\frac{1}{2} \left(\frac{3x}{5} + 4 \right) \geq \frac{1}{3}(x - 6)$
Q35	If f is a function satisfying $f(x + y) = f(x)f(y)$ for all $x, y \in \mathbb{N}$ such that $f(1) = 3$ and $\sum_{x=1}^n f(x) = 363$, find the value of n. OR If the first term and the n^{th} term of a G.P. are a and b, respectively, and if P is the product of n terms, prove that $P^2 = (ab)^n$.
SECTION – E (Case Study Based Questions) 4 Marks Each	
Q36	In a library, 25 students are reading books on physics, chemistry and mathematics. It was found that 15 students were reading mathematics, 12 reading physics and 11 reading chemistry, 5 students reading both mathematics and chemistry, 9 students reading both physics and mathematics, 4 students reading both physics and chemistry, and 3 students reading all three subjects.



Based on above information answer the following

- (A) Find the number of students reading only Chemistry. (1)
 (B) Find the number of students reading only Mathematics. (1)
 (C) Find the number of students reading at least one of the subjects and also find the number of students reading none of the subjects. (2)

Q37

A teacher asked randomly his two students to draw graph (figure) on the black board. Two students Raman and Prashant draw figure (graphs) (a) and (b) one by one on the board as shown below:

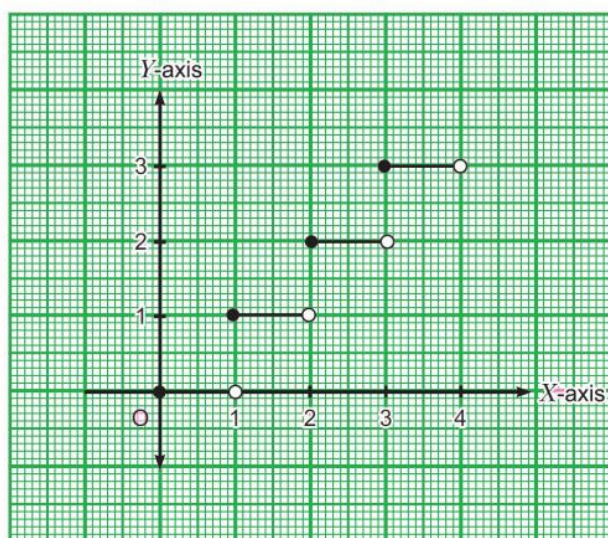


Figure (a)

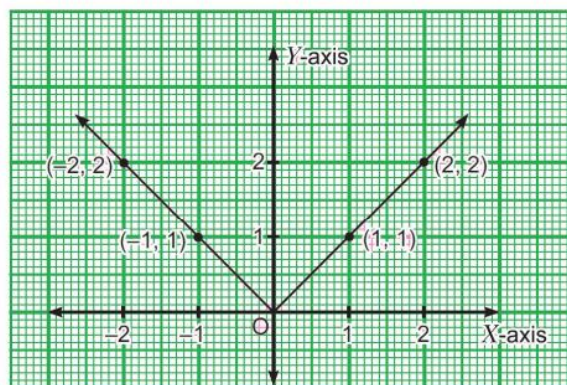


Figure (b)

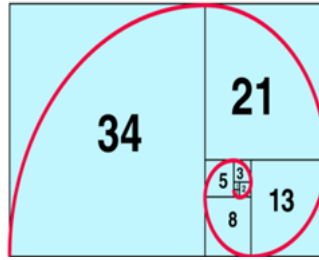
- (i) For the figure (a), write the function in terms of x .
 (ii) (a) For the figure (b), write the function in terms of x .

OR

- (ii) (b) Write the range of the function $f(x)$ of the figure (a).
 (iii) The function $f : \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = |x|$ then write the value of $f(-3)$.

Q38

Fibonacci number is a series of numbers in which each Fibonacci number is obtained by adding the two preceding numbers. It means the next number in the series is the addition of two previous numbers. Let the first two numbers in the series is taken as 0 and 1. By adding 0 and 1, we get the third number as 1, and similarly, the process goes on. Thus we get Fibonacci series as 0,1,1,2,3,5,8...



Based on above information answer the following:

- (i) The Fibonacci sequence is defined by:

$$a_1 = a_2 = 1, \text{ and } a_n = a_{n-1} + a_{n-2}; n > 2$$

Find $\frac{a_{n+1}}{a_n}, n = 1, 2, 3, 4$

- (ii) Write the first five terms of the sequence and obtain the corresponding series

$$a_1 = 3, a_n = 3a_{n-1} + 2 \text{ for all } n > 1$$