Class: XI   Sub: MATHEMATICS (041)   Max Marks: 30
Date: 13.05.2025   Set- 1   Time: 1 hr

General Instructions:

1. This question paper is divided in to 4 sections- A, B, C and D.
2. Section A comprises of 7 questions of 1 mark each.
3. Section B comprises of 3 questions of 2 marks each.
4. Section C comprises of 3 questions of 3 marks each.
5. Section D comprises of 2 case study-based questions
6. Internal choice has been provided for certain questions

SECTION – A

1    $\sin 30^0 \times \sec 60^0 + \tan 45^0 = $ _____   (1m)

   a) $\dfrac{3}{2}$ b) $\sqrt{3} + 1$ c) $\dfrac{\sqrt{3}}{2} + 1$ d) 2

2    $(\sec^2\theta - 1)(\csc^2\theta - 1)$ is equal to: (1m)

   a) -1   b) 0   c) 1   d) 2

3   Let $A = \{x : x$ is a multiple of 3, x $\in$ N$\}$ and $B = \{x : x$ is a multiple of 5, x $\in$ N $\}$.   (1m)
     Then, A $\cap$ B is given by

   a) $\{3, 6, 9, ...\}$ c) $\{15, 30, 45, ...\}$

   b) $\{5, 10, 15, 20, ...\}$ d) None of these

4   Which of the following can be the maximum number of subsets of any given finite   (1m)
     set?

   a) 6   b) 16   c) 26   d) 36

5   Let A = $\{x : x^3 = 8$ and $2x + 3 = 0\}$, then A is a   (1m)

   a) Null set   b) Singleton set   c) Finite Set   d) Infinite set

6   If $n(A) = 4$, $n(B) = 3$, $n(A \times B \times C) = 240$, then $n(C)$ is equal to   (1m)

   a) 228   b) 20   c) 12   d) 1

7 **Assertion (A):** The function $f: A \rightarrow B$ defined by $f = \{(1, x), (2, y), (3, x)\}$, then its domain is $A = \{1, 2, 3\}$ and range is $\{x, y\}$. (1m)
Reason (R): $g = \{(x, 1), (y, 2), (x, 3)\}$ is a function from $B \rightarrow A$.

(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 and R is True

SECTION – B

8 A, B and C are subsets of universal set U. If $A = \{2,4,6,8,10\}$, $B = \{1, 2, 3,5,7,9,10\}$, $C = \{1, 2, 5, 8, 9\}$ and $U = \{1, 2, 3,\ldots\ldots12\}$. Draw a Venn diagram showing the relation of U, A, B and C. (2m)

- **OR** -

Two finite sets have **m** and **n** elements, m > n. The total number of subsets of first set is 112 more than the total number of subsets of the second set. Find the value of **m** and **n**.

9 Write the functions in terms of 'x' for the following two situations (2m)
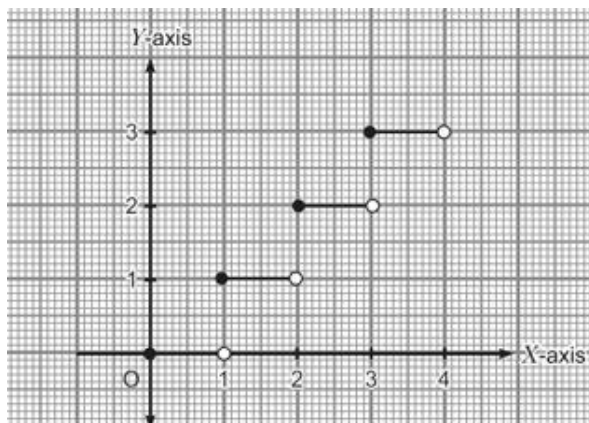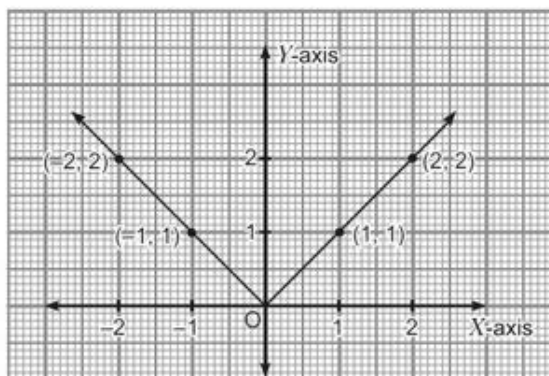

Fig (i)   Fig (ii)

10 Answer the following questions (2m)

(i)   If $f(x) = \dfrac{x - 1}{x + 1}$ then show that $f\left(\dfrac{1}{x}\right) = -f(x)$

(ii) If $f(x) = x^2$, then find the value of $\dfrac{f(1.1) - f(1)}{1.1 - 1}$

SECTION – C

11 If $U = \{1,2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 24\}$, $A = \{x : x \text{ is prime and } x \leq 10\}$, $B = \{x : x \text{ is a factor of } 24\}$ then verify the following result (3m)
(i) $A - B = A \cap B'$
(ii) $(A \cap B)' = A' \cup B'$

12 Answer the following questions   (3m)

(i) Are the following pair of sets are equal?, Give reason

A = {x : x is a letter in the word FOLLOW} and

B = {x : x is a letter in the word WOLF}

(ii) If S = {x : x is a positive multiple of 3 less than 100} and

P = {x : x is a prime number less than 20}, then find n(S) + n(P)

13 Solve the following: (3m)

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

(ii)   Find the domain of the function $f(x) = \dfrac{x^2 + 2x + 1}{x^2 - 8x + 12}$

- **OR** -

Let A = {1, 2, 3, 4, 5, 6}. Define a relation R from A to A by R = {(x, y) : y = x - 1}.
Write R in roster form. Represent the relation using arrow diagram.

SECTION – D (Case Study)

14 In a school, a survey was conducted among 100 students to understand their interest in two subjects: **Math (M)** and Biology **(B)**. The data collected was as follows:

- 60 students like Mathematics.
- 45 students like Biology.
- 25 students like both Math and Biology

Let: **M** be the set of students who like Math and B be the set of students who like Biology. Using this data, answer the following questions:

(i)   (a) Represent the above data using a Venn Diagram.   (2m)
      - OR-
      (b) How many students like neither Math nor Biology**?**

(ii) How many students like only Math?   (1m)

(iii) How many students at least one of the subjects**?**   (1m)

15 The Math teacher asked randomly his two students to solve the given questions on the white board. Two students Kenz and Sai attempted questions one by one. Find the answer for the following questions and help the teacher to verify the answers of Kenz and Sai.

Let A = {–2, –1, 0, 1, 2} and $f : A \rightarrow Z$ be given by $f(x) = x^2 - 2x + 3$, then find:

(i) the range of f (2m)

(ii) pre-image(s) of 3.   (2m)

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