Name : _____ Date : _____

Time : Start [ ] End [ ] Marks : 200

DPP JEE Main

Class XI | M | 001

MATHEMATICS

Chapter 1 : Sets, Relations and Functions

Topics :

- Sets, Types of Sets, Venn Diagrams, Algebraic Operations on Sets and Its Applications

Instructions :

➲ DPP contains 50 topicwise questions. ➲ Each DPP contains Multiple Choice Questions (MCQs) and Numerical Value Type Questions. ➲ Each question carries 4 marks. ➲ Mark the correct answer for MCQs and answers to be filled in as a numerical value for Numerical Value Type Questions in the OMR Sheet given at the end of the DPP. ➲ For every incorrect answer deduct 1 mark.

1. Let A and B be two sets defined as given below :
$A = \{(x, y) : |x - 3| < 1 \text{ and } |y - 3| < 1\}$ and
$B = \{(x, y) : 4x^2 + 9y^2 - 32x - 54y + 109 \le 0\}$, then
(a) $A \subset B$ (b) $B \subset A$
(c) $A = B$ (d) none of these

2. Let $P = \{\theta : \sin\theta - \cos\theta = \sqrt{2}\cos\theta\}$ and
$Q = \{\theta : \sin\theta + \cos\theta = \sqrt{2}\sin\theta\}$ be two sets. Then,
(a) $P \subset Q$ and $Q - P = \phi$ (b) $Q \not\subset P$
(c) $P \not\subset Q$ (d) $P = Q$

3. If $A = \{\theta : 2\cos^2\theta + \sin\theta \le 2\}$ and
$B = \left\{\theta : \frac{\pi}{2} \le \theta \le \frac{3\pi}{2}\right\}$, then $A \cap B$ is equal to
(a) $\{\theta : \pi/2 \le \theta \le 5\pi/6\}$
(b) $\{\theta : \pi \le \theta \le 3\pi/2\}$
(c) $\{\theta : \pi/2 \le \theta \le 5\pi/6\} \cup \{\theta : \pi \le \theta \le 3\pi/2\}$
(d) None of these

4. The intersection of all the intervals having the form $\left[1 + \frac{2}{n}, 6 - \frac{2}{n}\right]$, where n is a positive integer, is
(a) $[1, 6]$ (b) $(1, 6)$
(c) $[3, 4]$ (d) $[3/2, 5]$

5. If $A = \{x : \cos x > -1/2, 0 \le x \le \pi\}$ and
$B = \{x : \sin x > \frac{1}{\sqrt{2}}, \pi/3 \le x \le \pi\}$, then
(a) $A \cap B = \left[\frac{\pi}{3}, \frac{2\pi}{3}\right]$ (b) $A \cap B = \left[-\frac{\pi}{3}, \frac{2\pi}{3}\right]$
(c) $A \cup B = \left[-\frac{5\pi}{6}, \frac{5\pi}{6}\right]$ (d) None of these

6. Two sets A and B as under :
$A = \{(a, b) \in R \times R : |a - 5| < 1 \text{ and } |b - 5| < 1\}$;
$B = \{(a, b) \in R \times R : 4(a - 6)^2 + 9(b - 5)^2 \le 36\}$.
Then
(a) neither $A \subset B$ nor $B \subset A$
(b) $B \subset A$
(c) $A \subset B$
(d) $A \cap B = \phi$ (an empty set)

7. If $f(x) + 2f\left(\frac{1}{x}\right) = 3x,\ x \ne 0$ & $S = \{x \in R : f(-x) = f(x)\}$, then S
(a) is an empty set
(b) contains exactly one element
(c) contains exactly two elements
(d) contains more than two elements

8. If $A = \left\{p : p = \frac{(n+2)(2n^5 + 3n^4 + 4n^3 + 5n^2 + 12)}{n^2 + 2n}, n, p \in Z^+\right\}$
then the number of elements in the set A, is
(a) 2 (b) 3 (c) 4 (d) 6

9. If sets A and B are defined as
$A = \{(x, y) : y = e^x, x \in R\}$ and $B = \{(x, y) : y = x, x \in R\}$, then
(a) $B \subset A$ (b) $A \subset B$
(c) $A \cap B = \phi$ (d) $A \cup B = A$

10. If $A = \{(x, y) : x^2 + y^2 = 36\}$ and $B = \{(x, y) : x^2 + 9y^2 = 144\}$, then $A \cap B$ contains
(a) One point (b) Three points
(c) Two points (d) Four points

11. Let $A = \{(x, y) : x > 0, y > 0, x^2 + y^2 = 1\}$ and $B = \{(x, y) : x > 0, y > 0, x^6 + y^6 = 1\}$. Then $A \cap B =$

(a) A (b) B

(c) ϕ (d) $\{(0,1), (1,0)\}$

12. If $X = \{4^n - 3n - 1 : n \in N\}$ and $Y = \{9(n - 1) : n \in N\}$, then $X \cup Y$ is equal to

(a) X (b) Y

(c) N (d) None of these

13. Consider the two sets : $A = \{m \in R :$ Both the roots of $x^2 - (m + 1)x + m + 4 = 0$ are real$\}$ and $B = [-3, 5)$. Which of the following is not true?

(a) $A - B = (-\infty, -3) \cup (5, \infty)$

(b) $A \cap B = \{-3\}$

(c) $B - A = (-3, 5)$

(d) $A \cup B = R$

14. If $A = \{5^n - 4n - 1 : n \in N\}$ and $B = \{16(n - 1) : n \in N\}$, then

(a) $A = B$ (b) $A \cap B = \phi$

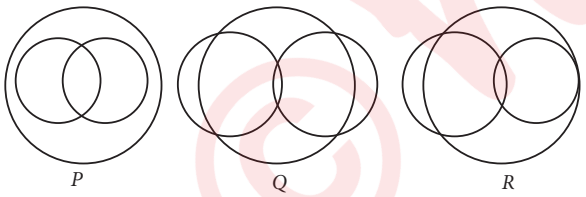
(c) $A \subseteq B$ (d) $B \subseteq A$

15. Let $A = \{(x, y) \in R \times R \mid 2x^2 + 2y^2 - 2x - 2y = 1\}$,
$B = \{(x, y) \in R \times R \mid 4x^2 + 4y^2 - 16y + 7 = 0\}$ and
$C = \{(x, y) \in R \times R \mid x^2 + y^2 - 4x - 2y + 5 \le r^2\}$.
Then, the minimum value of $2|r|$ such that $A \cup B \subseteq C$ is equal to

(a) $1 + \sqrt{5}$ (b) $3 + 2\sqrt{5}$

(c) $3 + \sqrt{10}$ (d) $2 + \sqrt{10}$

16. In a school, there are three types of games to be played. Some of the students play two types of games, but none play all the three games. Which Venn diagrams can justify the above statement?



(a) Q and R (b) P and Q

(c) P and R (d) None of these

17. Let S_1, S_2 and S_3 be three sets defined as

$S_1 = \{z \in C : |z - 1| \le \sqrt{2}\}$,

$S_2 = \{z \in C : \text{Re}((1 - i)z) \ge 1\}$ and

$S_3 = \{z \in C : \text{Im}(z) \le 1\}$

Then, the set $S_1 \cap S_2 \cap S_3$

(a) has exactly two elements

(b) has more than three elements

(c) has exactly three elements

(d) is a singleton set

18. Let $S = \{1, 2, 3, ..., 200\}$. The number of non-empty subsets A of S such that the product of elements in A is even is

(a) $2^{100}(2^{100} - 1)$ (b) 2^{100}

(c) $2^{100} + 1$ (d) $2^{100} - 1$

19. The set $S = \{1, 2, 3, ... ,15\}$ is to be partitioned into three sets A, B, C of equal size. Thus $A \cup B \cup C = S$, $A \cap B = B \cap C = A \cap C = \phi$. The number of ways to partition S is

(a) $\dfrac{15!}{(5!)^3}$ (b) $\dfrac{15!}{(5!)^4}$

(c) $\dfrac{15!}{3!(5!)^3}$ (d) $\dfrac{15!}{3!(5!)^4}$

20. In a certain town, 25% of the families own a phone and 15% families own a car, 65% families own neither a phone nor a car and 1000 families own both a car and a phone. Consider the following three statements :

(1) 5% families own both a car and a phone.

(2) 35% families own either a car or a phone.

(3) 20,000 families live in the town.

Then,

(a) only (1) and (2) are correct

(b) only (1) and (3) are correct

(c) only (2) and (3) are correct

(d) all (1), (2) and (3) are correct

21. Two newspapers A and B are published in a city. It is known that 25% of the city population reads A and 20% reads B while 8% reads both A and B. Further, 30% of those who read A but not B look into advertisements and 40% of those who read B but not A also look into advertisements, while 50% of those who read both A and B look into advertisements. Then the percentage of the population who look into advertisements is

(a) 13.5 (b) 13.9

(c) 13 (d) 12.8

22. Out of all the patients in a hospital 89% are found to be suffering from heart ailment and 98% are suffering from lungs infection. If K% of them are suffering from both ailments, then K can not belong to the set

(a) {79, 81, 83, 85}

(b) {84, 87, 90, 93}

(c) {80, 83, 86, 89}

(d) {84, 86, 88, 90}

23. If $n(A) = 115$, $n(B) = 326$, $n(A - B) = 47$, then $n(A \cup B)$ is equal to

(a) 373 (b) 165

(c) 370 (d) 389

24. If A, B and C are three non-empty sets such that A and B are disjoint and the number of elements contained in A is equal to those contained in the set of elements common to the sets A and C, then $n(A \cup B \cup C)$ is necessarily equal to

(a) $n(B \cup C)$ (a) $n(A \cup C)$

(c) both (a) and (b) (d) none of these

25. If A, B and C are three sets such that
$A \cap B = A \cap C$ and $A \cup B = A \cup C$, then

(a) $A = C$ (b) $B = C$

(c) $A \cap B = \phi$ (d) $A = B$

26. Let A, B and C be sets such that $\phi \neq A \cap B \subseteq C$. Then which of the following statements is not true?

(a) $B \cap C \neq \phi$

(b) If $(A - C) \subseteq B$, then $A \subseteq B$

(c) $(C \cup A) \cap (C \cup B) = C$

(d) If $(A - B) \subseteq C$, then $A \subseteq C$

27. In a class of 140 students numbered 1 to 140, all even numbered students opted Mathematics course, those whose number is divisible by 3 opted Physics course and those whose number is divisible by 5 opted Chemistry course. Then, the number of students who opted for any of the three courses is

(a) 102 (b) 38 (c) 1 (d) 42

28. Which of the following is correct, if $P(A)$ is power set of the set A?

(a) $P(A) \cup P(B) = P(A \cup B)$

(b) $P(A) \cap P(B) = P(A \cap B)$

(c) $P(A) - P(B) = P(A - B)$

(d) None of these

29. If A, B, C are three sets such that $(A \cup C) \subset (A \cup B)$ and $(A \cap C) \subset (A \cap B)$ then $C \subset B$. Then which of the following is true?

(a) It holds good but converse is not true

(b) Converse is also true

(c) C has to be a null set

(d) $C = B$

30. If $n(A) = 500$, $n(B) = 1000$ and if $n(A \cap B) \geq 1$ and $n(A \cup B) = p$, then

(a) $500 \leq p \leq 1000$ (b) $1001 \leq p \leq 1498$

(c) $999 \leq p \leq 1499$ (d) $1000 \leq p \leq 1499$

31. A survey shown that 63% of the Americans like bananas whereas 76% like apples. If x% of the Americans like both bananas and apples, then

(a) $x = 39$ (b) $x = 63$

(c) $39 \leq x \leq 63$ (d) None of these

32. Let U be the universal set and $A \cup B \cup C = U$. Then $\{(A - B) \cup (B - C) \cup (C - A)\}'$ is equal to

(a) $A \cup B \cup C$ (b) $A \cup (B \cap C)$

(c) $A \cap B \cap C$ (d) $A \cap (B \cup C)$

33. Let the sets $A = \{2, 4, 6, 8, ...\}$, $B = \{3, 6, 9, 12, ...\}$ and $n(A) = 200$, $n(B) = 250$, then

(a) $n(A \cap B) = 67$ (b) $n(A \cup B) = 450$

(c) $n(A \cap B) = 90$ (d) $n(A \cup B) = 384$

34. If A, B and C are finite sets and if $n(X)$ denotes number of elements in finite set X, then $n(A \cap (B \cup C)) =$

(a) $n(A \cap B) + n(A \cap C) - n(A \cap B \cap C)$

(b) $n(A \cap B) + n(A \cap C) + n(A \cap B \cap C)$

(c) $n(A \cap B) - n(A \cap C) + n(A \cap B \cap C)$

(d) $n(A \cap B) + n(A \cup C) - n(A \cap B \cap C)$

35. In an office, every employee likes at least one of tea, coffee and milk. The number of employees who like only tea, only coffee, only milk and all the three are all equal. The number of employees who like only tea and coffee, only coffee and milk and only tea and milk are equal and each is equal to the number of employees who like all the three. Then, a possible value of the number of employees in the office is

(a) 65 (b) 90 (c) 70 (d) 85

36. Of the number of three athletic teams in a school, 24 are in the badminton team, 30 in hockey team and 29 in the football team. 14 play hockey and badminton, 15 play hockey and football, 12 play football and badminton and 8 play all the games. The total number of members is

(a) 42 (b) 50 (c) 45 (d) 46

Numerical Value Type

37. In a rehabilitation programme, a group of 50 families were assured new houses and compensation by the government. Number of families who got both is equal to the number of families who got neither of the two. The number of families who got new houses is 6 greater than the number of families who got compensation. How many families got houses?

38. Let $X = \{n \in N : 1 \leq n \leq 50\}$. If $A = \{n \in X : n$ is a multiple of 2$\}$ and $B = \{n \in X : n$ is a multiple of 7$\}$, then the number of elements in the smallest subset of X containing both A and B is _____.

39. Let $A_1, A_2, ..., A_{15}$ are 15 sets each with 4 elements and $B_1, B_2, ..., B_n$ are n sets each with 2 elements. Let $\bigcup_{i=1}^{15} A_i = \bigcup_{j=1}^{n} B_j = X$. Assume that each element of X belongs to exactly 5 of A_i's and exactly 6 of B_j's. Find the value of n.

40. Let $S = \{(a, b, c) \in N \times N \times N : a + b + c = 15, a \leq b \leq c\}$ and $T = \{(a, b, c) \in N \times N \times N : a, b, c$ are in A.P.$\}$, where N is the set of all natural numbers. Then, the number of elements in the set $S \cap T$ is equal to _____ .

41. The sum of all the elements in the set $\{n \in \{1, 2, ..., 100\} |$ H.C.F. of n and 2040 is 1$\}$ is equal to _____.

42. Two finite sets have m and n elements. The number of subsets of the first set is 112 more than that of the second set. The value of $m \times n$ is _____.

43. If $A = \{x \in R : |x - 2| > 1\}$, $B = \{x \in R : \sqrt{x^2 - 3} > 1\}$, $C = \{x \in R : |x - 4| \geq 2\}$ and Z is the set of all integers,then the number of subsets of the set $(A \cap B \cap C)^c \cap Z$ is _____.

44. Let $A = \{n \in N : n$ is a 3-digit number$\}$, $B = \{9k + 2 : k \in N\}$ and $C = \{9k + l : k \in N\}$ for some $l (0 < l < 9)$. If the sum of all the elements of the set $A \cap (B \cup C)$ is 274×400, then l is equal to _____.

45. In a survey it is to be found that 70% of employees like bananas and 64% like apples. If x % like both bananas and apples, and $a \le x \le b$. Then, the HCF of a and b is _____.

46. A market research group conducted a survey of 2000 consumers and reported that 1720 consumers liked product A and 1450 consumers liked product B. What is the least number that must have liked both the products?

47. Let Z denotes the set of all integers where $A = \{(a, b): a^2 + 3b^2 = 28, a, b \in Z\}$ and $B = \{(a, b): a < b, a, b \in Z\}$, then the number of elements in $A \cap B$ is _____ .

48. Let $A = \{x : x$ is a digit in the number 3591$\}$, $B = \{x : x \in N, x < 10\}$. Then, number of elements in $B - A$ is

49. A company manufactures two types of products P_1 and P_2 and conducted a survey of 4000 consumers and reported that 3440 consumers use the product P_1 and 2900 use the product P_2. Find the least number that must use both the products.

50. If $A = \{x : x = n^2, n = 7, 8, 9\}$, then number of proper subsets is _____.

OMR SHEET

Use HB pencil only and darken each circle completely.
Mark only one choice for each question as indicated.

Correct marking ● ⓑ ⓒ ⓓ
Wrong marking ⊗ ⓐ ◑ ⊙

1. ⓐ ⓑ ⓒ ⓓ	7. ⓐ ⓑ ⓒ ⓓ	13. ⓐ ⓑ ⓒ ⓓ	19. ⓐ ⓑ ⓒ ⓓ	25. ⓐ ⓑ ⓒ ⓓ	31. ⓐ ⓑ ⓒ ⓓ	37. _____	43. _____	49. _____
2. ⓐ ⓑ ⓒ ⓓ	8. ⓐ ⓑ ⓒ ⓓ	14. ⓐ ⓑ ⓒ ⓓ	20. ⓐ ⓑ ⓒ ⓓ	26. ⓐ ⓑ ⓒ ⓓ	32. ⓐ ⓑ ⓒ ⓓ	38. _____	44. _____	50. _____
3. ⓐ ⓑ ⓒ ⓓ	9. ⓐ ⓑ ⓒ ⓓ	15. ⓐ ⓑ ⓒ ⓓ	21. ⓐ ⓑ ⓒ ⓓ	27. ⓐ ⓑ ⓒ ⓓ	33. ⓐ ⓑ ⓒ ⓓ	39. _____	45. _____	
4. ⓐ ⓑ ⓒ ⓓ	10. ⓐ ⓑ ⓒ ⓓ	16. ⓐ ⓑ ⓒ ⓓ	22. ⓐ ⓑ ⓒ ⓓ	28. ⓐ ⓑ ⓒ ⓓ	34. ⓐ ⓑ ⓒ ⓓ	40. _____	46. _____	
5. ⓐ ⓑ ⓒ ⓓ	11. ⓐ ⓑ ⓒ ⓓ	17. ⓐ ⓑ ⓒ ⓓ	23. ⓐ ⓑ ⓒ ⓓ	29. ⓐ ⓑ ⓒ ⓓ	35. ⓐ ⓑ ⓒ ⓓ	41. _____	47. _____	
6. ⓐ ⓑ ⓒ ⓓ	12. ⓐ ⓑ ⓒ ⓓ	18. ⓐ ⓑ ⓒ ⓓ	24. ⓐ ⓑ ⓒ ⓓ	30. ⓐ ⓑ ⓒ ⓓ	36. ⓐ ⓑ ⓒ ⓓ	42. _____	48. _____	

RESULT M | 001 - MATHEMATICS

Total Questions	50	Total Marks	200
Attempted		Correct	
Incorrect		Net Score	

Net Score = (Correct × 4) – (Incorrect × 1) = ...

Percentage Score = ...

Check your learning! If your score is

> 90%	EXCELLENT WORK !
90-75%	GOOD WORK !
74-60%	SATISFACTORY !
< 60%	NOT SATISFACTORY!