Exercise – I (JEE-Main Pattern)

SECTION–A

- This section contains **EIGHTEEN** questions.
- Each question has **FOUR** options (1), (2), (3) and (4). **ONLY ONE** of these four options is correct.
- For each question, darken the bubble corresponding to the correct option in the ORS.
- For each question, marks will be awarded in one of the following categories:

Full Marks : +4, if only the bubble corresponding to the correct option is darkened.
Zero Marks : 0, if none of the bubbles is darkened.
Negative Marks : –1 in all other cases.

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1. Which of the following statement is true?
(1) $3 \subseteq \{1, 3, 5\}$ (2) $3 \in \{1, 3, 5\}$ (3) $\{3\} \in \{1, 3, 5\}$ (4) $\{3, 5\} \in \{1, 3, 5\}$
MSN001

2. Which of the following is a null set?
(1) $A = \{x : x > 1 \text{ and } x < 1]$ (2) $B = \{x : x + 3 = 3\}$
(3) $C = \{\phi\}$ (4) $D = \{x : x \geq 1 \text{ and } x \leq 1\}$
MSN002

3. Let A and B be two sets in the universal set. Then $A - B$ equals-
(1) $A \cap B'$ (2) $A' \cap B$ (3) $A \cap B$ (4) none of these
MSN003

4. If $A \subseteq B$, then $A \cap B$ is equal to-
(1) A (2) B (3) A' (4) B'
MSN004

5. If A and B are any two sets, then $A \cup (A \cap B)$ is equal to-
(1) A (2) B (3) A' (4) B'
MSN005

6. If A and B are not disjoint, then $n(A \cup B)$ is equal to-
(1) $n(A) + n(B)$ (2) $n(A) + n(B) - n(A \cap B)$
(3) $n(A) + n(B) + n(A \cap B)$ (4) $n(A).n(B)$
MSN006

7. In a college of 300 students every student reads 5 newspapers and every newspaper is read by 60 students. The number of newspapers is
(1) at least 30 (2) at most 20 (3) exactly 25 (4) none of these
MSN007

8. Number of integers in between 200 to 2023 (both 200 and 2023 including) are divisible by 2 or 5
(1) 1093 (2) 1094 (3) 1275 (4) 1277
MSN008

9. Number of integers in between 500 to 2023 are divisible by 3 or 5 but not multiple of 2
(1) 356 (2) 355 (3) 710 (4) 711
MSN009

10. Let $S = \{1,2\}$, number of elements in the set $\{(A, B) : A \cup B = S\}$

(1) 4 (2) 6 (3) 9 (4) 10

MSN010

11. How many of the following statement is/are correct

P : In roster form, the order in which the elements are listed is immaterial

Q : While writing a set in roster form, an element is not generally repeated.

R : The collection of five most renowned mathematicians of the world is not a set.

S : A collection of most dangerous animals of the world is a set

(1) 1 (2) 2 (3) 3 (4) 4

MSN012

12. How many of the following statement is/are sets.

(i) The collection of all the months of a year beginning with the letter J.

(ii) The collection of ten most talented writers of india.

(iii) A team of eleven best-cricket bastsmen of the world.

(iv) The collection of all boys in your class.

(v) The collection of all-natural numbers less than 100.

(1) 1 (2) 2 (3) 3 (4) 4

MSN013

13. How many of the following statement is/are correct?

(a) Let $A = \{x : 1 < x < 2, x \text{ is a natural number}\}$. Then A is the empty set, because there is no natural number between 1 and 2.

(b) $B = \{x : x^2 - 2 = 0 \text{ and } x \text{ is rational number}\}$. Then B is the empty set because the equation $x^2 - 2 = 0$ is not satisfied by any rational value of x.

(c) $C = \{x : x \text{ is an even prime number greater than 2}\}$. Then C is the empty set, because 2 is the only even prime number

(d) $D = \{x : x^2 = 4, x \text{ is odd}\}$. Then D is the empty set, because the equation $x^2 = 4$ is not satisfied by any odd value of x.

(1) 1 (2) 2 (3) 3 (4) 4

MSN014

14. How many of the following statement is/are correct ?

(a) Let W be the set of the days of the week. Then W is finite.

(b) Let S be the set of solutions of the equation $x^2 - 16 = 0$. Then S is finite.

(c) Let G be the set of points on a line. Then G is infinite.

(1) 0 (2) 1 (3) 2 (4) 3

MSN015

15. How many of the following statement is/are correct?

P. $A \subset B$ if $a \in A \Rightarrow a \in B$

Q. A is a subset of B if a is an element of A implies that a is also an element of B

R. ϕ is a subset of every set

S. Every set A is a subset of itself

(1) 4 (2) 1 (3) 2 (4) 3

MSN016

16. If $x + y = 1$ and $x^2 + y^2 = 2$ then the value of $x^4 + y^4$ equals

(1) 7 (2) 6 (3) $\frac{7}{2}$ (4) $\frac{19}{4}$

MSN017

17. Pranshi has written down one integer two times and another integer three times. The sum of the five numbers is 100, and one of the numbers is 28. The other number is

(1) 6 (2) 8 (3) 10 (4) 12

MSN018

18. If $x, y \in \mathbb{N}$ and $xy - 3x - 2y = 54$, then number of ordered pairs (x, y) is

(1) 7 (2) 8 (3) 12 (4) 24

MSN019

SECTION–B

- This section contains **FIVE** Questions. Attempt any five Questions.
- The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value (If the numerical value has more than two decimal places, **truncate/round-off** the value to **TWO** decimal places; e.g. 6.25, 7.00, –0.33, –.30, 30.27, –127.30, if answer is 11.36777..... then both 11.36 and 11.37 will be correct).
- Answer to each question will be evaluated according to the following marking scheme:
  Full Marks : +4, if ONLY the correct numerical value is entered as answer.
  Zero Marks : 0 in all other cases.

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1. An investigator interviewed 100 students to determine their preferences for the three drinks : milk (M), coffee (C) and tea (T). He reported the following : 10 students had all the three drinks M, C and T; 20 had M and C; 30 had C and T; 25 had M and T; 12 had M only; 5 had C only; and 8 had T only. Using a Venn diagram find how many did not take any of the three drinks.

MSN021

2. A survey shows that 63% of the Americans like cheese whereas 76% like apples. If x% of the Americans like both cheese and apples, number of integral values of x is.

MSN022

3. How many ordered pairs of integers which satisfy the equation $\frac{1}{m}+\frac{2}{n}=\frac{1}{2}$?

MSN023

4. In DDPS – ALLEN, out of 400 students, 300 students opt for at least one subject out of Biology, Chemistry and Mathematics. If 120 students opted for Biology, 150 students opted for Chemistry, 200 students opted for Mathematics and 30 opted for all the three subjects, find the number of students who opted for exactly two subjects.

MSN024

5. In a Zoo, there are 6 Bengal white tigers and 6 Bengal royal tigers. Out of these tigers, 5 are males and 10 are either Bengal royal tigers or males. Find the number of female Bengal white tigers in the Zoo.

MSN025

Exercise – II (JEE-Main PYQs)

1. If A, B and C are three sets such that $A \cap B = A \cap C$ and $A \cup B = A \cup C$, then :- **[AIEEE 2009]**

(1) $B = C$ (2) $A \cap B = \phi$ (3) $A = B$ (4) $A = C$

MSN026

2. 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 did not opt for any of the three courses is : **[JEE Main 2019]**

(1) 102 (2) 42 (3) 1 (4) 38

MSN027

3. Two newspapers A and B are published in a city. It is known that 25% of the city populations 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 advertisement is :- **[JEE Main 2019]**

(1) 12.8 (2) 13.5 (3) 13.9 (4) 13

MSN028

4. Let $\mathbb{Z}$ be the set of integers. If $A=\left\{x\in\mathbb{Z}:2^{(x+2)\left(x^2-5x+6\right)}=1\right\}$ and $B=\left\{x\in\mathbb{Z}:-3<2x-1<9\right\}$, then the number of subsets of the set $A \times B$, is: **[JEE Main 2019]**

(1) 2^{18} (2) 2^{10} (3) 2^{15} (4) 2^{12}

MSN029

5. Let X = $\{n \in N : 1 \le n \le 50\}$. 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____ **[JEE Main 2020]**

MSN049

6. A survey shows that 73% of the persons working in an office like coffee, whereas 65% like tea. If x denotes the percentage of them, who like both coffee and tea, then x cannot be: **[JEE Main 2020]**

(1) 63 (2) 38 (3) 54 (4) 36

MSN050

7. Let A = {1,2,3,4,5,6,7} and B = {3,6,7,9}. Then the number of elements in the set $\{C \subseteq A : C \cap B \neq \phi\}$ is_____ **[JEE Main 2022]**

MSN051

8. An organization awarded 48 medals in event 'A', 25 in event 'B' and 18 in event 'C'. If these medals went to total 60 men and only five men got medals in all the three events, then, how many received medals in exactly two of three events? **[JEE Main 2023]**

(1) 10 (2) 9 (3) 21 (4) 15

MSN052

Exercise – III (JEE-Advanced Pattern)

SECTION-I

- This section contains **TEN** questions.
- Each question has **FOUR** options for correct answer(*s*). **ONE OR MORE THAN ONE** of these four option(*s*) is (are) correct option(*s*).
- For each question, choose the correct option(*s*) to answer the question.
- Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +4 if only (all) the correct option(*s*) is (are) chosen.
Partial Marks : +3 if all the four options are correct but ONLY three options are chosen.
Partial Marks : +2 if three or more options are correct but ONLY two options are chosen, both of which are correct options.
Partial Marks : +1 if two or more options are correct but ONLY one option is chosen and it is a correct option.
Zero Marks : 0 if none of the options is chosen (i.e. the question is unanswered).
Negative Marks : –2 in all other cases.

For Example : If first, third and fourth are the **ONLY** three correct options for a question with second option being an incorrect option; selecting only all the three correct options will result in +4 marks. Selecting only two of the three correct options (e.g. the first and fourth options), without selecting any incorrect option (second option in this case), will result in +2 marks. Selecting only one of the three correct options (either first or third or fourth option), without selecting any incorrect option (second option in this case), will result in +1 marks. Selecting any incorrect option(*s*) (second option in this case), with or without selection of any correct option(*s*) will result in –2 marks.

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1. If $U = \{1,2,3,4,5,6,7,8\}$, $A = \{1,2,3,5,6\}$ and $B = \{2,3,4,7,8\}$ which of the following are correct
(A) $A \cup B = U$ (B) $B - A = \{1,5,6\}$
(C) $A' \cup B = \{2,3,4,7,8\}$ (D) $(A - B)' = \{2,3,4,7,8\}$

MSN030

2. Which of the following are correct?
(A) $[2, 10] - \{2, 10\} = (2, 10)$ (B) $[3, 5] - \{5\} = (3,5]$
(C) $(-3, 5] - \{-3\} = (3, 5]$ (D) $[-2, 15] - (2, 15] = [-2, 2]$

MSN031

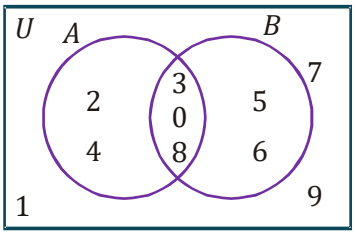
3. If $A \subseteq B$ then which of the following option(s) is/are correct ?
(A) $A' \subseteq B'$ (B) $B' \subseteq A'$ (C) $A \cap B' = \phi$ (D) $A' \cap B = \phi$

MSN032

4. Which of the following are correct ?
(A) $[a, b)$ is an interval from a to b, including a but excluding b.
(B) $(a, b]$ is an interval from a to b, including b but excluding a.
(C) $[a, b)$ is an interval from a to b, including b but excluding a.
(D) $(a, b]$ is an interval from a to b, including a but excluding b.

MSN033

5 From the adjoining Venn-diagram, find which of the following are correct :



(A) $A' = \{1,5,6,7,9\}$ (B) $B' = \{1,2,4,7,9\}$

(C) $(A \cap B)' = \{1,2,4,5,6,7,9\}$ (D) $(A - B)' = \{1,2,4,5,6,7,9\}$

MSN034

6. Which of the following option(s) is/are true ?

(A) If $A \subset B$ and $A \neq B$, then A is called a proper subset of B

(B) If $A \subset B$, then B is called superset of A.

(C) $A = \{1,2,3\}$ is NOT a proper subset of $B = \{1,2,3,4\}$

(D) If a set A has only one element, we call it a singleton set.

MSN035

7. In which of the following options, $A \neq B$:

(A) $A = \{x : x + 2 = 3\}$, $B = \{x : x \in \mathbb{N}$ and is less than $2\}$

(B) $A = \{x : x \in \mathbb{N}$ and $3x - 1 < 2\}$, $B = \{x : x \in \mathbb{W}$ and $3x - 1 < 2\}$

(C) $A = \{x : x \in \mathbb{N}$ and is prime factor of $36\}$, $B = \{1,2,3,4,6,9,12\}$

(D) $A = \{x : x \in I$ and $x^2 \leq 4\}$, $B = \{x : x \in \mathbb{R}$ and $x^2 - 3x + 2 = 0\}$

MSN036

8. Which of the following are examples of the null set

(A) Set of odd natural numbers divisible by 2

(B) Set of even prime numbers

(C) $\{x : x$ is a natural number $x < 5$ and $x > 7\}$

(D) $\{y : y$ is a point common to any two parallel lines$\}$

MSN037

9. Consider the set ϕ, $A = \{1,3\}$, $B = \{1,5,9\}$, $C = \{1,3,5,7,9\}$. Which of the following statements are correct?

(A) $\phi \subset B$ as ϕ is a subset of every set.

(B) $A \not\subset B$ as $3 \in A$ and $3 \notin B$

(C) $A \subset C$ as $1,3 \in A$ also belongs to C

(D) $B \subset C$ as each element of B is also an element of C.

MSN038

10. Which of the following options are incorrect

(A) $\{2,3,4,5\}$ and $\{3,6\}$ are disjoint sets

(B) $\{a, e, i, o, u\}$ and $\{a, b, c, d\}$ are disjoint sets

(C) $\{2,6,10,14\}$ and $\{3,7,11,15\}$ are disjoint sets

(D) $\{2,6,10\}$ and $\{3,7,11\}$ are disjoint sets

MSN039

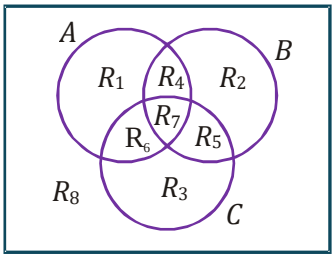
SECTION–II

- This section contains **ONE** paragraph.
- Based on each paragraph, there are **TWO/THREE** questions.
- Each question has **FOUR** options (A), (B), (C) and (D) **ONE OR MORE THAN ONE** of these four options is correct.
- For each question, darken the bubble corresponding to the correct option in the ORS.
- For each question, marks will be awarded in one of the following categories :

Full Marks : +3 if only the bubble corresponding to the correct answer is darkened.
Zero Marks : 0 in all other cases.

Comprehension # 1 (Q. No. 11 to 13)

R_i denotes region for i = 1, 2, ..., 8 as shown in figure.



11. Which of the following option(s) is/are true ?

(A) $R_1 = A \cap (B \cup C)'$ (B) $R_2 = B \cap (A' \cap C')$

(C) $R_3 = (A \cup B)'$ (D) $R_8 = (A \cup B \cup C)'$

MSN040

12. Which of the following option(s) is\are true ?

(A) $R_4 = (A \cap B) \cap C'$ (B) $R_5 = (B \cap C) \backslash A$

(C) $R_6 = (A \cap C) \cap (A \cap B \cap C)'$ (D) $R_8 = A' \cap B' \cap C'$

MSN041

13. Which of the following option(s) is/are true ?

(A) $R_7 = A \cap B \cap C$ (B) $R_7 = (A' \cup B' \cup C')'$

(C) $R_3 = (A' \cap B') \cap C$ (D) $R_5 = (B \backslash C') \cap A'$

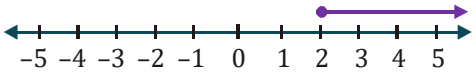
MSN042

SECTION–III

- This section contains **TWO** questions.
- Each question contains two columns, Column-I and Column-II.
- Column-I has four entries (A), (B), (C) and (D).
- Column-II has four entries (P), (Q), (R), (S).
- Match the entries in Column-I with the entries in Column-II.
- For each question, marks will be awarded in one of the following categories:

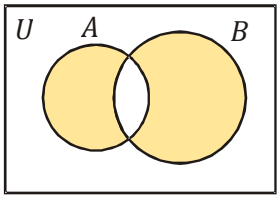
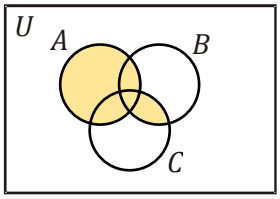
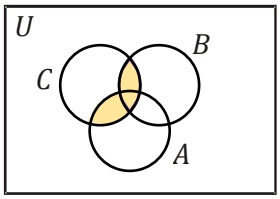
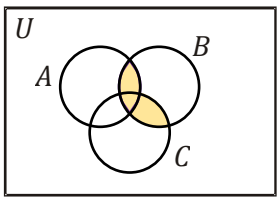
Full Marks : +4 If only correct answer is given.
Zero Marks : 0 If no answer is given.
Negative Marks : –1 For incorrect answer

14.

	Column-I		**Column-II**
(A)		(P)	$-1 \le x \le 5; x \in \mathbb{R}$
(B)		(Q)	$-5 \le x \le -1; x \in \mathbb{R}$
(C)		(R)	$x \ge 2; x \in \mathbb{R}$
(D)		(S)	$-4 \le x \le 3; x \in \mathbb{R}$

MSN043

15.

	Column-I		**Column-II**
(A)		(P)	$A \cup (B \cap C)$
(B)		(Q)	$(A - B) \cup (B - A)$
(C)		(R)	$(A \cap C) \cup (B \cap C)$
(D)		(S)	$(A \cup C) \cap B$

MSN044

Exercise - IV (JEE-Advanced PYQs)

1. If X and Y are two sets, then $X \cap (X \cup Y)^c$ equals

(A) X (B) Y (C) ϕ (D) none of these

MSN045

2. If $A = \{1, 2, 3, 4, 5\}$, then the number of proper subsets of A is-

(A) 120 (B) 30 (C) 31 (D) 32

MSN046

3. If A, B, C be three sets such that $A \cup B = A \cup C$ and $A \cap B = A \cap C$, then -

(A) $A = B$ (B) $B = C$ (C) $A = C$ (D) $A = B = C$

MSN047

4. Sets A and B have 3 and 6 elements respectively. What can be the minimum number of elements in $A \cup B$?

(A) 3 (B) 6 (C) 9 (D) 18

MSN048

ANSWER KEY

Exercise – I (JEE – Main Pattern)

Section-A	Q.	1	2	3	4	5	6	7	8	9	10
	A.	2	1	1	1	1	2	3	2	1	3
	Q.	11	12	13	14	15	16	17	18		
	A.	3	3	4	4	1	3	2	3		
Section-B	Q.	1	2	3	4	5					
	A.	20	25	7	110	2					

Exercise – II (JEE – Main PYQs)

Question	1	2	3	4	5	6	7	8	
Answer	1	4	3	3	29.00	4	112	3	

Exercise – III (JEE – Advanced Pattern)

Section-I	Q.	1	2	3	4	5	6	7	8	9	10
	A.	A,C,D	A,D	B,C	A,B	A,B,C	A,B,D	B,C,D	A,C,D	A,B,C,D	A,B
Section-II	Q.	11	12	13							
	A.	A,B,D	A,B,C,D	A,B,C,D							
Section-III	Q.	14				15					
	A.	(A→Q, B→R, C→S, D→P)				(A→Q, B→P, C→R, D→S)					

Exercise – IV (JEE – Advanced PYQs)

Question	1	2	3	4	
Answer	C	C	B	B	