

DPP No. # A1 (JEE-ADVANCED)

Total Marks : 31	Max. Time : 30 min.
Comprehension ('-1' negative marking) Q.1 to Q.7	(3 marks 3 min.) [21, 21]
Multiple choice Objective Questions ('-1' negative marking) Q.8	(4 marks 3 min.) [04, 03]
Subjective Questions ('-1' negative marking) Q.9 to Q.10	(3 marks 3 min.) [06, 06]

Question No.	1	2	3	4	5	6	7	8	9	10	Total
Marks Obtained											

Information about number system (Q. No. 1 to 7)

Counting numbers have fascinated human mind from time immemorial. The first set he seems to have pondered about is the set of natural numbers, N . Various subsets of this set were defined. Note worthy among them are

Prime Number :- If a natural number has exactly two divisors it is called a prime number. Yet another way to define it is as a natural number, other than 1, which is divisible by 1 & it self only.

Simple examples are 2, 3, 5, 7,

{2, 3} in the only set of consecutive primes.

Composite numbers :- A natural number having more than 2 divisors is called a composite number.

Simple examples are 4, 6, 8, 9, 10,

Note that 1 is neither prime nor composite.

Coprime or relatively prime numbers :- A pair of natural numbers is called a set of coprime numbers if their highest common factor (HCF) or greatest common divisor (g.c.d.) is 1.

For example 8 & 5 are co-prime

Note that these two numbers need not be prime.

More over 1 is coprime with every natural numbers.

A prime number is coprime with all natural numbers which are not it's multiple.

Twin Prime :- A pair of primes is called twin primes if their non-negative difference is '2'

For example {3, 5}, {5, 7}, {11, 13},

The natural numbers were not sufficient to deal with various equations that mathematicians encountered so some new sets of numbers were defined

Whole Numbers (W) = {0, 1, 2, 3, 4,

Integers (Z or I) = {....., -3, -2, -1, 0, 1, 2, 3, 4,

Even Integers :- Integers divisible by 2, they are expressed as $2n$, $n \in Z$.

Odd Integers :- Integers not divisible by 2, they are expressed as $2n + 1$ or $2n - 1$, $n \in Z$.

Based on above definitions solve the following problems

- Number of prime numbers less than 10 is p and number of composite numbers less than 15 is q then $p + q$ is equal to
(A) 11 (B) 9 (C) 7 (D) 15
- Let p & q be the number of natural numbers which are less than or equal 20 and are prime & composite respectively, then $20 - p - q$ is equal to
(A) 1 (B) 0 (C) 2 (D) 3
- Difference of squares of two odd integers is always divisible by
(A) 3 (B) 5 (C) 16 (D) 8
- Identify the correct statement
(A) If a, b, c are odd integers $a + b + c$ cannot be zero
(B) If a, b, c are odd integers $a^2 + b^2 - c^2 \neq 0$
(C) If $a^2 + b^2 = c^2$, then at least one of a, b, c is even, given that a, b, c are integers
(D) If $a^2 + b^2 = c^2$ where a, b, c are integers then $c > a + b$

5. If $m^2 - n^2 = 7$, where $m, n \in \mathbb{Z}$, then number of ordered pairs (m, n) is
Hint : $(m + n)(m - n) = 7 \times 1 = (-7) \times (-1)$
 (A) 1 (B) 2 (C) 3 (D) 4
6. Number of ordered pairs of integers (n, m) for which $n^2 - m^2 = 14$ is
 (A) 0 (B) 1 (C) 2 (D) 4
7. If $n^2 + 2n - 8$ is a prime number where $n \in \mathbb{N}$, then n is
 (A) also a prime number (B) relatively prime to 10
 (C) relatively prime to 6 (D) a composite number
8. Which of the following collections are sets?
 (A) Collection of all natural numbers lying between 21 and 210.
 (B) Collection of all rational numbers which lie between $\frac{1}{3}$ and $\frac{1}{2}$.
 (C) Collection of handsome boys in class XI of a given school.
 (D) Collection of all rectangles in a given plane.
9. Write the following sets in the tabular form :
 (i) $B = \{x : x \text{ is a natural number} < 10\}$
 (ii) $C = \{x : x \text{ is an odd positive integer and } x^2 < 30\}$
 (iii) $D = \{x : x \text{ is a letter of the English alphabet in the word 'LALLY'}\}$
 (iv) $E = \{x : x \text{ is a natural number that divides } 24\}$.
10. Write the following sets in the set builder form :
 (i) $P = \{2\}$ (ii) $Q = \{1, 4, 9, 16\}$ (iii) $T = \{A, E, I, O, U\}$ (iv) $V = \{0, 3, 6, 9\}$

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|-------|---|-----|-----|---------------------------|-----|------|--|-------|-----------|----|-----|----|------|
| 1. | (A) | 2. | (A) | 3. | (D) | 4. | (ABC) | 5. | (D) | 6. | (A) | 7. | (AB) |
| 8. | (ABD) | 9. | (i) | {1, 2, , 7, 8, 9} | | (ii) | {1, 3, 5} | (iii) | {A, L, Y} | | | | |
| (iv) | {1, 2, 3, 4, 6, 8, 12, 24} | 10. | (i) | $P = \{x : x = 2\}$ | | (ii) | $Q = \{x : x = n^2, n \leq 4 \quad n \in \mathbb{N}\}$ | | | | | | |
| (iii) | $T = \{x : x \in \text{English vowels अंग्रेजी स्वर}\}$ | | | | | (iv) | $V = \{x : x = 3\lambda, \lambda \in \mathbb{W}, \lambda \leq 3\}$ | | | | | | |