Dear student following is an Easy level [● ○ ○] test paper. Score of 24 Marks in 15 Minutes would be a satisfactory performance. Questions 1-10(+3, –1) (All questions have only one option correct)

Q.1 If $0 < r < s \leq n$ and ${}^nP_r = {}^nP_s$, then value of r + s is

(A) 2n – 2 (B) 2n – 1

(C) 2 (D) 1

Q.2 If $E = \frac{1}{4}\cdot\frac{2}{6}\cdot\frac{3}{8}\cdot\frac{4}{10}.....\frac{30}{62}\cdot\frac{31}{34} = 8^x$, then value of x is

(A) – 7 (B) – 9

(C) – 10 (D) – 12

Q.3 The number of words that can be formed by using the letters of the word MATHEMATICS that start as well as end with T is

(A) 80720 (B) 90720

(C) 20860 (D) 37528

Q.4 How many ways are there to arrange the letters in the world GARDEN with the vowels in a alphabetical order ?

(A) 360 (B) 240

(C) 120 (D) 480

Q.5 The number of numbers that can be formed with the help of the digits 1, 2, 3, 4, 3, 2, 1 so that odd digits always occupy odd places is

(A) 24 (B) 18

(C) 12 (D) 30

Q.6 The number of ways in which n books can be arranged on a shelf so that two particular books shall not be together is

(A) (n – 2) (n – 1)! (B) (n – 1) n!

(C) (n – 2) n! (D) None of these

Q.7 The number of ways in which the letters of the word "STRANGE" can be arranged so that vowels may appear in the odd places, is

(A) 1440 (B) 1470

(C) 1370 (D) None

Q.8 There are three copies each of different books. The number of ways in which they be arranged on a shelf is

(A) $\frac{12!}{(3!)^4}$ (B) $\frac{11!}{(3!)^2}$ (C) $\frac{9!}{(3!)^2}$ (D) None

Q.9 The number of diagonals in a polygon of n sides is

(A) $\frac{n(n-3)}{2}$ (B) $\frac{n(n-1)}{2}$

(C) $\frac{(n-1)(n-2)}{2}$ (D) None of these

Q.10 The number of ways in which r letters can be posted in n letterboxes in a town is

(A) n^r (B) r^n (C) ${}^nP_r$ (D) ${}^nC_r$

MATHEMATICS IIT JEE (AUGUST 4th WEEK CLASS TEST 1) (PERMUTATION & COMBINATION) ANSWER KEY

Name : .... Roll No. : ....

	A	B	C	D		A	B	C	D		A	B	C	D
1	⬭	⬭	⬭	⬭	4	⬭	⬭	⬭	⬭	7	⬭	⬭	⬭	⬭
2	⬭	⬭	⬭	⬭	5	⬭	⬭	⬭	⬭	8	⬭	⬭	⬭	⬭
3	⬭	⬭	⬭	⬭	6	⬭	⬭	⬭	⬭	9	⬭	⬭	⬭	⬭
										10	⬭	⬭	⬭	⬭

ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	B	D	B	A	B	A	A	A	A	A

SOLUTIONS

Sol.1 (B)

$^nP_r = {^nP_s}$

$\Rightarrow \quad \frac{n!}{(n-r)!} = \frac{n!}{(n-s)!}$

$\Rightarrow \quad (n - r)! = (n - s)!$

As $r < s$, $n - r > n - s$. But the only two different factorials which are equal are 0! and 1!. Thus $n - r = 1$ and $n - s = 0$

$\Rightarrow \quad r = n - 1$ and $s = n$.

$\Rightarrow \quad r + s = 2n - 1$

Sol.2 (D)

We have, $E = \frac{31!}{2^{31}(32!)} = \frac{1}{2^{31}(32)} = \frac{1}{2^{36}}$

$= 2^{-36} = (2^3)^{-12} = 8^{-12}$

Thus, $x = -12$.

Sol.3 (B)

The word MATHEMATICS contains 11 letters viz. M, M, A, A, T, T, H, E, I, C, S. The number of words that being with T and end with T is

$\frac{9!}{2!\,2!} = 90720.$

Sol.4 (A)

Sol.5 (B)

The 4 odd digits 1, 3, 3, 1 can be arranged in the 4 odd places in $\frac{4!}{2!\,2!} = 6$ ways and even digits 2, 4, 2 can be arranged in the three even places in $\frac{3!}{2!} = 3$ ways.

Hence the required number of ways

$= 6 \times 3 = 18$

Sol.6 (A)

Given number of books are n, which can be arranged in = n! ways.

Consider the two particular books as one book.

$\therefore$ n – 1 books can be arranged in (n – 1)! ways.

Also the two books can be arranged in themselves in 2! ways.

$\therefore$ No. of ways in which two particular books are always together

$(n - 1)! \times 2! = 2(n - 1)!$ ....(1)

$\therefore$ No. of ways in which two particular books are never together

$= n! - 2 \,.\, (n - 1)! = n\,(n - 1)! - 2(n - 1)!$

$= (n - 2)\,(n - 1)!$

Sol.7 (A)

There are 5 consonants and 2 vowels in the word STRANGE. Out of 7 places for the 7 letters, 4 places are odd and 3 places are even.

2 vowels can be arranged in 4 odd places in P (4, 2) ways = 12 ways and then 5 consonants can be arranged in the remaining 5 places in P(5, 5) ways

$= 5 \times 4 \times 5 \times 3 \times 2 \times 1 = 120$ ways

Hence the required number of ways

$= P(4, 2) \times P(5, 5) = 12 \times 120 = 1440.$

Sol.8 (A)

Total number of books = $3 \times 4 = 12$ in which each of 4 different books is repeated 3 times.

Hence the required number of arrangements

$= \frac{12!}{3! \times 3! \times 3! \times 3!} = \frac{12!}{(3!)^4}$

Sol.9 (A)

The number of diagonals + number of sides = number of selections of two vertices from n vertices

$\therefore$ the number of diagonals. $= {^nC_2} - n$

$= \frac{n(n-1)}{2} - n = \frac{n^2 - n - 2n}{2} = \frac{n(n-3)}{2}.$

Sol.10 (A)

Since every letter can be posted in n ways

[$\because$ no of letter boxes = n]

$\therefore$ total number of ways for r letters

$= \underbrace{n \times n \times \ldots\ldots \times n}_{r \text{ factors}} = n^r.$