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

Q.1 If ${}^{n}P_5 = 20 \cdot {}^{n}P_3$, then n =

(A) 4 (B) 8 (C) 6 (D) 7

Q.2 If ${}^{n}P_5 = 9 \times {}^{n-1}P_4$, then the value of n is-

(A) 6 (B) 8 (C) 5 (D) 9

Q.3 If ${}^{m+n}P_2 = 90$ and ${}^{m-n}P_2 = 30$ then (m, n) is given by-

(A) (8, 2) (B) (9, 2)

(C) (16, 8) (D) (7, 3)

Q.4 ${}^{1}P_1 + 2 \cdot {}^{2}P_2 + 3 \cdot {}^{3}P_3 + \ldots\ldots\ldots + n \cdot {}^{n}P_n =$

(A) ${}^{n+1}P_{n+1}$ (B) ${}^{n+1}P_{n+1} - 1$

(C) ${}^{n+1}P_{n+1} - 2$ (D) None of these

Q.5 If ${}^{12}P_r = {}^{11}P_6 + 6 \cdot {}^{11}P_5$, then r is equal to-

(A) 6 (B) 5 (C) 7 (D) None

Q.6 ${}^{n}P_r =$

(A) ${}^{(n-1)}P_r + r \cdot {}^{(n-1)}P_{r-1}$

(B) $\frac{n!}{r!\,(n-r)!}$

(C) $r \cdot {}^{(n-1)}P_r - {}^{(n-1)}P_{r-1}$

(D) ${}^{(n-1)}P_r + {}^{(n-1)}P_{(r-1)}$

Q.7 Which of the following is correct-

(A) ${}^{n}P_n = 2\,{}^{n}P_{n-2}$

(B) ${}^{n}P_n = {}^{n}P_{n-1}$

(C) ${}^{n}P_r = {}^{n-1}P_r + r\,{}^{n-1}P_{r-1}$

(D) ${}^{n}P_r = n\,{}^{n-1}P_{r-1}$

Q.8 Eleven animals of a circus have to be placed in eleven cages one in each cage. If 4 of the cages are too small for 6 of the animals, then the number of ways of caging the animals is-

(A) 304800 (B) 504800

(C) 604800 (D) None of these

Q.9 The number of permutations of n different things, taken r at a time, in which p($r \leq n - p$) particular things will never occur is-

(A) P(n – p, r)

(B) P(n, r) – P(n, p)

(C) P(n, r) × P(n, p)

(D) P(n – p, r) × P(n, n – p)

Q.10 The number of permutations of n different objects taken r (≥ 3) at a time which include 3 particular objects is-

(A) ${}^{n}P_r \times 3!$ (B) ${}^{n}P_{r-3} \times 3!$

(C) ${}^{n-3}P_{r-3} \times 3!$ (D) ${}^{r}P_3 \times {}^{n-3}P_{r-3}$

MATHEMATICS IIT JEE (AUGUST 3rd WEEK CLASS TEST 2) (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	A	B	A	A	All	C	A	D

SOLUTIONS

Sol.1 (B)

$$\frac{n!}{(n-5)!} \times \frac{(n-3)!}{n!} = 20$$

$\Rightarrow$ $(n-3)(n-4) = 20$

$\Rightarrow$ $n = -1, 8$

But -1 is not exceptable.

Sol.2 (D)

$$\frac{{}^{n}P_5}{{}^{n-1}P_4} = 9 \Rightarrow \frac{n!}{(n-5)!} \times \frac{(n-5)!}{(n-1)!} = 9$$

$\Rightarrow$ $n = 9$.

Sol.3 (A)

$(m+n)(m+n-1) = 90$

$\Rightarrow$ $x(x-1) = 90$ Where $x = m+n$

or $x^2 - x - 90 = 0$

$\therefore$ $(x-10)(x+9) = 0$

$\therefore$ $x = m+n = 10 \ (\neq -9)$

Similarly $y = m-n = 6$

$\therefore$ $m = 8, n = 2$

Sol.4 (B)

$T_r = r \cdot {}^{r}P_r = r \cdot r! = (r+1-1)\, r!$

$T_r = (r+1) \cdot r! - r! = (r+1)! - r!$ ...(1)

Put $r = 1, 2, 3, \ldots\ldots n$ in (1) and add, the terms cancel diagonally.

$\therefore$ $S_n = (n+1)! - 1 = {}^{n+1}P_{n+1} - 1$.

Sol.5 (A)

We know that $\frac{{}^{n}P_r}{{}^{n}P_{r-1}} = n - r + 1$

$\therefore$ ${}^{11}P_6 + {}^{11}P_5 = 11 - 6 + 1 = 6$

$\therefore$ ${}^{11}P_6 = 6 \times {}^{11}P_5$

$\therefore$ ${}^{12}P_r = 6 \times {}^{11}P_5 + 6 \times {}^{11}P_5 = 12 \times {}^{11}P_5$

or ${}^{12}P_r = 12.\frac{11!}{6!} = \frac{(12)!}{6!} = {}^{12}P_6$

$\therefore$ $r = 6$.

Sol.6 (A)

Solving L.H.S. of (a) $\Rightarrow {}^{n-1}P_r + r\,{}^{n-1}P_{r-1}$

$$= \frac{(n-1)!}{(n-r-1)!} + r\frac{(n-1)!}{[(n-1)-(r-1)]!}$$

$$\frac{(n-1)!}{(n-r-1)!}\left[1 + \frac{r}{n-r}\right]$$

$$= \frac{(n-1)!}{(n-r-1)!}\,\frac{n}{(n-r)} = \frac{n!}{(n-r)!} = {}^{n}P_r$$

Sol.7 (All)

(a) $2\,{}^{n}P_{n-2} = 2\frac{n!}{[n-(n-2)]!} = n! = {}^{n}P_n$

(b) ${}^{n}P_{n-1} = \frac{n!}{[n-(n-1)]!} = n! = {}^{n}P_n$

(c) As we know $\frac{{}^{n}P_r}{{}^{n}P_{r-1}} = (n - r + 1)$

$\Rightarrow$ ${}^{n}P_r = (n-r+1)\,{}^{n}P_{r-1}$

$$= (n-r+1) \cdot \frac{n!}{(n-r+1)!}$$

$$= \frac{n!}{n-r!}$$

$$= \frac{(n-r)\,(n-1)!}{(n-r)!} + \frac{r(n-1)!}{(n-r)!}$$

$= {}^{n-1}P_r + r\,{}^{n-1}P_{r-1}$.

(d) $n\,{}^{n-1}P_{r-1} = n\frac{(n-1)!}{[(n-1)-(r-1)]!}$

$$= \frac{n!}{(n-r)!} = {}^{n}P_r$$

Sol.8 (C)

6 large animals can be caged in 7 large cages in ${}^{7}P_6 = 7!$ ways. 5 small animals can be caged in remaining 5 cages (4 small + 1 large) in 5! ways. Hence the number of ways is

$7! \times 5! = 5040 \times 120 = 604800$

Sol.9 (A)

[$\because$ p things are excluded,

$\therefore$ no. of things left = $n - p$]

$= {}^{n-p}P_r$

Sol.10 (D)

First we arrange 3 particular things in r places. This can be done in ${}^{r}P_3$ ways. Then, remaining $n-3$ things can be arranged taken $r-3$ at a time in ${}^{n-3}P_{r-3}$ ways.

$\therefore$ Total no. of ways = ${}^{r}P_3 \cdot {}^{n-3}P_{r-3}$