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← ULTIMATE MATHEMATICS : By AJAY MITTAL →

CHAPTER: PERMUTATION & COMBINATION

← CLASS NO: 5 →

Q.No.1 Determine the number 5-card combination out of a deck of 52 cards if each selection of 5 cards has exactly one king

Solution = 1 king & 4 non-king

	(4) k	(48) ~k
R4=5	1	4

ways = $^4C_1 \times {}^{48}C_4$

$= 4 \times \frac{48 \times 47 \times 46 \times 45}{24}$ = ☐ Ans.

(ii) atleast one king = total − none is king

$= {}^{52}C_5 - {}^{48}C_5$

Q.No.2 How many 6-digit numbers can be formed from the digits 0, 1, 3, 5, 7 & 9 which are

(i) divisible by 10

(2) which are div by 5

when rep of digits not allowed

Sol (i) Rep not allowed

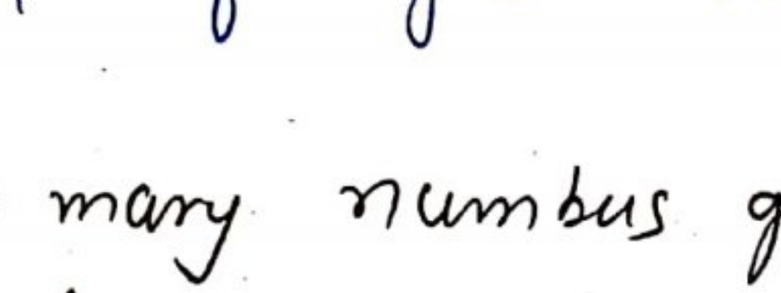
5	4	3	2	1	0 1

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

$= 120$

(ii) div by 5 → 0, 1, 3, 5, 7, 9

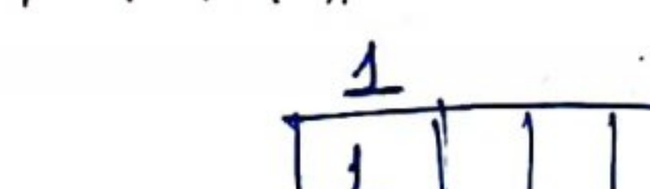
Case I nos ends with 5



$= 4 \times 4 \times 3 \times 2 \times 1 \times 1$

$= 96$

Case II nos ends with 0



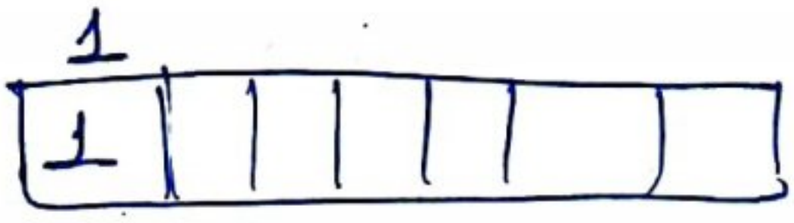
$= 5 \times 4 \times 3 \times 2 \times 1$

$= 120$

∴ Req no of ways = $96 + 120 = 216$ Ans

Ques 3 → How many numbers greater than 1000000 can be formed by using the digits 1, 2, 0, 2, 4, 2, 4.

Method 1



Nos Starting with 1 = $1 \times \frac{6!}{3!2!} = \frac{720}{6 \times 2} = 60$

Nos starting with 2 = $1 \times \frac{6!}{2!2!} = \frac{720}{2 \times 2} = 180$

Nos Starting with 4 = $1 \times \frac{6!}{3!} = \frac{720}{6} = 120$

∴ Required No of ways = $60 + 180 + 120 = 360$ Ans

Method II

total ways = $\frac{7!}{3!\,2!}$

ways start with O = $1 \times \frac{6!}{3!\,2!}$

Required no of ways = $\frac{7!}{3!\,2!} - \frac{6!}{3!\,2!} = 360$ Ans

Q.N.4 Dictionary

Rank of MOTHER

E	H	M	O	R	T
E---- = 5! = 120	H---- = 5! = 120	[ ]			(720)

total words = 6! = 720

MOTHER

ME ---- = 4! = 24

MH ---- = 4! = 24

MOE --- = 3! = 6

MOH --- = 3! = 6

MOR --- = 3! = 6

MOTE -- = 2! = 2

MOTHER = 1

Rank = 120+120+48+18+2+1 = 309 Ans

Q:5 Rank of SHARMA

total $= \frac{6!}{2!} = \frac{720}{2} = 360$

A	H	M	R	S
A ----	H ----	M ----	R ----	
$= 5!$	$= \frac{5!}{2!}$	$= \frac{5!}{2!}$	$= \frac{5!}{2!}$	
$= 120$	$= 60$	$= 60$	$= 60$	

SHARMA

$S\underline{A}\_\_\_\_ = 4! = 24$

$S\underline{H}\,\underline{A}\,\underline{A}\_\_ = 2! = 2$

$S\underline{H}\,\underline{A}\,\underline{M}\_\_ = 2! = 2$

$S\underline{H}\,\underline{A}\,\underline{R}\,\underline{A}\,\underline{M} = 1$

$S\underline{H}\,\underline{A}\,\underline{R}\,\underline{M}\,\underline{A} = 1$

total $= 300 + 30 = 330$

Q.16 Find the number of words with or without meaning which can be made using all the letters of the word AGAIN. If these words are written in a dictionary, then what will be the 50th word, 52th word?

Sol total $= \frac{5!}{2!} = \frac{120}{2} = 60$

AGAIN

A	G	I	N
A - - - - = 4! = 24	G - - - - = 4!/2! = 12	I - - - - = 4!/2! = 12	

NAAGI = 49

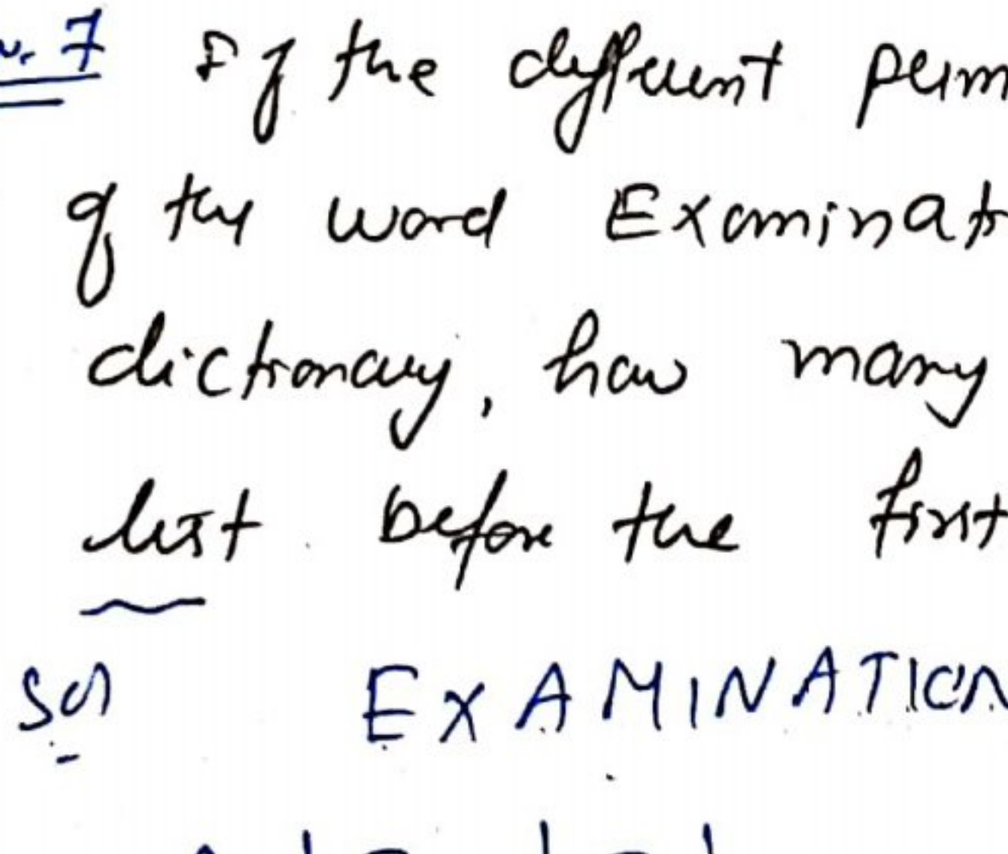
NAAIG = (50) Ans

NAGAI = 51

NAGIA = (52) Ans

Qn. 7 If the different permutations of all the letters of the word Examination are listed in a dictionary, how many words are there in the list before the first word starting with E?

Sol EXAMINATION = 11



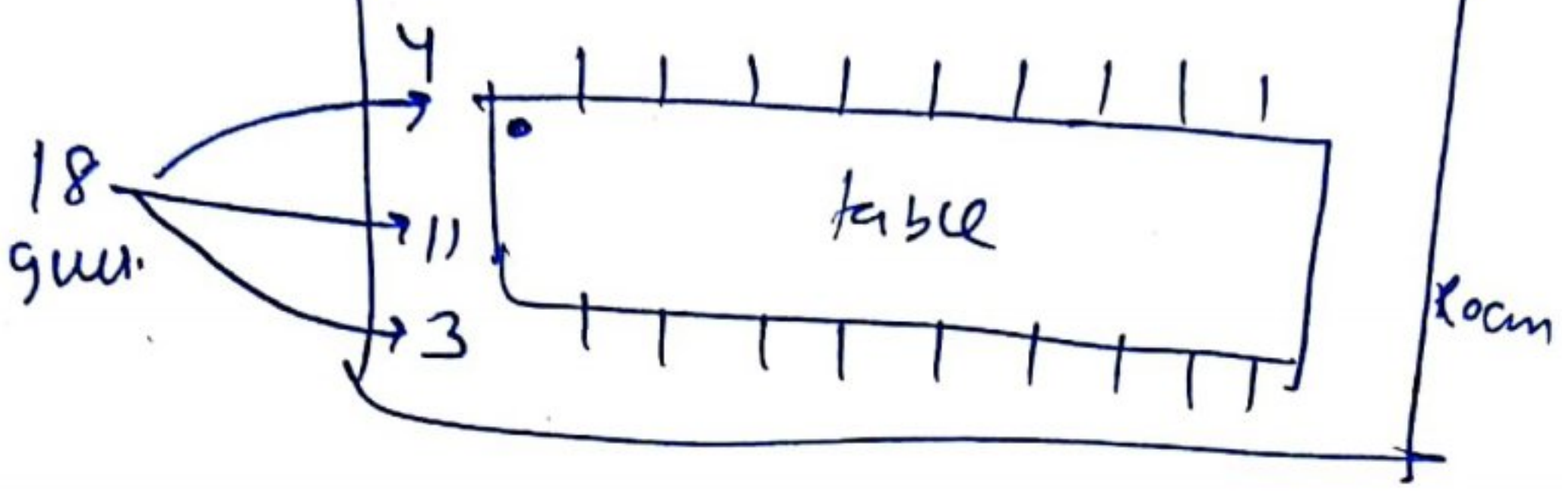
Req. no. of words =

No words starting with A

$= 1 \times \frac{10!}{2!}$ Ans

Qn 8 → eighteen guests are to be seated, half on each side of a long table. Four particular guests desire to sit on one particular side and three others on other side of the table. Find the number of ways of their seating arrangement.

Sol



ways $= {}^{9}P_4 \times {}^{9}P_3 \times 11!$ Ans

Qn 9 → Suppose 'm' men & 'n' women are to be seated in a row so that no two women sit together

Sol $- m_1 - m_2 - m_3 - \quad\quad - m_m -$

✓ total gaps $= (m-1)+2 = m+1$

✓ on these $(m+1)$ gaps 'n' women can be seated in $= {}^{m+1}P_n$ ways

✓ m men's can mutually arranged in $m!$ ways

∴ Required No of ways $= {}^{m+1}P_n \times m!$ Ans

Qn. 10 three married couples are to be seated in a row having six seats in a cinema hall. If spouses to be seated next to each other, in how many ways can they be seated? Find also the number of ways of their seating if all the ladies sit together?

Sol (i) $\boxed{M_1 W_1}$ $\boxed{M_2 W_2}$ $\boxed{M_3 W_3}$
(1) (1) (1)

$= 3! \times 2! \times 2! \times 2! = 6 \times 2 \times 2 \times 2 = 48$

(ii) $(W_1 W_2 W_3) - 1$

$= 3 + 1 = 4$

$4! \times 3! = 24 \times 6 = 144$ Ans

Qn. 11 → A polygon has 44 diagonals. Find the number of sides.

Sol Let no of sides $= n$

No of diagonal $= {}^nC_2 - n = 44$

$\frac{n(n-1)}{2} - n = 44$

$n^2 - n - 2n = 88$

$n^2 - 3n - 88 = 0$

$(n - 11)(n + 8) = 0$

$n = 11$ Ans

$n \neq -8$

Qn12 A box contains two white, three black and four red balls. In how many ways can three balls be drawn from the box, if atleast one black is to be included in the draw.

ways- $(^3C_1 \times {}^6C_2) + (^3C_2 \times {}^6C_1) + (^3C_3 \times {}^6C_0)$

Req = 3

3	6
B	WB
1	2
2	1
3	0

(Or) $^9C_3 - {}^6C_3$ ways

Qn.13 → A five digit number divisible by 3 is to be formed using the numbers 0, 1, 2, 3, 4, 5 without repetitions. Find the total no. of ways can this be done

Sol^n digits = 0, 1, 2, 3, 4, 5 $\quad 0+1+2+3+4+5 = 15$

Case I numbers exclude 0

5	4	3	2	1

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

Case II numbers exclude 3

4	4	3	2	1

$= 4 \times 4 \times 3 \times 2 \times 1 = 96$

Req no of ways = 120 + 96 = 216 Ans