SOLUTION : WORKSHEET No: 1 (class No: 2)

PERMUTATION & COMBINATION (SOLUTIONS)

Ans: 1 DAUGHTER

total = 8 vowels = A, U, E = 3

Consonants D, G, H, T, R = 5

① (·) Consider 3 vowels as 1 letter = (A, U, E) = 1

(·) Now we have to arrange (5+1) = 6 letters

(·) these can be arranged in = 6! ways

(·) 3 vowels can mutually arranged in = 3! ways

(·) Required No of ways in which all vowels are together = $6! \times 3!$

$= 720 \times 6 = 4320$ ANS

② (·) total No of words = 8!

(·) words in which all vowels together = 4320

(·) words in which vowels never together

$= 8! - 4320$

$= 40320 - 4320 = 36000$ ANS

Ans 2 EQUATION

total = 8 Vowels = A, E, U, I, O = 5

Consonants = Q, T, N = 3

① (·) Fix E in I^{st} position in 1 way

(·) Remaining 7 letters can be arranged in = 7! ways

(·) Required no of words = $1 \times 7! = 7!$ Ans

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(2) (∴) Fix E in 1^{st} position & N in 8^{th} position

(∴) Remaining 6 letters can be arranged in $= 6!$ ways

(∴) Required No of words $= 1 \times 6! \times 1 = 6! = 720$ Ans

(3) (∴) there are three constants

(∴) I^{st} position can be filled in 3 ways.

(∴) last (8^{th}) position can be filled in 2 ways.

(∴) remaining 6 letters can be filled in $6!$ way

(∴) Required No of ways $= 3 \times 6! \times 2$

$= 3 \times 720 \times 2 = 4320$ Ans

Ans 3 → PERMUTATIONS

total = 12   vowels = E, U, A, I, O = 5

Consonant = P, R, M, T, T, N, S = 7

(1). Fix P in 1^{st} position and S in last position

$= 1$ way

(∴) remaining 10 letters can be arranged in

$= \frac{10!}{2!}$ ways

(∴) Required no of ways $= 1 \times \frac{10!}{2!} \times 1 = 1814400$ Ans

(2) (∴) consider 5 vowels as 1 letter (E, U, A, I, O) = 1

(∴) Now we have to arrange $(7+1) = 8$ letters

(∴) these can be arranged in $= \frac{8!}{2!}$ ways

(ii) Five vowels can mutually arranged in $= 5!$ ways

(·) Required No of words in which all vowels are together $= \frac{8!}{2!} \times 5! = 2419200$ Ans

(3)

P	·P	··P	·P	·P·	$\cancel{S}$ (P)	S (P)	S	S	S	S	S

(·) Case I: (·) Fix P in I^{st} position and S in 6^{th} position $= 1$ way

(·) Remaining 10 letters can be arranged in $= \frac{10!}{2!}$ ways

(·) Now there are 7 such cases

$\therefore \frac{10!}{2!} \times 7$

(·) Now, same number of words can be formed when S comes first and P later

(·) Hence Required No of words $= \left(\frac{10!}{2!} \times 7\right) \times 2$

$= 25401600$ Ans

Qn. 4 → INTERMEDIATE

total $= 12$ Vowels $=$ I, E, E, I, A, E $= 6$

Consonants $=$ N, T, R, M, D, T $= 6$

(i)

_	V_1	_	V_2	_	V_3	_	V_4	_	V_5	_	V_6
1	2	3	4	5	6	7	8	9	10	11	12

(∵) there are 6 even places & 6 vowels

(∵) 6 vowels can mutually arrange in

$$= \frac{6!}{3!\,2!}$$

(∵) 6 consonants can mutually arranged in

$$= \frac{6!}{2!}$$

(∵) Required No of words in which vowels occupy even places $= \frac{6!}{3!\,2!} \times \frac{6!}{2!}$

$$= \frac{720}{6 \times 2} \times \frac{720}{2} = 21600$$

Ans

(2) (∵) all the vowels and consonants must be in their respective positions

(∵) Now 6 vowels can arrange themselves in $= \frac{6!}{3!\,2!}$ ways

(∵) and 6 consonant can arrange themselves in $= \frac{6!}{2!}$ ways

→ It means

consonants

I N T E R M E D I A T E

vowels

(∵) Required No of words $= \frac{6!}{3! \times 2!} \times \frac{6!}{2!} = 21600$

Ans

Ans 5 $P(2n-1, n) : P(2n+1, n-1) = 22 : 7$

$$\Rightarrow \frac{{}^{2n-1}P_n}{{}^{2n+1}P_{n-1}} = \frac{22}{7}$$

$$\Rightarrow \frac{\dfrac{(2n-1)!}{(n-1)!}}{\dfrac{(2n+1)!}{(n+2)!}} = \frac{22}{7}$$

$$\Rightarrow \frac{(2n-1)!\,(n+2)!}{(2n+1)!\,(n-1)!} = \frac{22}{7}$$

$$\Rightarrow \frac{\cancel{(2n-1)!}\,(n+2)(n+1)(\cancel{n})\cancel{(n-1)!}}{(2n+1)(2\cancel{n})\cancel{(2n-1)!}\,\cancel{(n-1)!}} = \frac{22}{7}$$

$$\Rightarrow \frac{n^2+3n+2}{4n+2} = \frac{22}{7}$$

$$\Rightarrow 7n^2 + 21n + 14 = 88n + 44$$

$$\Rightarrow 7n^2 - 67n - 30 = 0$$

$$\Rightarrow 7n^2 - 70n + 3n - 30 = 0$$

$$\Rightarrow 7n(n-10) + 3(n-10) = 0$$

$\boxed{n = 10}$; $n = -3/7$ (Rejected
(n cannot be -ve)

Ans

Ans 6 $\;{}^nC_{r-1} = 36$; ${}^nC_r = 84$ and ${}^nC_{r+1} = 126$

Now $\dfrac{{}^nC_{r-1}}{{}^nC_r} = \dfrac{36}{84}$ and $\dfrac{{}^nC_r}{{}^nC_{r+1}} = \dfrac{84}{126}$

$$\Rightarrow \frac{\dfrac{\cancel{n!}}{(r-1)!\,(n-r+1)!}}{\dfrac{\cancel{n!}}{r!\,(n-r)!}} = \frac{3}{7} \quad \Bigg| \quad \frac{\dfrac{\cancel{n!}}{r!\,(n-r)!}}{\dfrac{\cancel{n!}}{(r+1)!\,(n-r-1)!}} = \frac{2}{3}$$

$$\Rightarrow \frac{r!\,(n-r)!}{(r-1)!\,(n-r+1)!} = \frac{3}{7}$$

$$\Rightarrow \frac{r}{n-r+1} = \frac{3}{7}$$

$$\Rightarrow 7r = 3n - 3r + 3$$

$$\Rightarrow 3n - 10r = -3 \quad \text{--- (1)}$$

$$\frac{(r+1)!\,(n-r+1)!}{r!\,(n-r)!} = \frac{2}{3}$$

$$\frac{(r+1)}{n-r} = \frac{2}{3}$$

$$3r + 3 = 2n - 2r$$

$$2n - 5r = 3 \quad \text{--- (2)}$$

solving (1) & (2)

we get $\boxed{r = 3}$ Ans

Q.7 → ASSASSINATION

total = 13

S = 4
A = 3
N = 2
I = 2
T = 1
O = 1

(·) Consider all 4 S's as 1 letter = (SSSS) = 1

(·) Now we have to arrange (9+1) = 10 letters

(·) these 10 letters can be arranged in

$= \frac{10!}{3!\,2!\,2!}$ ways

(·) 4 S's can mutually arranged in $= \frac{4!}{4!} = 1$ way

(·) Required No of words $= \frac{10!}{3!\,2!\,2!} = 151200$ Ans

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Qn. 8 → MISSISSIPPI

total: 11

M = 1
S = 4
I = 4
P = 2

(·) Consider 4 I's as one letter = IIII = 1

(·) now we have arrange = (7 + 1) = 8 letters

(·) these can be arranged in = $\frac{8!}{4!\,2!}$

(·) 4 I's can mutually arranged in = $\frac{4!}{4!}$ = 1 way

(·) No of words in which 4 I's together

$$= \frac{8!}{4!\,2!} \times 1$$

(·) Total No of words = $\frac{11!}{4!\,4!\,2!}$

(·) Now Required No of words in which 4 I's do not come together

$$= \frac{11!}{4!\,4!\,2!} - \frac{8!}{4!\,2!}$$

$= 3~~4650~~ - 840$

$= 34650$

$= 33810$ Ans