PERMUTATION AND COMBINATION

Permutation : Arrangement of objects
Combination : selection of objects

* Fundamental Principal of Counting
let, work A can be done in "m" different ways and another work B can be done in 'n' different ways

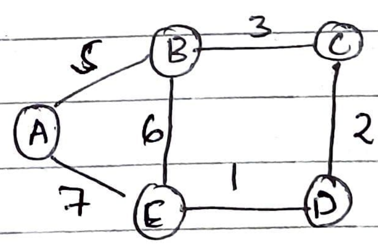
(1) Addition Rule : Total no. of ways of doing either work A or work B is

$\boxed{m+n}$.

(2) Multiplication Rule : Total no. of ways of doing work A and work B is $\boxed{m \times n}$.

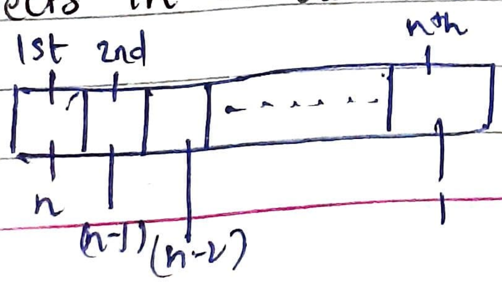
Q1) Find the total no. of ways of going A to E

→ Total ways =
AE + ABE + ABCDE
= 7 + 5x6 + 5x3x2x1
= 7 + 30 + 30
= 67



* Theorem 1
Total no. of ways of arranging "n" different objects in a row is $\boxed{n!}$

⇒



⇒ Total ways = $n(n-1)(n-2)\ldots\ldots 1$

⇒ $n!$

Theorem 2

Total no. of ways of arranging "r" different objects out of "n" different object in a row is.

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

$\Rightarrow$ Total ways $= n(n-1)(n-2)(n-3) \ldots (n-r+1)$

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

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

Q1) How many 3 digits no. are possible whose all digits are odd. If.

(i) Repeatation of digits is not allowed

(ii) Repeatation of digit is allowed

$\rightarrow$ (i) $\boxed{5 \mid 4 \mid 3}$ $\Rightarrow$ Total ways $= 5 \times 4 \times 3$

$= 60$

or $\;{}^5P_3 = \frac{5!}{2!} = \frac{120}{2} = 60$.

(ii) $\boxed{5 \mid 5 \mid 5}$ $\Rightarrow$ Total ways $= 5 \times 5 \times 5 = 125$

Q2) How many 3 digits no. are possible whose all digits are even.

$\rightarrow$ (i) $\boxed{\cancel{0}\;4 \mid 4 \mid 3}$ $\Rightarrow$ Total ways $= 4 \times 4 \times 3 = 48$

OR

$${}^5P_3 - {}^4P_2 = \frac{5!}{2!} - \frac{4!}{2!} = 60 - 12 = 48$$

(ii) 4 5 5 $\Rightarrow$ Total ways $= 4 \times 5 \times 5 = \underline{100}$

Q3) How many 4 letter words can be formed from letter of the word HISTORY (Repeatation is not allowed).

(2) How many of them contain only consonant

(3) How many of them begun and end with consonant

$\rightarrow$ (1) 7 6 5 4 $\Rightarrow$ Total ways $= 7 \times 6 \times 5 \times 4$

$\Rightarrow \frac{7!}{3!} \Rightarrow {}^7P_4 = \underline{\underline{840}}$

(2) 5 4 3 2 $\Rightarrow$ Total ways $= 5 \times 4 \times 3 \times 2$.

$= \frac{5!}{1!} = {}^5P_4 = \underline{\underline{120}}$

(3) 5 5 4 4 $\Rightarrow$ Total ways $= 5 \times 4 \times 5 \times 4$

$= 20 \times 20 = \underline{\underline{400}}$

Q4) Find the no. of different 8 letters arrangements that can be made from the letters of the word DAUGHTER, so that

(1) All vowels occur together

(2) All vowels do not occur together.

$\rightarrow$ DAUGHTER $\Rightarrow$ AUE | DGHTR.

(i) $\boxed{AUE}$, D, G, H, T, R $\Rightarrow$ Total ways $= 6! \times 3!$

$= 720 \times 6 = \underline{\underline{4320}}$

(ii) Total ways $= 8! - 6! \times 3! = 40320 - 4320$

$= \underline{36000}$

Q5) Find the no. of ways in which 5 boys & 5 girls be seated in a row so, that.

(1) No 2 girls seat together.
(2) All the girls seat together.
(3) All the girls seat together and all boys seat together.
(4) All the girls never seat together
(5) Boys and girls are alternate.

□ = Boys
O = Girls

(i) $-□-□-□-□-□-$ $\Rightarrow$ $^6P_5 \times 5!$

$= 6! \times 5!$

(ii) □□□□□ $\boxed{OOOOO}$

$\Rightarrow$ ~~$2! \times 5! \times 5!$~~ $6! \times 5!$

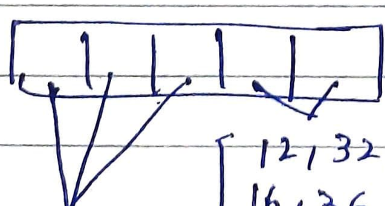
(iii) $\boxed{□□□□□}$ $\boxed{OOOOO}$ $\Rightarrow$ $2! \times 5! \times 5!$

(iv) Total ways $= 10! - 6!5!$

(v) □O□O□O□O□O $= 5! \times 5!$ $\Rightarrow 2 \times (5!)^2$

O□O□O□O□O□ $= 5! \times 5!$

Q6) Find total no. of all five digit no. having all different digits and divisible by 4, that can be found using the digits 1, 2, 3, 6, 8, 9.



12, 32, 92
16, 36, 96
28, 68.

8 ways

$^4P_3$

$\Rightarrow$ Total ways $= {}^4P_3 \times 8$

$= 4! \times 8$

$= 24 \times 8$

$= 192$