

DME - U2

Pigeon hole Principle - If 'n' pigeons are assigned to 'm' pigeon holes and $n \geq m$, then atleast one of the pigeon hole will contain two or more pigeons.

Generalized Pigeon hole Principle - If 'n' pigeons are assigned to 'm' pigeonholes, $n \geq m$, atleast one of the pigeon hole will contain $\left\lceil \frac{n-1}{m} \right\rceil + 1$ pigeons.

⇒ NOTE - $[x]$ - greatest integer $\leq x$

Permutation & Combination - * Permutation → ordered arrangement of objects
 * Combination → selection of objects

⇒ permutation of 'r' objects from 'n' objects $\Rightarrow n_{P_r} = \frac{n!}{(n-r)!}$

⇒ combination of 'r' objects from 'n' objects $\Rightarrow n_{C_r} = \frac{n!}{r!(n-r)!}$

Inclusion & Exclusion Principle - It is a counting technique which generalizes the familiar method of obtaining the no. of elements in the union of two finite sets.

$$\Rightarrow |A \cup B| = |A| + |B| - |A \cap B|$$

where, $|A| \rightarrow$ cardinality of A, $|B| \rightarrow$ cardinality of B

$$\text{Similarly } |A \cup B \cup C| = |A| + |B| + |C| - |A \cap B| - |A \cap C| - |B \cap C| + |A \cap B \cap C|$$

Divisibility - when a and b are any two integers such that $a \neq 0$,
a is said to divide b if there exists an integer c
such that $b = ac$.

Prime Number - A positive integer $p \geq 1$ is called a prime number
if the possible division are only 1 and p.

Composite Number - Not a prime number.

Fundamental Theorem of Arithmetic - every integer $n (n \geq 1)$,
can be uniquely written
as a product of prime
factorization.

Division Algorithm - When a and b are any two integers $b > a$
and there exists $b > a$ and there exists integers
 q, q, r , such that $b = aq + r$; $0 \leq r \leq b$
 $q \rightarrow$ quotient
 $r \rightarrow$ remainder

Euclid's Algorithm for finding GCD - When a and b are any two
integers, $a \geq b$, if r_1 is the
remainder when a is divided by b;

r_2 is the remainder when b is divided by a , r_3 is the remainder when r_1 is divided by r_2 and if $r_k+1=0$, the last non-zero remainder is -

$\Rightarrow r_k$ is the $\text{GCD}(a, b)$