Permutations - Addetion pernaple: One can be performed on ways or other can be done to n ways, either of both can be done in monways. -> Multiplication plunciple: One can be done in m ways of these can be done in n usage, there two can be done one after other in mn ways. - factorial: continuous product of notured numbers ni-10-11 → 01 =1 , 11=1, 21=2, 31=6, 41=24, 51=129 61=720, 71=5040, 81=40820, 91 = 362880 , 101 = 362 8800 - Perinutation - avangement of some of all of finite set of things. -> Linear permutation: avvanged in June. -> Permutations of in distinction things = npr(B) p(nr)(1) p(n) n=no of diminular things in a set To no of things taken from n. - no dessimilar things taken by at a time = no of ways of felling er blank places by n donnibe, things $n_{p_{r}} = n(n-1)(n-2) \cdot \dots \cdot n-(r-1) \cdot \dots$ why = 12 my or wing wing har to see to receive the a Person of their wolfer superior bringing The rise of priordition of a different thing sides is at a -> mer = n-rette and qualit modelingue and a const

 $\frac{n_{p_{r+1}}}{a} = \frac{n_{p_r}}{b} = \frac{n_{p_{r+1}}}{a} + \frac{n_{p_{$ No of permutations of n things passe alike it all one taken at a time Then it my for modulumed to obt

Ho of permutations nothings, parealike of 1 kind, q are dike of it kind by all are taken at a time then n! peroduct of in consecutive numbers is downthe by n? I number is divenible by 2, if last digit is downish by 2 (even) -> A member is divisible by 3, if the sum of digits of number is downible by 3. - A number is divisible by 4, if last 2 digits drussible by 4, Divisible by 5, if the last digit is 0605. Divisible by 6, the number divisible by 2 & 3. (even numbers whose num of digits also durible by 3). Divisible by 7, if the difference blu the truice the digits in the unit place and the no formed by other digits is eitser 0(89 multiple of 7. Ens 3675

2x5=10 = 367-10 = 357 = 51x7 to on = 11

most result to one of the state of the one of the state of the one of the state of the one Discussor by 8, if the Land digits is divisible by 8 -> Discirible by 9, if the sum of the number discourse by 9. -> Diverible by 10, last digit is secitly on - Divisible by n if the num of the digits in the odd and run of the digits in the even places are equal Ex. 3564 3+6=9 5+4=9 -> Divisible by 25, if last two digits diverible by 25 -> Pearmutation when expeatation things one allowed. -> The most perioritations of a different things taken reat a time, when superatation thing one allowed is -> floof permetation of an different thing taken sel at a time sent sent atlant perpentation is non-npr - No. of permutations of "n" different things "taken not make than I at a time, geopeatation things we allowed

is A personated to exist to excelent personated in the (first) and
Man delhousers them taken more transa at a time
-> No of period of no Comment
1. 14 4: 4.36/BT (7)
Polindrome! And a word which greads same from left to right to left
with to left
Reom 221 etc.
Ex ATTA, ROTOR, 12321, etc.
Refer motes
taleme all the
Sum of mon's formed by taking (III - notions) (Sum of in-digits) X (n-1) [A (III - notions)
(Sum of m- argus) A () the n digits (including 9) is
Sum of nos formed by taking all the ndugits (including 9) is Sum of nos formed by taking all the ndugits (including 9) is (cont oil the ndugits) [(n-1)! (111-1-ndimes) - (n-2)!(111-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-
Sum of nos formed by taking and (111-1-1)! (111-1-1) (111-(notines)) (Sum of all their blights) [(n-1)! (111-1-1) the taking the given n-digits
Sum of all the roughts numbers formed by taking the great rumbers
Sum of all the respect numbers formed by taking the given n-digits (excluding zero) is (excluding zero)
(a) x (m) x (11) in 1 dimes)
(Sum of all then digits) x (m) pr x (11) · ~ 1 times) Sum of all the digits numbers followed by taking the
-> Sum of all the digit minders 7
given n-oligitis (including zono) is.
(Sum of all the n-digits)
The state of the s
digits in any place of all the number
Sum of all the sur digits (including 300) is. (Sum of all the n-digits) [n-1) p x (111-1+1+1+1+1+1+1+1+1+1+1+1+1+1+1+1+1+1
taken all at a time is (n-1)! [a1+a2+] ten the sem
taken it all plan fit in wind then the sum
When n clogets agree green encluding seems then the sum
of the value of digits and place of modern's place value)
(m-1) (Sum of all the numbers) (on place value)
number is a little of will find
the madly tetter will go were in
4. North way all the tellers million

-> A peremutation is said to carrelar peremutation of the objects are accomped in the form of a crecke & doved avere. - No of creicular perioritations of n-different things taken all at a 17me & (n-1)! No of alcadar pounutations of n-defferent things taken a at a time (when clock-use & articlock-unie reder on taken on different) is -> No. of circular permutations of n-different things taken a at a time in one dievection (clockeuse & anticlockeuse orders are not different) Like honging trype is np - No of clercular perenatations of n-dissimilar thing in doclause discrection that = no of circular permutations in anticollaure = (n-1)! - Gardands, chains, necklace are treated as hanging type of arrangement Deavoiangements 1. No of ways in which exactly (21 letters can be placed in weargly addressed envelops when n letters are put in n addressed envelopes is $np_{\gamma} \left(1 - \frac{1}{11} + \frac{1}{21} - \frac{1}{31} + \cdots + (1)^{\gamma} \frac{1}{11} \right)$ 2. No of ways in which in different detleses can be put in their addressed envelopes to that all the letters aue in weiong envelopes is n! (1-1+1+1+++++++++) 3. No of ways that in letters are in in addressed envelopely then bractly letter will go weing is O. 4. No of ways all the letters will go into consect

Combinations Definition! A selection formed by taking some (Be) all of finite set of Hings or objects. Ex: Combination formed by taking two at a time from the set {A,B,C} are {A,B}, {A,C}, {B,C} → Formation of a combination by taking a all elements from a finite set A means picking up an a elements subset of A. -> Ho of combination of n-diminilar things taken at a sime= \rightarrow No of combinations is denoted by $n_{(Y)}(x)$, $\binom{n}{Y}$, $\binom{n}{Y}$, $\binom{n}{Y}$, $\binom{n}{Y}$, > ncn=1 , ncr= (n-r)[r] - ncy=ncn+

→ n(y+n(y = n+1 (y, n, n, 12 tn cy++ n(y = n+2(y) -> ncy=ncs then res, n=9c+s -> If no 3 points are collinear ferom n points then

i) No of st lines formed = nc2 11) Alo of se, formed = ng \rightarrow No of diagonals in a elegible polygon of n sides is n(n-3)-> No of combinations of nthing taken (si at a time in which

1) '5' particular things will never occur is (n-s) (r-s)

11) '5' particular things will never occur is (n-s) (r. No of onto functions $2n^m - nc(n-1)^m + nc(n-1)^m$

No of onto function = 2m-2 m(A) = m, n(B)=n

Vander mends theorem me ner + me ner + me ner + me ne me me me Geometerical applications If n points are on the wecomperence of a course we given then i No of stilines = no 11 No of Dies = ncg in. No of quader lateral - ncy → It a polygon has n sides then no of diagonals in it is nog-n (%) $\frac{n(n-3)}{n}$, interior angle $=\frac{n-2}{n}$ In a plane there are n points & no there of which core collen care except K points which lie on a line then (i) No of it lines that can be found by joining them = ng - Kg (ii) No of Dies that can be formed by joining them = nc3-kc3 If a set of milled lines are intersected by another set of niled Lines then the no of Melograms that can be found is myny \rightarrow no of sectangles of any size in a square of nxn is Σ_{γ}^{3} no of squares of any size is $\sum_{r=1}^{\infty} r^2$ -> In a sectangle of nxp (nzp). no. of sectangles of any size is $\frac{1}{4}$ n(n+1) p(p+1)no of squares of any the is $\sum_{i=1}^{n} (p+1-i)(p+1-i)$ no of electargles in a chess board including squares is 1296 no of squaeces of all dimensions on a cheps boards is 204. no of sectangles on a dren board which are not aspossed \frac{7}{721} \frac{7}{721} = \frac{7}{721} = \frac{7}{1092} 2 Times and serving - - to which morn items can be divided into 2 linequal groups - containing in &n stem in min,

-> Vander mond's theorem
mg ner + mg ner+ + mg ner+ + mc no = (m+n)cy
Geometerical applications
I p points are on the warmference of a warde one given then
No of Hilling - ne
" No of Dies = no
in No of quadewlateral - neg
→ A a polygon has n sicles then no of dragonals in it is neg-n
(or) $\frac{n(n-3)}{2}$ interior angle = $\frac{n-2}{2}$
on a plaine there are n points & no there of which me colleges.
points which lie on a line then
(1) No of stilines that can be found by joining them = ng - KgH
(1) No of Dies that can be found by joining them = nc - k
that a set of milled lines use intersected by another set of
ines then the no of Melograms that can be found is my ny
\rightarrow In a evectangle of $n \times p$ $(n \times p)$. no. of evectangles of any size is $\frac{1}{4} n(n+1) p(p+1)$
size is money no of electangles of any
no of squares of any three in m
The of squares of any tize is 5 total Com
no of squares of any type is $\sum_{r>1}^{m} (n+1-r)(p+1-r)$ \rightarrow no of electangles in a chess board including squares is 1296
no of squares of all disposions
Chest ham a
10 90 telle unger on a chen boesed which are not asquarece is
no of sectangles on a den bowed which are not asquarece is 1092. \(\frac{1}{12} = \frac{1}{12} = 1092 \) Algorithms Algorithms with the
Jecoups: No of ways in which mon items can be divided into
when with mind mind mind mind mind mind mind mind
min!

min mini -> No of way of distributing min different things to 2 persons 1 gets in things, other gets indrings is fronti)? 21 -> No of ways of druding In different things into 2 groups each containing n things & dedee of the gloups is not important is (an)? - No of ways of dividing 2n different thing into 2 groups each containing n things & deder of the group is important is (2n)! -> No of ways in which am different stems can be divided equally into m gleocyss, each containing n objects is the officer of frequency is not important is (mn!) $m!(n!)^m$ No of ways in which men different items can be divided equally into m groups, each containing n objects & the order of from important is (mn!) No of way in which month things can divided into 3 different things groups of m, n & p suspectively is [(m+n+p!) / [+ 10]] [+ 10] ilian of all bringed - min j bj -> Total no of combinations: Teloplo of (P,+P2+ ++++) things taken any number at a time when to things accer alike of I kind & B alse able of 2nd find By things are alike of kth kind is (P+1)(P+1)(Pk+1) (dit) (dkt)) +1 (: Nis a perfect square

1 Total roof combinations (P,+P2+ + Pu) things 1 the move at a time we
P, things were aloke of /kind, By things are alike of 2nd kind & Px things
On Total no of combinetion
of in dellaring the taken any named
cut a time is 2^n . The proof ways of the proof of the proof ways of the proof ways of the proof ways of the proof ways of the proof
(11) No of ways of answering all yestions when each question has
alterinative 11-2n.
1) Total no of combinations of n different things taken 18 moule a
a time is 2^n-1 .
(1) No of ways of answering low move in question is 2nd
Diugoes att is a spin of realistic to the second of the se
Let N= P, 4, B, d, P3 d3,, Ph du where P, 1, B, my Pk are defferent
power numbers & d, de, m, de ave natural numbers tren
1) Total no of diversors of N = (4+1) (2+1) (dx+1)
1) Total no of division (phopper) of M(excluding 1EN) =
non-terral dhissols.
non-terral divisors $(\alpha_1+1)(\alpha_2+1)-\dots$ $(\alpha_k+1)-1$
(iii) Total most doubles of M (excluding extrem 184 N) =
(iii) Total most downers of N (excluding extres 184N) = (d1+1) (d2+1) (dx+1) -1
Sum of all divisions $\left(\frac{P_1^{(k+1)}-1}{P_1-1}\right)\left(\frac{P_2^{(k+1)}-1}{B_1-1}\right)\cdots\left(\frac{P_k^{(k+1)}-1}{P_k-1}\right)$ P is prime no. No of ways in which N can be predouved as a product of 2 for (1) $(k+1)$ (d_2+1) (d_2+1) (d_k+1)
Pis prime no.
No of ways in which N can be evolved as a product of 2 for
(1) (x+1) (d2+1) (dx+1) (: Nis not a perfect quare)
(12) (1-1) (1-1)

(ii) (d,+1)···· (d,+1)+1 (: Nis a perfect square)

(v) sum of all drawed of $N = \left(\frac{2^{4+1}-1}{2-1}\right)\left(\frac{3^{4}+1-1}{3-1}\right)$ (v) turn of all odd diwrote of $N = \left(\frac{3^{4+1}-1}{3+1}\right) \left(\frac{5^{4+1}-1}{5-1}\right) \cdots$ (VI) Sur of all even divisors of N - num of all devisors of N-sum of all odd diwind of N. NOTE: n) = 24,34,543 74.... -> Total no of downer of n = 3 5 \$ 1 ... are of the form 4 x +1 is (4+1) (B+1) (r+1)... - Exponent of Pinn)! Exponent of Pinn! of highest power of Pinn! is denoted by Ep (n!) $E_{p}(n!) = \left[\frac{n}{p}\right] + \left[\frac{n}{p^{2}}\right] + \left[\frac{n}{p^{3}}\right] + \cdots$ where P's a plime number & n is a natural number, [x] is a GIF & X → If n! = 2d13h 5d3 7dy then n! ends with Y-zwees i.e. (E5 - exponent of 5) Distribution of nimitar things into groups: (i) Total no of ways of dividing "n" identical items among "ei" person, each 1 of whom can succeive 91,2,3 de mobile idens $(\leq n)$ u $n+r-1_{c_{r+1}}$ $o \leq 1, 12, 13, ..., 1 \leq n$ (i) Total no of ways of dividing no identical things into use Ordered groups if blank glosups are allowed is not blank (2) (i) Total no of ways of deciding "no identical stems among "ge" pelisons each one of whom succeive atteast 1 istem

_ N= 24,3254, 74.... then

(ii) Total to of even divisory of No

1) Total no of diwinds of N = (x,+1) (x2+1) (d3+1) ...

(1) Total no of odd diwholy of N = (42+1) (43+1).....

of (02+1) (03+1) ----

No of ways in which "no identical items can be devided winto use ordered groups her that blank groups are not 3 No of non-negative integral solm of the egn 11that 13th thy 27 is north (ri, where OX x, 1x2, ..., xx2n. A No of the integral who of the egn 1, 12+ mot in is かけいり 1とないかしりつかれるか 3 No. of non-negative integral solm of 4+1/2+--+ 1, 47 4 $\mathcal{E}_{\mathcal{R}}$: ① $\times + y = 6$ (0,6) (6,0) (1,5) (5,1) (2,4) (4,2) (3,3) $\rightarrow 6 + 1 = 7$ 02 2, 866 No of 16h = n+r+ 6+2+1 - 7 = 7 = 7 (3) x+y=6 (1,5) (5,1), (2,4) (4,2) (3,3) -5 12x,46 No of the som = n-1(2= 5-12= 5 - There are n pairs of shoes in a closet. If r(xn) are relected at reandom then no of ways that among the selected shoes 1) There is no pained is no 21. 1) There is atleast one pain $2n_{c_7} - n_{c_7} 2^{r}$ (ii) There is exactly one pair is ny ming 27-2 (1) There is exactly 2 pains is no n-2 cry 2 min > It ABC is a sle then in points on AB, in points on & k points on CA then no of the formed by non collinear points in m+n+kc3-(m3. n3. kc2 grano sonte locanzo

while testilly survey without to my disco