Chellenge Problem: How many subsets does a set
of size n have?
$$n(n-1)(n-2) - -(k)$$

I element subsets : n
Z element subsets : $\frac{n(n-1)}{z}$
Add all together

A,
$$A_2 \rightarrow A_3 \rightarrow - - - A_n$$

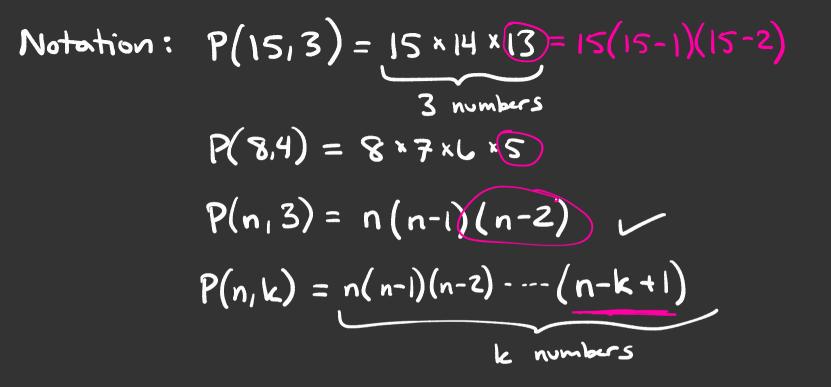
deciding if first
element is in set
 $2 \times 2 \times 2 \times - \times 2 = 2^n$

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Motivation Example: For a Christmes Party, brought 5
different presents, but only 3 kids showed up. How
many to give each kid one present?
$$5 \times 4 \times 3 = P(5,3) = sP_3$$

Permutation of 5 things
taken 3 at a time"
Permutation: subset of distinct elements selected
from a given set arranged in a
specific order

Exemples: i) 15 Olympians in an event. How many ways to award gold/silver/bronze medels? Permutation! $15 \times 14 \times 13 = P(15, 3)$ ii) ZZ students in class. How many ways to assign letter grade to each student (out of \$A,B,C,D,F?)? Not permutation Breaks rule Z iii) How mong 3-element subsets does a set of size 8 have? Not permutation Breaks rule 3



Factorial:
$$n! = n(n-1)(n-2) - (3)(2)(1)$$

"n factorial"
Example: $5! = 5 \times 4 \times 3 \times 2 \times 1 = 120$
Special Cases: $1! = 1$
 $0! = 1$
Another very to write permutations:
 $P(8,3) = 8 \times 7 \times 6 = \frac{8 \times 7 \times 6 \times 5!}{5!} = \frac{8!}{5!}$
Currently $P(n,k) = \frac{n!}{(n-k)!}$

Permutations w/ some objects alike
Example: How many way can all letters of "ABOUT"
be rearranged?

$$5! = P(5,5) = 120$$

i) Pretend E's are different "AGRE, E2" P(5,5)=5! mys to reamange ii) How much did we overcount? Factor of 2 ways to permute E's in a word GRE, A Ez $G R E_2 A E_1$ \longrightarrow "AGREE" can be rearranged in $\frac{5!}{2}$ w-ys

"BANANA"= _____ Example: "DEEPEN" 3! Z! A's N's i) DE_2PE_3N'' P(G,G) = G[= 720]Overcounted by fector of 3! ii) E, D Ez N Ez P EID E3 N E2 P EZDEINEZP EZ D EZ N E, P ~ "DEEPEN" can be rearranged in <u>6</u>" mays EI DEINEZP ES DEZNEP