STAT 230 F2017

MY UNOFFICIAL
REVIEW NOTES

CH 3

CHAPTER 3

OVERVIEW:
COUNTING TECHNIQUES, WE USE COUNTING TO CALC PROBABILITIES.

PROBABILITY OF EVENT A IS:

$$P(A) = \frac{\text{COUNT}(A)}{\text{COUNT}(S)} \quad \begin{array}{l} \rightarrow \text{HOW MANY IN EVENT A} \\ \rightarrow \text{HOW MANY TOTAL.} \end{array}$$

SO ITS ABOUT COUNTING TECHNIQUES MORE THAN PROBABILITIES.

STEPS
1. COUNT (S) TOTAL, USING COUNTING TECH.
2. COUNT (A) USING COUNTING TECHNIQUES.
3. CALC $\frac{\text{COUNT}(A)}{\text{COUNT}(S)} = \text{PROB}(A)$

BACKGROUND RULES

1. IF A OR B, THEN COUNT(A) + COUNT(B)
2. IF A AND B, THEN COUNT(A) • COUNT(B)

* **NOTE** → USE FOR COUNTING NOT PROBABILITIES.

THERE ARE FOUR WAYS TO COUNT (AND 1 VARIATION). THEY ARE WITH + WITHOUT REPLACEMENT, AND ORDER MATTERS OR ORDER DOESN'T MATTER.

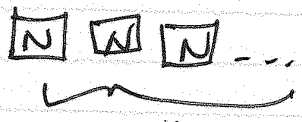
TERMINOLOGY "ARRANGEMETS", "PERMUTATIONS" AND "SEQUENCES" $\Rightarrow$ ORDER MATTERS

"SETS" $\Rightarrow$ ORDER DOESN'T MATTER.

SO:

1. WITH REPLACEMENT, ORDER MATTERS
2. WITHOUT REPLACEMENT, ORDER MATTERS
3. WITH REPLACEMENT, ORDER DOESN'T MATTER
4. WITHOUT REPLACEMENT, ORDER DOESN'T MATTER.

(1) N OBJECTS, CHOOSING K, HOW MANY? WITH REPLACEMENT, ORDER MATTERS

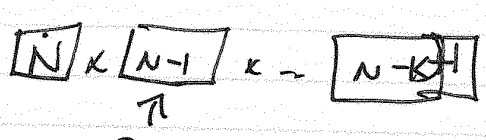


$\Rightarrow$ SO COUNT $= N^K$

K WAYS

$N \times N \times N \cdots \times N = N^K$

(2) WITHOUT REPLACEMENT, ORDER MATTERS



$= N^{(K)}$

BECAUSE WE HAVE ONE LESS

(3) WITH REPLACEMENT, ORDER DOESN'T MATTER.

WHEN ORDER DOESNT MATTER, DIVIDE BY $k!$ TO REMOVE COUNTING SIMILIAR SETS:

321
123
312
132
213
231

} ALL THE SAME. IF ORDER DOESN'T MATTER, $3!$

SO $\text{COUNT} = \frac{N^k}{k!}$

(4) W/O REPLACEMENT, ORDER DOESNT MATTER

$$\text{COUNT} = \frac{N^{(k)}}{k!}$$

$$= \frac{N!}{(N-k)!\,k!} = \binom{N}{k}$$ ← TERMINOLOGY FOR

W/O REPLACEMENT, ORDER DOESNT MATTER,

AND 5: AS IN 4, BUT WITH REPEATED SYMBOLS

$$\text{COUNT} = \frac{N!}{x_1!\,x_2!\cdots x_N!}$$

NOTES – SOMETIMES N=K, WHEN WE DRAW ALL.

– WHEN MAPPING PEOPLE TO THINGS
(3 PEOPLE, 8 BEER HALLS
6 PEOPLE, 12 BUS STOPS
4 PEOPLE, 6 FLOORS IN ELEVATOR)

THEN N = # OPTIONS
K = # OF PEOPLE