§ 4.4 USEFUL COUNTING RULES

SUPPOSE N SIMPLE EVENTS, ALL EQUALLY LIKELY (SAME PROB.).

SO EACH SIMPLE EVENT HAS PROB. $\frac{1}{N}$.

THEN $P(A) = \dfrac{n_A}{N}$ ← # SIMPLE EVENTS THAT RESULT IN EVENT A.

ALL ABOUT COUNTING

THE mn RULE

EXPERIMENT IN 2 STAGES.

1^{st} HAS m POSS. OUTCOMES, AND FOR EACH OF THESE,

2^{nd} HAS n POSS. OUTCOMES

THEN THERE ARE mn POSS OUTCOMES OF EXPERIMENT.

EX. HOW MANY CARDS IN A DECK? SUIT, DENOMINATION
VALUE

EXTENDED mn RULE

K STAGES, 1^{st} HAS n_1 POSS OUTCOMES

$\vdots$

K^{TH} HAS n_K POSS OUTCOMES

$n_1 \cdots n_K$ POSS OUTCOMES.

PERMUTATIONS

GIVEN n DISTINCT OBJECTS, THE NUMBER OF WAYS TO CHOOSE & ARRANGE (ORDER) r OBJECTS IS GIVEN BY

$$P_r^n = \frac{n!}{(n-r)!} = n(n-1)\cdots(n-r+1)$$

(JUST r STAGE EXPERIMENT. USE EXTENDED mn RULE)

<u>NOTE:</u> $P_n^n = n!$ $(0! = 1)$

<u>ex.</u> BOOKSHELF

COMBINATIONS

GIVEN n DISTINCT OBJECTS, THE NUMBER OF WAYS TO CHOOSE (WITHOUT ORDERING) r OBJECTS IS GIVEN BY

$$C_r^n = \frac{n!}{r!(n-r)!} \qquad \left(\text{NOTE } C_r^n = \frac{P_r^n}{r!} \right)$$

eg. HOW MANY 3 PERSON COMMITEES FROM 5 PEOPLE?

(2 ?)