

Permutations vs. Combinations (Electing Officers vs. Forming a Committee)

Ex. 1) We want to elect three officers from our club of 25 people. The first person elected will be the President, the second person elected will be the Vice President, and the third person elected will be the Treasurer. How many different "arrangements" of officers can we have?

Permutation

$${}_{25}P_3 = 13,800$$

↑ ↑
total # to
to select be
from selected

Ex. 2) We want to form a 3-person committee (i.e., no officers) from our club of 25 people. How many committees can we form?

Combination
order does not
matter

$${}_{25}C_3 = 2,300$$

When you're counting how many ways there are to arrange some number of items, order matters; that's a permutation. nPr

When you're counting how many ways there are to simply group some number of items, order does not matter; that's a combination. nCr

Ex. 3) The Debate Club wants to elect four officers (Pres, VP, Sec, and Treas), from its membership of 30 people. How many different ways could the Debate Club elect its officers?

Permutation

$${}_{30}P_4 = 657,720$$

Ex. 4) The Debate Club wants to create a 4-person committee (i.e., no officers) from its membership of 30 people. How many different committees are possible?

Combination

$${}_{30}C_4 = 27,405$$

AFM Notes, Unit 1 Probability

Combinations with Restrictions

Ex. 5) The Young Republicans Club consists of 7 seniors, 9 juniors, and 5 sophomores. They want to form a Planning Committee (i.e., without officers) to plan their spring social. The Planning Committee will consist of 4 members.

a) How many different 4-member committees are possible?

$$21C_4 = 5,985$$

b) How many committees are possible that consist of all sophomores? → Restriction

$$5C_4 = 5$$

↓
sophomores

c) How many different committees could be formed if the club's president must be one of the members? → Restriction

$$20C_3 = 1,140$$

↓ ↓
of remaining # of remaining
students spots

d) How many different committees could be formed if the committee must contain exactly two seniors and two juniors?

↓
multiply

Seniors · Juniors

$$7C_2 \cdot 9C_2 = 756$$

total # of spots

$$21 \cdot 36$$

total amount
choosing from