Combinations

Combination: a selection made from a group of items without regard to their order

The number of combinations of n things taken r at a time is given by

$$C(n,r) = \frac{n!}{(n-r)!\,r!}, \quad n \geq r.$$

Practice Exercises

A. Determine whether each situation involves a permutation or a combination.
1. Seven toppings for a pizza.
2. A classroom sitting arrangement.
3. Fifteen books in a library shelf.
4. Choosing a class president, vice president, and a secretary.
5. Eight outfits chosen from 15 outfits to be modeled.
6. A six-person committee from your math class.

B. Solve each problem completely.
1. From a class of 32 girls and 18 boys, how many study groups of 3 girls and 2 boys can be formed?
2. A five-member committee is being formed from a group of 9 sophomores and 12 seniors. How many committees can be formed given each condition?
   a. all sophomores
   b. 1 sophomore, 4 seniors
   c. 3 sophomores, 2 seniors
   d. any mixture of sophomores and seniors
3. A box of Mrs. Donuts contains 8 honey dipped, 6 bavarians, and 7 chocolate filled donuts. How many ways can 5 donuts be selected to meet each condition?
   a. all bavarian
   b. exactly 2 honey dipped
   c. none is chocolate filled
   d. 2 bavarians, 2 honey dipped, 1 chocolate filled
   e. any mixture of donuts

Problem Set

Solve each problem completely.
1. Anabelle would like to invite 9 friends to go on a trip but has room for only 5 of them. In how many ways can they be chosen?
2. A box with 12 articles contains one that is defective. In how many ways can Martin select 5 articles such that:
   a. the defective article is included?
   b. the defective article is not included?
3. A box contains 8 blue balls, 6 white balls, and 4 black balls. In how many ways can we select 4 balls such that:
   a. they are all white?
   b. two are blue, one is white, and one is black?
   c. exactly 2 are black?
   d. none is blue?
4. A group of 11 women and 6 men must select a four-person committee. How many committees are possible if it must consist of the following?
   a. three men and one woman
   b. any mixture of men and women
   c. a man and three women

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