

QUICKHELP

MAT109 Statistics

Permutations & Combinations

VOCABULARY & NOTATION

$$\text{Permutation} = nPr = \frac{n!}{(n-r)!}$$

The order of the items matters.
ie., ABC is distinct from BAC; both are counted.

$$\text{Combination} = nCr = \frac{n!}{(n-r)! \cdot r!}$$

The order of the items does not matter.
ie., ABC is considered similar to BAC;
they are not counted separately.

n = total number of items

r = number of items selected

! : factorial; multiplication of consecutive integers

Permutations and Combinations are different ways of counting items selected from a larger group.

<< TI-Calculators have these formulas!

TI-82 & 83: Press MATH, choose PRB

TI-85: Press MATH, choose F2:PROB

See Ch. 5.2 & 5.3 in *Modern Elementary Statistics* by Freund

Permutation

a.) How many different ways can the letters L M N O be arranged?

This problem is a permutation because the order matters. The words "different ways" imply that each sequence is considered distinct.

There are a total of 4 letters, so $n=4$. We are arranging all four letters in all possible ways, so $r=4$.

$${}_4P_4 = \frac{4!}{(4-4)!} = \frac{4!}{0!} = \frac{4 \cdot 3 \cdot 2 \cdot 1}{1} = 24 \quad [\text{NOTE: } 0! = 1]$$

b.) How many different arrangements of 2 letters are there in the set L M N O? /

There are a total of 4 letters, so $n=4$. We are arranging sets of 2 letters in all possible ways, so $r=2$.

Combination

a.) How many different 4 topping pizzas can be made when there are 12 toppings to choose from?

This problem involves combinations. Think about it: do you have to request toppings in a specific order to get the pizza you want?

There are a total of 12 toppings, $n = 12$. We want 4 toppings, so $r = 4$. [NOTE: Similar terms in numerator and denominator cancel 1 /

$${}_{12}C_4 = \frac{12!}{(12-4)! \cdot 4!} = \frac{12!}{8! \cdot 4!} = \frac{12 \cdot 11 \cdot 10 \cdot 9 \cdot 8!}{8! \cdot 4!} = 495$$