Pre-Calculus 12 Combinations

A *combination* is a selection of objects where order **DOES NOT** matter.

Ex. 1) The letters P, Q, R and S can be arranged into 3-letter combinations:

PQR	**PRS**	**PQS**	**QRS**	**4 combinations**
QRP	RSP	etc…	etc…	
RPQ	SPR			
PRQ	PSR			**24 permutations**
QPR	RPS			
RQP	SRP			

When order matters (permutations) there are $_4P_3$, or 24, ways to choose 3 letters from 4 letters. Then, there are 3!, or 6, ways to choose the same 3 letters.

So, the number of combinations is: $\frac{24}{3!} = 4$

Combinations of Different Objects

The number of combinations of n distinct objects taken r at a time is:

$$nCr = \frac{n!}{(n-r)!\,r!}\ , n \geq r$$

Note:

- $_nC_r$ can also be written as $\left(\frac{n}{r}\right)$ "n choose r", also C(n,r)

- $_nP_r$ is the number of ways to choose r objects from n

- r! is r objects can be arranged in r ways.

Ex. 2) How many combinations are possible in Lotto 6/49?

Ex. 3) Lotto Max is a Canadian lottery where a player chooses 7 numbers from 1 to 49. To win the jackpot, all 7 numbers must match. Determine the probability that you will win Lotto Max.

Ex. 4) A local arena has 10 applicants interested in working in the snack bar.

a) How many ways can 4 applicants be chosen?

b) How many ways can 6 applicants be chosen?

Ex. 5) Solve for n: $_nC_2 = 10$

Ex. 6) In how many ways can a committee of 7 people be selected from 9 girls and 3 boys if exactly 2 boys must be on the committee?

Ex. 7) A new store must have 3 cashiers and 4 clerks. There are 7 applicants for cashier and 8 applicants for clerk. How many ways can 7 employees be chosen?

Case Examples

Ex. 8) In how many ways can a committee of 5 people be selected from 7 boys and 5 girls if at least 3 girls must be on the committee?

Ex. 9) On a geography exam Rihanna must answer 2 of the 4 questions in part A and at least 4 of 5 questions in part B. How many ways can she answer the questions?