

## Combinations-50

Suppose that a club has 11 members. The club needs to choose a president, a vice-president and a treasurer. How many ways (combinations) can this be done? (order not important)

The number of choices is  $11 \times 10 \times 9$ . But the three positions can be ordered in  $3!$  ways, so the number of combinations is  $11!/(3! \times 8!)$ .

In general: the number of combinations of  $n$  distinct objects taken  $r$  at a time is:

$${}_n C_r = \frac{n!}{r!(n-r)!}$$

Problems:

- 1) Evaluate:      a)  ${}_8 C_3$                       b)  ${}_{10} C_6$                       c)  ${}_5 C_5$
- 2) Show by using factorial notation that:       ${}_n C_r = {}_n C_{n-r}$
- 3) Solve for  $r$ .       ${}_{10} C_r = 45$                       (give two answers)
- 4) Find the number of combinations of the four letters; A, B, C, and D, taken two at a time. Write down all of the combinations.
- 5) A club has thirty-two members. An executive committee of four members is to be chosen. How many committees are possible?
- 6) How many different combinations of three vegetables are there in the five choices; peas, beans, corn, carrots and potatoes? Write down all of the choices.
- 7)a) How many poker hands (five cards) can be dealt from a standard deck of (fifty-two) cards?  
b) How many poker hands can be dealt from a standard deck if the cards are all of the same suit? (there are four suits, thirteen cards each)

Answers: 1)a) 56, b) 210, c) 1, 2)  ${}_nC_r = n!/(r!(n-r)!)$ ; and  ${}_nC_{n-r} = n!/((n-r)!(n-(n-r))!) = n!/((n-r)!r!)$ , 3)  $r = 2, 8$ , 4)  ${}_4C_2 = 6$ , {AB, AC, AD, BC, BD, CD}, 5)  ${}_{32}C_4 = 35960$ , 6)  ${}_5C_3 = 10$ , the combinations are {peas, beans, corn; peas, beans, carrots; peas, beans, potatoes; peas, corn, carrots; peas, corn, potatoes; peas, carrots, potatoes; beans, corn, carrots; beans, corn, potatoes; beans, carrots, potatoes; corn, carrots, potatoes}, 7)a)  ${}_{52}C_5 = 2598960$ , b)  $4 \times {}_{13}C_5 = 4 \times 1287 = 5148$ ,