

6.4 & 6.5

Quick Notes

1) Factorial If n is a positive integer, then $n! = n(n-1)(n-2)(n-3)\dots(3)(2)(1)$
 $n!$ is pronounced "n factorial" By definition, $0! = 1$

Ex) $5! = 5*4*3*2*1 = 120$

On a Ti – 83, to type in $12!$ → Type 12, press the **MATH** key, arrow over to **PRB**, then select option **4**

Calculator examples $12! \quad \frac{10!}{6!} \quad \frac{13!}{10!3!}$

2) Combinations and Permutations

(Each involves selecting a group of r objects from a group of n objects, where n is greater than or equal to k)

Combination

Objects are distinct
 No repetition of objects
 Order doesn't matter

Permutation

Objects are distinct
 No repetition of objects
 Order matters (it matters what object is in what position)

Notation: ${}_n C_r = C(n,r)$ ("n choose r") Notation: ${}_n P_r = P(n,r)$ ("n permute r")

(BOARD EXAMPLES)

- 1) How many ways can a company of 50 employees select a budget committee consisting of four people?
- 2) How many different ways can a company of 50 employees choose a president, vice president, secretary, and treasurer. (No person can hold more than one position)
- 3) How many ways can four different letters from the set {a, b, c, d, e, f, g, h, i, j, k, l, m} be placed into the shapes below if each letter chosen goes into exactly one shape?
 (draw a circle, rectangle, triangle, and a star)

3) If we have a total of n objects, n_1 of one indistinguishable type, n_2 of another indistinguishable type, n_3 of another indistinguishable type,, and n_k of another indistinguishable type, then the number of distinguishable ways that those n

objects can be arranged is given by $\frac{n!}{n_1!n_2!n_3!\dots n_k!}$ where $n^1 + n^2 + n^3 + \dots + n^k = n$

(BOARD EXAMPLES)

- 1) A clear tube is standing up. It is just wide enough to put marbles into. Billy has 8 red, 4 blue, and 5 green marbles. The only way to tell them apart is color. How many distinguishable ways can Billy place the marbles into the tube?
- 2) 7 ogres and 5 trolls. Choose a committee of 4.
- 3) How many different ways can we rearrange all of the letters of the word "bubbles"?

4) A red team and a Blue team each have 6 players. From these two teams, we will form an All Star team of 4 players.

A) How many ways can we do so?

B) What if at least one player from each team must be on the All Star Team?

Card examples: A) How many hands of five cards?

B) How many 5 card hands have all spades?

C) How many 5 card hands have at least 2 kings?

5) Assume x is any integer greater than 3. Find and simplify a) ${}_x C_3$ b) ${}_x C_{x-3}$ c) ${}_x P_3$ d) ${}_x P_{x-3}$