ECS 315: In-Class Exercise 1 Solution

Instructions

1. Separate into groups of no more than three persons.
2. The group cannot be the same as your former group.
3. Only one submission is needed for each group.
4. ***Write down all the steps*** that you have done to obtain your answers. You may not get full credit even when your answer is correct without showing how you get your answer.
5. **Do not panic.**

Name	ID
Prapun	555

1. (**Course Organization**) When is/are Dr.Prapun's office hour(s)?

Tuesday 9:00-10:00
Wednesday 14:20-15:20
Thursday 9:00-10:00

Remark: There are many places that you can find the information about Dr.Prapun's office hours. For example,
- On the course website
- On Goodgle Calendar (which is also on the course website)
- On the first page of the slides for each chapter.

2. Suppose we sample 4 objects from a collection of 6 distinct objects. Calculate the number of different possibilities when (r = 4, n = 6)

a) the sampling is ordered and performed with replacement

$$n^r = 6^4 = 1{,}296$$

b) the sampling is ordered and performed without replacement

$$(n)_r = (6)_4 = 6\times5\times4\times3 = 360$$

(4 terms)

c) the sampling is unordered and performed without replacement

$$\binom{n}{r} = \frac{n!}{r!(n-r)!} = \frac{6!}{4!\,(6-4)!} = 15$$

($\times \frac{1}{r!}$)

Alternatively, for the sampling without replacement case, we can divide the answer from the "ordered" sampling by r! to get the answer for the "unordered" case.

2. How many different results can we get when we permute AAAABBCC?

There are $n_A + n_B + n_C = 4+2+2 = 8$ objects (not all distinct)

n_x = the number of x among the objects

$$\#\text{ permutations} = \frac{n!}{n_A!\,n_B!\,n_C!} = \frac{8!}{4!\,2!\,2!} = \frac{8\times7\times5\times\cancel{6}^{\,3}}{\cancel{2}\times\cancel{2}} = 420$$

Don't forget to simplify your answers.

ECS 315: In-Class Exercise 2

Instructions

1. Separate into groups of no more than three persons.
2. The group cannot be the same as your former group.
3. Only one submission is needed for each group.
4. ***Write down all the steps*** that you have done to obtain your answers. You may not get full credit even when your answer is correct without showing how you get your answer.
5. **Do not panic.**

Name	ID

1. How many different results can we get when we permute 111|||||?

There are $n = 3 + 5 = 8$ objects here.

$n_1 = \#1\text{s} = 3$

$n_2 = \#|\text{s} = 5$

$$\#\text{permutations} = \frac{n!}{n_1! n_2!} = \frac{8!}{3!5!} = \frac{8 \times 7 \times 6}{3 \times 2 \times 1} = 56$$

2. Suppose we sample 4 objects from a collection of 6 distinct objects. Calculate the number of different possibilities when the sampling is unordered with replacement.

$n_1 + n_2 + n_3 + n_4 + n_5 + n_6 = 4$

n_i = the number times that the i^{th} object is in the sample.

$\Rightarrow$ Permute 4 1s and 5 bars.

$$\Rightarrow \#\text{permutations} = \frac{9!}{4!5!} = \frac{9 \times 8 \times 7 \times 6}{4 \times 3 \times 2 \times 1} = 126$$

Alternatively, $n = 6, r = 4 \Rightarrow \binom{n+r-1}{r} = \binom{6+4-1}{4} = \binom{9}{4} = 126$

3. Find the coefficient of $x^6 y^9$ when we expand $(x + y)^{15}$.

$$\binom{15}{6} = \frac{15!}{9!6!} = \frac{15 \times 14 \times 13 \times 12 \times 11 \times 10}{6 \times 5 \times 4 \times 3 \times 2 \times 1} = 5005$$

Don't forget to simplify your answers.