



Assignment-2

Group-15

Subject: DISCRETE STRUCTURE

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Question 1:

a. There are $6*6*6 = 216$ numbers.

b. If the digits are instnct 20

c. Numbers between 300 to 700 where only odd numbers are allowed:

If odd numbers then at the end there are only 5 numbers allowed and in the middle we can take all 0-9 all 10 numbers and in the first we have only 4 digits 3 to 7. So there are total $4*10*5 = 200$ numbers.

Question 2:

- a. If all men sit together then all women will sit together as well.
So all men $5!$ And all women $5! = 5! * 5! = 120 * 120 = 14400$
- b. If the couple insists on sitting next to each other then if we assume that the couple is a single unit then there are $(9-1)! = 8!$ Ways we can arrange it. Also the couple can rearrange themselves. So the answer will be: $8! * 2! = 80640$
- c. Men can be arranged $(5-1)! = 4!$ Ways and women can be arranged $5!$ Ways. So the answer will be: $4! * 5! = 2880$ ways
- d. The photographer can arrange $= 10! * 11 * 2 = 79833600$ ways.

Question 3:

- a. If there are no ties they can finish in 1st, 2nd, 3rd, 4th and 5th position. So the sprinters can finish in $5! = 120$ ways.
- b. If two sprinter ties then the answer will be: $4! * 5 * 2 = 240$ ways.
- c. If two groups of two sprinters are tied together then the answer will be: $3! * 5 * 3 * 2 = 180$ ways

Question 4:

- a. A croissant shop has plain croissants, cherry croissants, chocolate croissants, almond croissants, apple croissants, and broccoli croissants = 6 types of croissants.

Kinds of croissants = Plain , Cherry , Chocolate , Almond , Apple , Broccoli.

For all the below parts , let us consider they are $x_1+x_2+x_3+x_4+x_5+x_6$ in numbers.

Now , no of ways of non- negative solutions of $x_1+x_2+x_3+x_4+x_5+x_6 = N$ is $(N+5C5)$

If there are dozens of croissants then we can choose then $N(\text{number of croissants}) = 12$.

So the answer will be = 6188 ways.

- b. Two dozen croissants of each type. Let us assume that each type is x so.

$$x_1+x_2+x_3+x_4+x_5+x_6 = 24 \text{ and } x_1=2, x_2=2, x_3=2, x_4=2, x_5=2, x_5=2, x_6=2$$

$$\text{Then } (x_1-2) + (x_2-2) + (x_3-2) + (x_4-2) + (x_5-2) + (x_6-2) = 12$$

So the answer will be = $17C5 = 6188$ ways.

- c. Two dozen croissants with at least 5 chocolate croissants and at least 3 almond croissants.

Like last time.

Hence , $x_3 \geq 5$ and $x_4 \geq 3$

$$\text{Now , } x_1 + x_2 + x_3 + x_4 + x_5 + x_6 = 24$$

But , we do not need all the non - negative solutions of this

$$x_1 + x_2 + (x_3 - 5) + (x_4 - 3) + x_5 + x_6 = 16$$

So the ans will be $= {}^{21}C_5 = 20349$.

Question 5:

a) There are 10 ways in which either team A or team B wins.

Team A can win following ways: (10,0),(9,1),(8,2),(7,3),(6,4)

Team B can win following ways: (0,10),(1,9),(2,8),(3,7),(4,6)

Hence, there are 10 possible scoring scenarios for the game to end in the first round.

b) 11 kicks in the first round of penalty shoot-out are possible while all the 10 kicks will settle the game in the first round. The possibility (5,5) leads to the 2nd round of 10 kicks.

Hence, there are 11 possible scoring scenarios for the game to settle in the second round of 10 penalty kicks.

c) In the first round the outcome (5,5) leads to the 2nd round and the (5,5) in the 2nd round leads to sudden death shootout.

The possible numbers of scoring scenarios till the end of two rounds is $= 11 + 11 = 22$

Hence, there are 22 possible scoring scenarios for the game to have a sudden death shootout.

Question 6:

The number of different answer sheets that are possible assuming every student answers every question with an a, b, c or d is 4^{10} as each question has 4 possible answers. so, the possible number of distinct answer sheets = $4^{10} = 1048576$.

to guarantee that at least three answer sheets are identical ,there must be a minimum of $2(1048576) + 1 = 2097153$ students in the examination.

Question 7:

From secondary assignment

- 75% students passed in history - $P(H) = 0.75$
- 65% students passed in mathematic -- $P(M) = 0.65$
- 50% passed both in His and mat ---- $P(B) = 0.5$
- 35 failed in both subject --- B' ; $(P(B'))$

From law $P(B') = 1 - P(B) = 1 - 0.5 = 0.5$

$P(B') = B' / \text{sample space}$

Sample Space = $35 / 0.5 = 70$; sample space = Number Candidate sit for the exam

Question 8:

Integer from 300 through 780, Inclusive to be chosen at random

Probability number chosen will have 1 as at least 1 digit.

- C denote Probability number chosen

From equation - Probability = E/S

Desire event 93 and total possible event 480

$$P(C) = 93/480 = 0.192$$

Question 9:

a) Blue cars:

$$C(10,2) = 10 \times 9 \times 8! / 2 \times 1 \times 8!$$

$$\text{Yellow cars: } C(10,4) = 10 \times 9 \times 8 \times 7 \times 6! / 4 \times 3 \times 2 \times 1 \times 6! = 210$$

Then, Blue + Yellow = 255 ways

b) 4 empty lots next to each other counts as 1.

$$\text{Parking lots} + 1 \text{ group of 4 empty lots} = 6 + 1 = 7$$

$$\begin{aligned} C(10,7) &= 10 \times 9 \times 8 \times 7! / 3 \times 2 \times 1 \times 7! \\ &= 120 \text{ ways} \end{aligned}$$

$$\text{The probability is } = 120/255 = 24/51 = 0.47$$

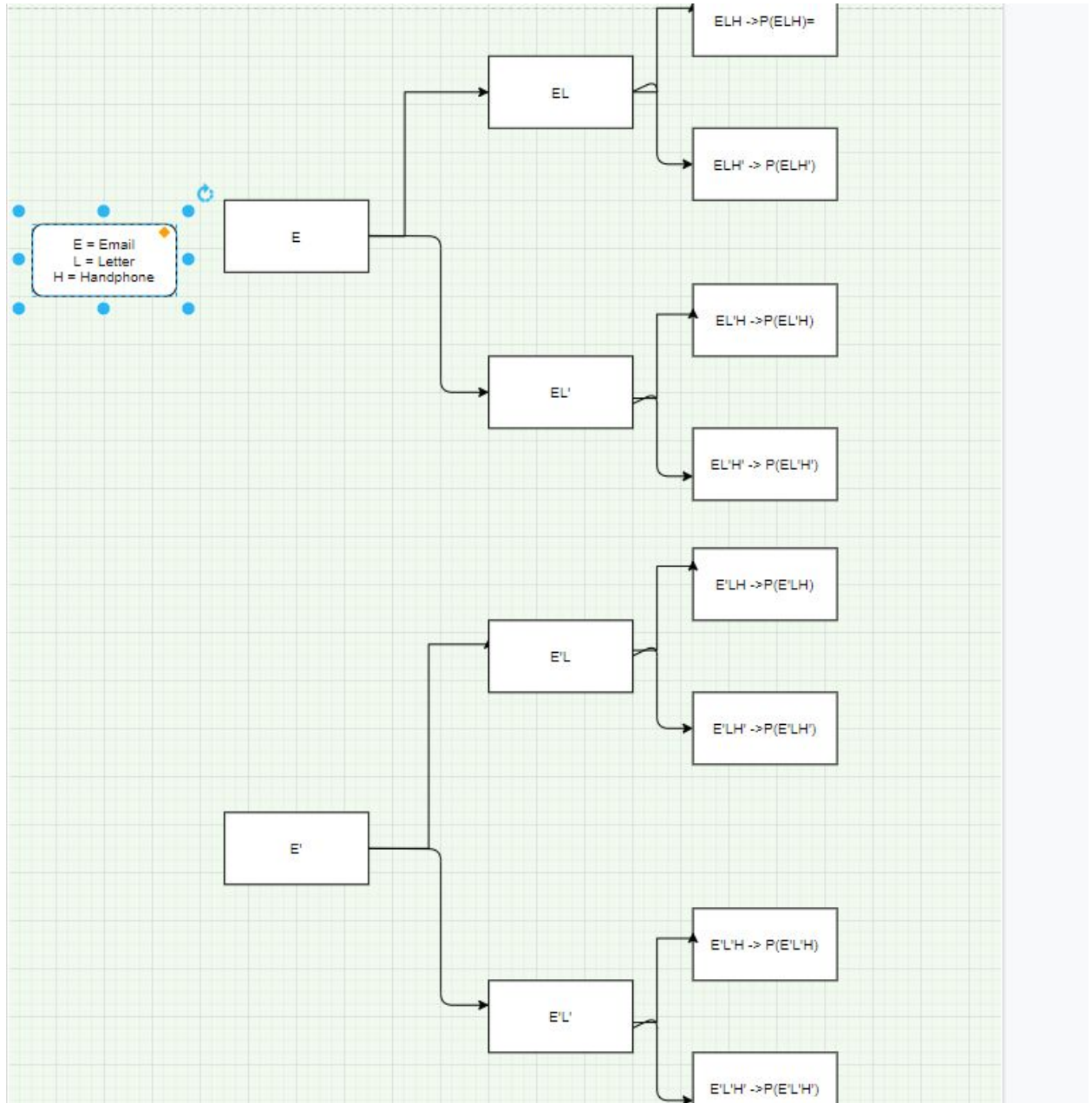
Question 10:

a) $P(E) = (0,4 + 0,6) / 2 = 0,5$

$$P(L) = (0,1 + 0,8) / 2 = 0,45$$

$$P(H) = (0,5 + 1) / 2 = 0,75$$

b)



Then the probability receives it via email is

$$\begin{aligned}
 P(E) &= P(E, L, H) + P(E, L, H') + P(E, L', H) + P(E, L', H') \\
 &= 0.17 \times 0.06 \times 0.2 \times 0.07 \\
 &= 1.4 \times 10^{-4}
 \end{aligned}$$

Question 11:

Events

C- Cars

T –Light truck

F –Fatal Accident

N- Not a Fatal Accident

Given

$$P(F|C) = 20/10000 \text{ and } P(F|T) = 25/100000$$

$$P(T) = 0.4$$

In addition, we know C and T are complementary events

$$P(C)=1-P(T)=0.6$$

Our goal is to compute the conditional probability of a Light truck accident given that it is fatal $P(T|F)$.

Question 12:

We have 4 boxes which each contain at least 1 letter from a total 7 letters. It can't be repeated because it has different colors.

$$C(7,4) = 7 \times 6 \times 5 \times 4! / 3 \times 2 \times 1 \times 4!$$

$$= 35 \text{ ways}$$

