Assignment-2

Discrete Structure (SECI1013)

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Math no. done by —

* Kazi Omeir Mustafa : 1, 2, 3, 12
* Nazmul : 6, 7, 8, 9
* Tanshiba : 4, 5, 10, 11

Ans to the Q.N-1

ⓐ According the question we have to form 3 digit numbers

1st, 2nd and 3rd place can be filled in 6 ways

So total will be = $6 \times 6 \times 6 = 216$ (Ans)

ⓑ 1st, 2nd, and 3rd place can be filled as 6, 5, 4 ways

So total will be = $6 \times 5 \times 4 = 120$

ⓒ Between 300-700 only odd number should be formed in 3 digits.

So 1st place can be filled in 4 ways where 3, 4, 6, 5 is only allowed.

and 2nd place can be filled in 6 ways

and for 3rd place 3, 5, 7 € odd numbers are allowed, 3rd place can be filled in 3 ways.

Total $= 4 \times 6 \times 3$

$= 72$

Ans to the Q.N-2

ⓐ Men insist to sit next to each other $(6-1)!\,(5)!$

$= (5)!\,(5)!$

except Anita, we have 5 man and 5 women

If ~~mon~~ all men want to sit togather, where 6 person around a table $(6-1)!$ ways and 5 men arranged in $5!$ ways.

If all men sit togather then $(6-1)!\,(5)!$ ways

$= (5)!\,(5)!$ ways.

$= 14400$ ways

ⓑ If couple sit next to each other $= (9-1)!\,(2)!$

If take 1 couple as a group $= (8)!\,(2)!$

we arrange 9 people around a table in $(9-1)!$ ways. But in between can be rearranged in $2!$ ways.

So, We can arrange couple who want to sit next to each other in $(9-1)!\,2!$ ways

$= (8)!\,(2)!$ ways.

$= 80640$ ways

Ans:

(c) If men, women sit in alternate sit, then $(5-1)!(5)!$
$= (4)!(5)!$

If 5 women sit in alternate sits, then $(5-1)!$ ways it can be done.

5 men can be arranged in $5!$ ways.

So we can arrange man and women sit in alternate sits in $(5-1)!\ (5)!$ ways
$= (4)!\ (5)!$ ways.
$= 2880$ ways

(d) With anita and her husband there are 12 people.

If Anita and her husband is group, there are 11 person remaining.

So in a line we can arrang in $11!$ ways
and for Anita and her husband $2!$ ways.

So, Anita and her husband can stand togather in $(11)!\ (2)!$ ways.
$= 79833600$ ways

Ans to the Q.N-3

ⓐ If no ties, and 5 sprinters
and they can finish in, 1st, 2nd, 3rd, 4th
and 5th positions.

So no ~~to~~ of ways for the spritters can
finish, if there is no tie = $5! = 120$

ⓑ If there is 1 tie and 5 sprinters
and they can finish in 1st, 2nd, 3rd, 4th,
~~5th~~ positions

So number of ways for the sprinters
can finish, if there is 1 tie is $(4)! \times \binom{5}{2}$

$= 24 \times 10$

$= 240$

ⓒ If there are 2 ties and 5 sprinters.
and they can finish in 1st, 2nd, 3rd position

so, no of ways for the sprinters can
finish, if there are 2 ties is $(3)! \times \binom{5}{2} \times \binom{3}{2}$

$= 180$

Tanshika Naorin Prapti

4

(a) croissants = Plain, cherry, chocolate, Almond, Apple, Broccoli.

∴ Ways to choose a dozen croissants

$= {}^{12}C_6$

$= 924$ ways

(b) Taking at least two of each kind, in two dozen croissants,

we get $= \dfrac{24!}{2!\,2!\,2!\,2!\,2!\,2!}$

$= 9.69 \times 10^{21}$

(c) With at least five chocolate croissants and at least three almond croissants, in two two dozen croissants.

we get $= \dfrac{24!}{5!\,3!}$

$= 8.62 \times 10^{20}$.

5 (b)

We know, there are 10 penalty kicks in a penalty scenerio. For a tie in penalty attempts, in the first round the ways should be (5, 5).

∴ Possible ways to settle the game in 2nd round

= 10 + 1

= 11 scoring scenerios.

(Ans.)

(c)

Since from (b) we get,

Possible scoring sceneriose

= 11 (~~for~~ including (5,5) way).

~~From~~ In the same way, for 2nd round the total outcomes / possible scenerios = 11 (including (5,5))

∴ Total possible scoring scenerio for full set of penalty kicks = 11 + 11

= 22.

(Ans.)

5

(a) Let, the two teams be X and Y.
When ~~the~~ teams reaches the situation of penalty attempt, then any of the team need to score the maximum.

There are 10 ways which will determine the win or lose of the teams.

The possible ways for winning –

Team X = (6, 4), (7, 3), (8, 2), (9, 1), (10, 0).

Team Y = (4, 6), (3, 7), (2, 8), (1, 9), (0, 10)

(Ans)

(x→6)

total number of attempts combination possible for a Student "m",

For each question choose any 1 of the 4 option and there are 10 such questions

$= 4\times4\times4\times4\times4\times4\times4\times4\times4\times4 = 1048576$

It is given that at least 3 answer sheets will be identical

According to Pigeon hole Principle,

$\left\lceil \frac{(n-1)}{m} \right\rceil + 1 = 3$

$\Rightarrow \left\lceil \frac{(n-1)}{1048576} \right\rceil = 3-1$

$\Rightarrow \frac{n-1}{1048576} = 2 \Rightarrow n-1 = 2\times 1048576$

$\Rightarrow n-1 = 2097152$

$\Rightarrow n = 2097152+1$

$\Rightarrow n = 2097153$

Ans.

Q→7//

The Percentage of students that passed at least one subject is →

$$P(\text{history}) + P(\text{mathematics}) - P(\text{both}) = 75\% + 65\% - 50\%$$
$$= 90\%$$

The Percentage of students that failed both subjects is

$$100 - P(\text{Pass at least one sub}) = 100\% - 90\% = 10\%$$

we know that 35 students ~~faild~~ failed both

let, T = total number of students

$$T \times (10/100) = 35$$

$$\Rightarrow T = \frac{35 \times 100}{10} = 350$$

∴ we get T = 350 students.

Q→8//

Case 1

1 at one digit

301, 310, 312, 313, 314, 315, 316, 317, 318, 319, 321,
331, 341, 351, 361, 371, 381, 391 = 18

401, 410, ... 491 = 18

501, 510, ... 591 = 18

601, 610, ... 691 = 18

701, 710, ... 771 = 16

total = 18 + 18 + 18 + 18 + 16 = 88

Case 2

1 at two digit

311, 411, 511, 611, 711

total = 5

∴ Probability of number chooen will have 1 as at least one digit $= \frac{5+88}{780-299}$

$= \frac{93}{481}$

$= 0.1933$

Q→9//

(a) $^{10}C_2 + {}^{8}C_4 = 115$

(b) $^{6}C_2 + {}^{4}C_4 = 16$ $\therefore$ not all empty lots are next each other

$= 115 - 16 = 99$

$\therefore$ empty lots are next to each other

~~Roba~~ Probability $= \frac{99}{115} = 0.86$

Tanzhiba Neesun Prapti

1(

(a)

The Probability the trainee receives the message

$= (0.4)(0.6) + (0.1)(0.8) + (0.5)(1)$

$= 0.82$

(Ans.)

chance of getting message,

$P(E) = 0.4$

$P(L) = 0.1$

$P(H) = 0.5$

Probability of trainee receive the message,

$P'(E) = 0.6$

$P'(L) = 0.8$

$P'(H) = 1$

(b) According to Bayes theorem. the conditional probabilities that the trainee receives via email $= \dfrac{(0.4)(0.6)}{(0.4)(0.6)+(0.1)(0.8)+(0.5)(1)}$

$= \dfrac{0.24}{0.82}$

$= 0.29$ (Ans.)

Taushiba Nasrin Prapti

11

According to the Qus,

$$P\left(\frac{A}{C}\right) = \frac{20}{100000} = \cdot 00020$$

$$P\left(\frac{A}{T}\right) = \frac{25}{100000} = \cdot 00025$$

And, ~~therefore~~,

$$P(T) = 0.4$$

Let us consider,

cars = C

Light truck = T

And,

Fatal Accident = A

Not a Fatal Accident = A'

Now,

$$P(C) = 1 - P(T)$$
$$= 1 - 0.4$$
$$= 0.6$$

Therefore,

the probability of the accident involved a light truck,

$$P\left(T/A\right) = \frac{P\left(\frac{A}{T}\right) \cdot P(T)}{P\left(\frac{A}{T}\right) \cdot P(T) + P\left(\frac{A}{C}\right) \cdot P(C)}$$

$$= \frac{(0.00025) \cdot (0.4)}{(0.00025) \cdot (0.4) + (0.00020)(0.6)}$$

$$= 0.4545$$

(Ans)

Ans to the Q.N-12

Let's say, no. of ways one can distribute the letter is N where one can place each letter in any 4 boxes, $|N| = 4^9$

If shapes have no box,

Let,

Set of tetrahedron = A

Set of cube = B

Set of Polyhedron = C

Set of dodecahedron = D

So,

$$|A| = |B| = |C| = |D| = 2^9$$

and $|A \cup B| = |B \cup C| = |C \cup D| = |D \cup A| = 1^9 = 1$

and, $|A \cap B \cap C \cap D| = 0$

So, $|A \cup B \cup C \cup D| = |A| + |B| + |C| + |D| - |A \cup D| - |B \cup C| - |C \cup D| - |D \cup A| + |A \cap B \cap C \cap D|$

$\Rightarrow |A \cup B \cup C \cup D|$

$$= 2^9 + 2^9 + 2^9 + 2^9 - 1 - 1 - 1 - 1 + 0$$

$\Rightarrow |A \cup B \cup C \cup D| = 2044$

So 9 letters can be placed in 4 boxes where at least one letter, $|N| - |A \cup B \cup C \cup D|$

$= \cancel{4^9 \quad \quad}$

$= 4^9 - 2044$

$= 262144 - 2044$

$= 260100$