Assignment 2

SECI 1013 Group - 9

Members:

Name	Matric No.	Task (Questions)
Islam Mohammed Ruzhan	A20EC4028	3,6,9,12
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1. 3 digit number (2, 3, 4, 5, 6, 7)

~~a) 6 · 5 · 4 = 120 (if numbers can't be repeated) / (distinct)~~

a) $6 \cdot 6 \cdot 6 = 216$ (numbers can be repeated)

b) $6 \cdot 5 \cdot 4 = 120$

c) between 300 - 700

(3, 4, 5, 6) (all) (3, 5, 7)

$4 \cdot 6 \cdot 3 = 72$

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Question 2

a. 5 men , 5 women

5 men count as one , 1 + 5 women = 6

$(6-1)! = 5!$

$= 5 \times 4 \times 3 \times 2 \times 1 = 120$ ways

Arrangement of 5 men , $5! = 5 \times 4 \times 3 \times 2 \times 1$

$= 120$ ways

$\therefore 120 \times 120 = 14\ 400$ ways

b. 1 couple , 8 person

couple count as one , 1 + 8 person = 9

$(9-1)! = 8!$

$= 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 40\ 320$ ways

Arrangement of couple , $2! = 2 \times 1$

$= 2$ ways

$\therefore 40\ 320 \times 2 = 80\ 640$ ways

c. Arrangement of men , $(5-1)! = 4!$

$= 4 \times 3 \times 2 \times 1 = 24$ ways

Arrangement of women , ${}^5P_5 = 120$ ways

$\therefore 24 \times 120 = 2\ 880$ ways

d. Anita and her husband count as one , 1 + 10 person = 11

$11! = 11 \times 10 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$

$= 39\ 916\ 800$ ways

Arrangement of Anita and her husband , 2!

$2! = 2 \times 1$

$= 2$ ways

$\therefore 39\ 916\ 800 \times 2 = 79\ 833\ 600$ ways

3

a) When no ties occur, there are 5 people in 5 positions. They can finish the race in 5! ways

$= 120$ ways. (Ans)

b) Considering the tie, the 2 sprinters who tie can be considered as 1. We can select the 2 sprinters in $^5C_2$ ways or, 10 ways.

Again, if 2 sprinters tie, then there will be 4 positions.

∴ The sprinters can finish in $4! \times 10$ ways

$= 240$ ways (Ans)

c) If there is 2 groups who tie, there will be 4 sprinters who tie in 2 positions.

∴ Selecting 4 from 5 in $^5C_4 = 5$ ways.

∴ The sprinters can finish in $5 \times 3!$ ways

$= 30$ ways (Ans)

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4. plain, cherry, chocolate, almond, apple, broccoli

a)

6 croissant $= n$

12 way to choose $= r$

$6 + 12 - 1, 12 = C(17,12) = 17,5$

$$\frac{17!}{5!(12!)} = \frac{17 \cdot 16 \cdot 15 \cdot 14 \cdot 13}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1} = \underline{\underline{6188}} \text{ ways}$$

b) 24 croissant, 2 of each kind

$C(17,12)$

$$\frac{17!}{12!(17-12!)} = \cancel{\frac{17!}{25!(1}} = \frac{17!}{12!(5!)} = \cancel{1721}$$

$$\frac{17 \cdot 16 \cdot 15 \cdot 14 \cdot 13}{5!} = \underline{6188} \text{ ways}$$

c) 5 chocolate 24 croissant
3 almonds

$(24-(5+3)) = 16$

$$C(6+16-1, 16) = \frac{21!}{5!(21-5)!} = \underline{20349} \text{ ways}$$

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Question 5

a) Two options, 2 wins with 1 tie or win and 1 win with 3 ties or wins.

Therefore,

2 wins and 1 tie or win, ${}^4C_2 \times {}^3C_1 \times 2 = 36$

1 win and 3 ties or wins, ${}^3C_1 \times {}^4C_3 \times 2^3 = 96$

As there are two teams, $2 \times (36 + 96) = 264$

$\therefore$ Total scenarios $= 264$

b) 10 rounds have done, so there are 2^{10} outcomes.

$2^{10} = 1024$ ways.

Scenarios for second round to occur, $1024 - 264 = 760$ ways

For second round to end, it has 264 ways as it is the same as the first round.

$\therefore$ Total scenarios $= 760 \times 264$

$= 200\ 640$

c) Scenario for second round to occur, $1024 - 264 = 760$ ways

Scenario for sudden death to occur, $1024 - 264 = 760$ ways

For sudden death, 5 round of penalty kicks mean there are $2 \times 5 = 10$ scenarios.

$\therefore$ Total scenarios $= 760 \times 760 \times 10$

$= 5\ 776\ 000$

6

Total number of questions = 10.

Number of responses in 1 question = 4.

$\therefore$ Ways to answer = 4^{10} = 1048576.

At least three answer sheets identical means that two answer sheets must be identical.

Lets least number of students be 'x'.

According to pigeon hole principle. $\left\lceil \frac{x}{1048576} \right\rceil = 2.01$ (at least)

$\therefore$ Minimum students should be $\{(1048576 \times 2) + 1\}$

$= 2097153.$

Ans = 2097153.

P = Probability
n = candidates
N = total candidates

7) $P(History) = 0.75$

$P(Math) = 0.65$

$P(His \ \& \ math) = 0.50$

$n(His' \ \& \ math') = 35$

$His / math = 0.75 + 0.65 - 50$

$= 0.90$

$N = \frac{N - 35}{0.90} \Rightarrow N(0.90) = N - 35$

$\Rightarrow 0.10 N = 35$

$N = \underline{350}$ candidates

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Question 8

300 - 780

No. of integers = 780 - 299
= 481

From 300 - 699

$^4C_1 \times {^1C_1} \times {^9C_1}$ = 36 ways ⇒ _ $\underline{1}$ _

$^4C_1 \times {^9C_1} \times {^1C_1}$ = 36 ways ⇒ _ _ $\underline{1}$

$^4C_1 \times {^1C_1} \times {^1C_1}$ = 4 ways ⇒ _ $\underline{1}$ $\underline{1}$

From 700 - 780

$^1C_1 \times {^1C_1} \times {^9C_1}$ = 9 ways ⇒ _ $\underline{1}$ _

$^1C_1 \times {^8C_1} \times {^1C_1}$ = 8 ways ⇒ _ _ $\underline{1}$

total ways = 36 + 36 + 4 + 9 + 8 = 93 ways

$$\text{Probability} = \frac{93}{481}$$

9)

a) 6 cars can be parked in the ~~parkin~~ 10 parking lots in $^{10}C_6$ ways.

Again arrangement between the 6 cars

$$= \frac{6!}{4!\,2!}$$

$\therefore$ Total ways to park the car $= {}^{10}C_6 \times \frac{6!}{4!\,2!}$

$= 3150$ ways.

(Ans)

b) If the empty slots are next to each, we can get 4 empty slots.

Considering the empty slots as 1 and the other 6 slots, we can park in $^{7}C_6$ ways or 7 ways.

Again the cars can be arranged in $\frac{6!}{4!\,2!}$ ways.

~~$\therefore$ Total ways the~~ Again empty slots arrangement

$$= \frac{4!}{4!}$$

$\therefore$ ways the cars can be parked so that empty slots are next to one another is

$$7 \times \frac{6!}{4!\,2!} \times \frac{4!}{4!} = 105 \text{ ways.}$$

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10)

send		receive
0,4	email	0,6
0,1	letter	0,8
0,5	hand phone	1

a) receive message

email $(0,4 \cdot 0,6) = 0,24$

letter $(0,1 \cdot 0,8) = 0,08$

handphone $(0,5 \cdot 1) = 0,5$ +

$0,82$

b) receive via email

$$\frac{0,24}{0,82} = \frac{12}{41} = 0,292$$

Question 11

$P(\text{light truck}) = \frac{40}{100}$

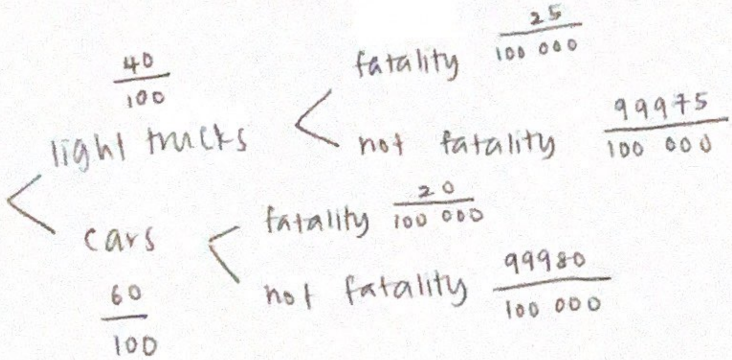
$P(\text{cars}) = \frac{60}{100}$

$P(\text{fatality} \mid \text{cars}) = \frac{20}{100\,000}$

$P(\text{fatality} \mid \text{light truck}) = \frac{25}{100\,000}$

$P(\text{light truck} \mid \text{fatality}) = ?$

$$P(\text{light truck} \mid \text{fatality}) = \frac{P(\text{fatality} \mid \text{light truck}) \cdot P(\text{light truck})}{P(\text{fatality})}$$



$$P(\text{fatality}) = P(\text{light truck and fatality}) + P(\text{cars and fatality})$$

$$= \left(\frac{40}{100} \times \frac{25}{100\,000}\right) + \left(\frac{60}{100} \times \frac{20}{100\,000}\right)$$

$$= 0.00022$$

$$P(\text{light truck} \mid \text{fatality}) = \frac{\frac{25}{100\,000} \times \frac{40}{100}}{0.00022}$$

$$= 0.4545$$

12

Ways for each box to have ~~ba~~ 1 letters.

$= {}^9P_4$

$= 3024$

Way for any other letter in any box.

$= \frac{4!}{3!} \times 1 + \frac{4!}{2!} \times 2 + \frac{4!}{1!} \times 3$

$= 100$

$\therefore$ Ways to place 9 letters into the 4 boxes such that each box contain at least 1 letter.

$= 3024 \times 100$

$= 302400$ (Ans)

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Now, probability the empty slots are next to each other

$$= \frac{105}{3150}$$

$$= \frac{1}{30} \quad (\text{Ans})$$

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