

No:.....

Date: . . .

Subject:.....

Discrete Structure Assignment 2

Members:

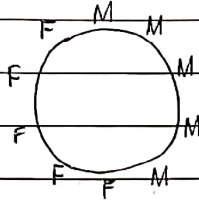
- 1) Tham Chuan Yew (A20EC0166)
- 2) Lai Yee Jen (A20EC0061)

1.a) ${}^6C_1 \times {}^6C_1 \times {}^6C_1 = 216$ numbers

b) ${}^6C_1 \times {}^5C_1 \times {}^4C_1 = 120$ numbers

c) ${}^4C_1 \times {}^6C_1 \times {}^3C_1 = 72$ numbers

2.a)



Male arrangement = 5P_5

= 120

Total arrangement = $(6-1)! \times 120$

= 14400

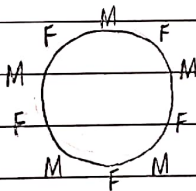
b) Couple arrangement = 2P_2

= 2

Total arrangement = $(9-1)! \times 2$

= 80640

c)



Male arrangement = 5P_5

Female arrangement = 5P_5

Total arrangement = $({}^5P_5 \times {}^5P_5) \times 2$

= 28800

d) No. of ways = ${}^2P_2 \times {}^{11}P_{11}$

= 79833600

$$3. a) \text{ Ways} = {}^5C_1 \times {}^4C_1 \times {}^3C_1 \times {}^2C_1 \times {}^1C_1 \\ = 120$$

$$b) \text{ Ways} = ({}^5C_2 \times {}^3C_1 \times {}^2C_1) \times 4 \\ = 240$$

$$c) \text{ Ways} = ({}^5C_2 \times {}^3C_2 \times {}^1C_1) \times 3 \\ = 90$$

$$4. a) \text{ Ways} = 6^{12} \\ = 2176782336$$

$$b) \frac{P}{1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1} \frac{CR}{1} \frac{CR}{1} \frac{CH}{1} \frac{CH}{1} \frac{AL}{1} \frac{AL}{1} \frac{AP}{1} \frac{AP}{1} \frac{BR}{1} \frac{BR}{1} \times 6^{12}$$

$$\text{Ways} = 1^{12} \times 6^{12} \\ = 2176782336$$

$$c) \frac{C}{1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1} \frac{AL}{1} \frac{AL}{1} \frac{AL}{1} \times 6^{16}$$

$$\text{Ways} = 1^8 \times 6^{16} \\ = 2821109907456$$

$$\begin{aligned}
 5.a) \quad 2 \text{ wins among 4 games} &= C(4, 2) \\
 &= \frac{4!}{2!(4-2)!} \\
 &= 6
 \end{aligned}$$

$$\begin{aligned}
 1 \text{ win among 3 games} &= C(3, 1) \\
 &= \frac{3!}{1!(3-1)!} \\
 &= 3
 \end{aligned}$$

$$\begin{aligned}
 2 \text{ wins and 1 ties/wins} &= C(4, 2) \cdot C(3, 1) \cdot 2 \\
 &= 36
 \end{aligned}$$

$$\begin{aligned}
 1 \text{ win and 3 ties/wins} &= C(3, 1) \cdot C(4, 3) \cdot 2^3 \\
 &= 96
 \end{aligned}$$

$$\begin{aligned}
 \text{Number of scenarios} &= 2 \times (36 + 96) \\
 &= 2 \times 132 \\
 &= 264
 \end{aligned}$$

$$\begin{aligned}
 b) \quad \text{Possible outcomes for 10 penalties} &= 2^{10} \\
 &= 1024
 \end{aligned}$$

$$\begin{aligned}
 \text{Scenarios for game not settled in first round} &= 1024 - 264 \\
 &= 760
 \end{aligned}$$

$$\text{First round} = 760 \text{ scenarios}$$

$$\text{Second round (game ends)} = 264 \text{ scenarios}$$

$$\begin{aligned}
 \text{Total number of scenarios} &= 760 \times 264 \\
 &= 200640
 \end{aligned}$$

$$c) \text{ First round} = 760 \text{ scenarios}$$

$$\text{Second round (game not ended)} = 760 \text{ scenarios}$$

$$\begin{aligned}
 \text{Sudden death (game ends)} &= 2 + 2 + 2 + 2 \\
 &= 10 \text{ scenarios}
 \end{aligned}$$

$$\begin{aligned}
 \text{Total number of scenarios} &= 760 \times 760 \times 10 \\
 &= 5776000
 \end{aligned}$$

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6. 10 questions

Possibilities of answers = 4^{10}

$$= 1048576$$

Minimum number of students = $(1048576 \times 2) + 1$

$$= 2097153$$

7. Passed history only = $75\% - 50\%$

$$= 25\%$$

Passed mathematics only = $65\% - 50\%$

$$= 15\%$$

Passed both = 50% Failed both = $100\% - 50\% - 25\% - 15\%$

$$= 10\%$$

 $10\% = 35$ candidates $100\% = 350$ candidates

Total candidates = 350

8. Total size = $(780 - 300) + 1$

$$= 481$$

Numbers with at least a 1 = $({}^5C_1 \times {}^{10}C_1) \times 2 - 2 - 5$

$$= 93$$

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

$$= 0.1933$$

9.a) No. of ways = $\frac{{}^{10}P_6}{2! \times 4!}$

$$= 3150 \text{ ways}$$

b) No. of ways = $\frac{7!}{2! \times 4!}$

$$= 105 \text{ ways}$$

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

$$= 0.03333$$

$$10. a) P(R) = (0.4 \times 0.6) + (0.1 \times 0.8) + (0.5 \times 1) \\ = 0.82$$

$$b) P(E|R) = \frac{(0.4)(0.6)}{0.82} \\ = 0.2927$$

$$11. P(L) = 0.40$$

$$P(C) = 0.60$$

$$P(A|L) = 2.5 \times 10^{-4}$$

$$P(A|C) = 2.0 \times 10^{-4}$$

$$P(L|A) = \frac{P(L \cap A)}{P(A)} \\ = \frac{0.40 \times 0.00025}{0.40 \times 0.00025 + 0.60 \times 0.0002} \\ = \frac{0.0001}{0.00022} \\ = 0.4545$$

$$12. \text{Arrangement for minimum letters} = {}^9P_4 \\ = 3024$$

$$\text{Arrangement for remaining letters} = 4^5 \\ = 1024$$

$$\text{Total ways} = 3024 \times 1024 \\ = 3096576$$