UTM

UNIVERSITI TEKNOLOGI MALAYSIA

DISCRETE STRUCTURE (SECI 1013-03)

SEMESTER 1-2020/2021

ASSIGNMENT# 2

GROUP 13

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Question 1

a)6^3=216 numbers

b) $6 \times 5 \times 4 = 120\ numbers$

c) choose 1st digit = 2 ways (3,5)

choose 2nd digit = 3 ways (3,5,7)

choose 3rd digit = 3 ways (3,5,7)

∴ 2X3X3=18 (numbers between 300 to 700 is only odd digits allow)

Question 2

a) (2-1)! x 5! x 5! = 14400

b) (9-1)! x 2 = 80640

c) (5-1)! x 5! = 2880

d) 11! x 2 = 79833600

Question 3

a) $5! = 120$

b) $4! \times 2! = 24 \times 2$
$= 48$

c) $3! \times 2! \times 2! = 6 \times 2 \times 2$
$= 24$

Question 4

a) $n = 6$ (6 types of croissants)

$r = 12$ (1 dozen =12)
Repetition of croissants is allowed

$$C\ (n + r - 1, r) = C(6 + 12 - 1,12) = C\ (17,12)$$

$$= \frac{17!}{12! \cdot (17 - 12)!}$$

$$= \frac{17!}{12! \cdot 5!}$$

$$= 6188$$

b) $n = 6$ (6 types of croissants)
2 dozen =24
$r = 12$ (Select 2 of each kind, which are 12 croissants in total)
Repetition of croissants is allowed

$$C\ (n + r - 1, r) = C(6 + 12 - 1,12) = C\ (17,12)$$

$$= \frac{17!}{12! \cdot (17 - 12)!}$$

$$= \frac{17!}{12! \cdot 5!}$$

$$= 6188$$

c) $n = 6$ (6 types of croissants)

$r = 16$ (1 dozen=24, 5 chocolate croissant, 3 almond croissant , 24-5-3=16)
Repetition of croissants is allowed

$$C(\ (n + r - 1, r) = C(\ 6 + 16 - 1, 16) = C(\ 21,16)$$

$$= \frac{21!}{16! \cdot (21 - 16)!}$$

$$= \frac{21!}{16! \cdot 5!}$$

$$= 20349$$

Question 5

a) 2 wins among 4 games: $C(4,2) = \frac{4!}{2!(4-2)!} = \frac{4!}{2!2!} = 6$

1 win among 3 games: $C(3,1) = \frac{3!}{1!(3-1)!} = \frac{3!}{1!2!} = 3$

Let:

2 wins and 1 ties/wins: $C(4,2).C(3,1).2 = 36$

1 win and 3 ties/wins: $C(3,1).C(4,3).2^3$= 96

Number of scenarios=2X(36+96)

=264

b) If 10 penalty kicks are played, then 2^{10}=1024 possible outcomes (score or not score)

First round of 10 penalty kicks settle=264

$$1024 - 264 = 760\ scenarios\ in\ first\ game\ not\ settle$$

First round: 760

Second round:264

Ans: 760 X 264= 200640

c) First round: 760

Second round:760

Sudden death shout out: 2 X 5=10

Number of scenarios= 760 X 760 X 10= 5776000

Question 6

pigeonholes =answer sheet; n=3

Pigeon, k=number of students

Possible answer = 4^{10}=1048576

Thus, $k = 2 \times 4^{10} + 1$

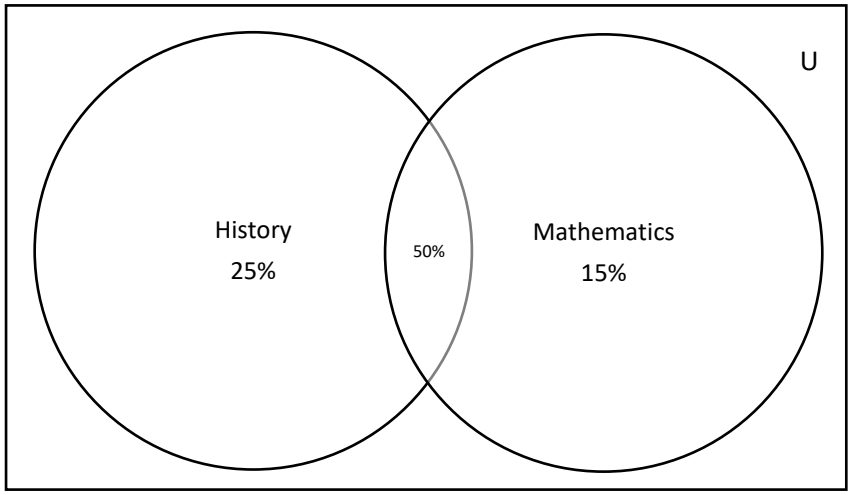
$= 2097153$ (The minimum number of students guarantee that three answersheets are same)

Question 7

75% - Pass History

65%- Pass Mathematics

50% - Pass both mathematics and history



Students who fail both history and mathematics $= 100\% - (25\% + 50\% + 15\%) = 10\%$

Students who fail both history and mathematics $= 10\% = 35$ students

$90\% = 35 \times 9$

$= 315$

Number of candidates who sit for the exam $= 90\% + 10\%$

$= 315 + 35$

$= 350$

Question 8

Integer from 300 through 780: 780-300+1=481

Integer from 300-700 without digit 1: 4 x 9 x 9 = 324

Integer from 700-780 without digit 1: 1x7x9 = 63

Answer: $\frac{481-(324+63)}{481} = \frac{94}{481}/0.1954$

Question 9

a) $\frac{10p_6}{2!4!}$

$= \frac{151200}{48}$

$= 3150\ ways$ can the cars be parked in the parking lots

b) $\frac{8!}{4!2!}$

=840 ways can the cars be parked so that the empty lots are next to each one another

The probability that the empty lots are next to one another is $\frac{840}{3150} = 0.2667/\frac{4}{15}$

Question 10

a. P(T)=probability the trainee receives the message
P(T)=(0.6X0.4)+(0.8X0.1)+(1X0.5)
=0.82

b. $P(A|T) = \frac{0.6\ X\ 0.4}{0.82}$
$= 0.2927$

Question 11

Let,

A= Light truck

A'= Cars

B=Fatal Accident

B'= Not a fatal accident

Given that,

$$\mathrm{P}\left(\frac{B}{A'}\right) = \frac{20}{100000}$$

$$P\left(\frac{B}{A}\right) = \frac{25}{100000}$$

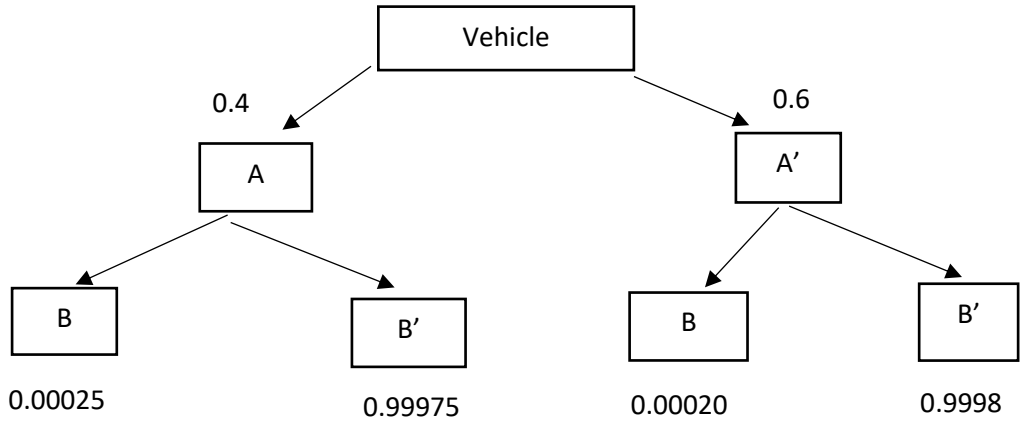
$$P(A) = 0.4$$

$$P(A') = 0.6$$

Using Baeyer theorem, consider $P\left(\frac{A}{B}\right)$ conditional probability of light truck involved accident given that it is fatal.

$$P\left(\frac{A}{B}\right) = \frac{P\left(\frac{B}{A}\right) \cdot P(A)}{P\left(\frac{B}{A}\right) \cdot P(A) + P\left(\frac{B}{A'}\right) \cdot P(A')}$$

Reserve tree diagram:



$$P\left(\frac{B}{A}\right) = \frac{(0.00025)(0.4)}{(0.00025)(0.4) + (0.0002)(0.6)}$$

$$P\left(\frac{B}{A}\right) = 0.4545 = 45.45\%$$

Question 12

Total ways to distribute 9 letters into 4 boxes = 4^9 = 262144

Ways of boxes do not contain at least one letter = 4C3 x 3^9 + 4C2 x 2^9 + 4C1 x 1^9 = 81808

Ans: 262144 – 81808 = 180336