Tutorial #2

Q1

a) $^nC_r = {}^6C_3$

$= \cancel{20}\ \dfrac{6!}{3!(6-3)!}$

$= 20$

b) $^nP_r = {}^6P_3$

$= 6 \times 5 \times 4$

$= 120$

c) $4 \times 6 \times 3 = 72$

Q2

a) $5! \times (6-1)! = 14,400$ ways

b) $2! \times (9-1)! = 80,640$ ways

c) $(5-1)! = 24$ ways

d) $11! \times 2 = 79\ 833\ 600$ ways.

Q3

a) $5! = 120$ ways

b) $4 \times 3! = 24$ ways

c) $(4 \times 3) \times 1! = 12$ ways.

Q4

a) $C(17, 12) = \dfrac{17!}{(12! \times (6-1)!)}$

$= 6188$

b) $C(17, 12) \times 1! = 6188 \times 1!$

$= 6188$

c) $C(21, 16) = \dfrac{21!}{(16! \times (6-1)!)}$

$= 20349$

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Number 5

(a) For each round, we have 3 options. Team A wins the round, Team B wins the round or tie. Note that a team wins the round if the ~~the~~ team scored and the opposite team did not score.

However the round ~~cand~~ ends once it is impossible for ~~t~~ a team to equal the number of goals scored by the other team. This occurs when if there ~~is~~ are 2 wins for one of the team with 1 additional wins or tie for that team or one 1 win for one of the team with 3 additional ties or wins for that team.

Since the order of the wins/losses/ties does not matter among the first round, it is appropiate ~~th~~ to use the defination of of a combination.

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

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

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

$= \frac{3!}{1!\,2!} = 3$

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

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

Finally we obtain the number of different scoring scenario by adding all scenarios. and multiplying by 2.

Numbers of scenarios $= 2(36+96)$

$= 2 \cdot 132$

$= 264$

Ans

(b) Next we know that, the game is not ~~st~~ setteled after the first round of panalty picks.

If 10 Panalty kicks are played, then there are $2^{10} = 1024$ possible outcomes by the product rull as there are 2 outcomes per penalty kicks,

We know that, 264 of the 1024 scenarios result in game being settels in the first round of 10 penalty kicks and

thus $1024 - 264 = 760$ scenarios.

If the game is settled in second round of penalty kicks, then the game was not settled in the next round ~~by~~ of 10 penalty kicks.

1st round : 760 scenerios

2nd round : 264 (by part a)

by product rull : Number of scenarios

$= 760 \cdot 264 = 200640$

(c) Next we know that the game is not ~~s~~ settled after the first round of 10 penalty kicks.

10 penalty kicks are played, ~~then~~ Then there are $2 \cdot 2 \cdots 2 = 2^{10} = 1024$ possible outcomes.

If the game is ~~ett~~ settled in the sudden death shout out then the game was not settled in the first round ~~by~~ of the 10 penalty ~~of~~ kicks or was the game settled in the second round of 10 penalty kicks, but the game was ~~et~~ settled within the next round of 10 penalty kicks.

1st round : 760 scenarios.

2nd round : 760 scenarios.

sudden death : $2+2+2+2+2=10$ "

By the product rule :- ~~the~~ Number of scenarios $= 760 \cdot 760 \cdot 10 = 5776000$.

Question 6

Each question has 4 possible responses. And we have 10 questions and no answers is left bank.

There are 4 chances for a 1 question

∴ For 10 ques. there are $- 4^{10}$ ways.

∴ If there are 4^{10} students in the class, we can not quarantie that 3 answer sheets are identical.

similarly there are 2×4^{10} students in the class. we still can not querantee, there is a chance that each possible answer sheet is present 2 times

$$= 2 \times 4^{10}.$$

∴ The minimum number of students that must be in the class to guarantee at least 3 answer sheets must be ideantical $- 2 \times 4^{10} + 1 = 2^{21} + 1$

Number 7

Suppose H and M denotes the event that student is passed in the history and mathmatics respectively.

$P(H) = 0.75,\ P(M) = 0.65,\ P(H \cap M) = 0.50$

$n(H^c \cap M^c) = 35$

Since,

$$P(H \cup M) = P(H) + P(M) - P(H \cap M)$$

$$\Rightarrow P(H \cup M) = 0.75 + 0.65 - 0.50 = 0.90$$

$$\Rightarrow \frac{n(H \cup M)}{N} = 0.90$$ [N denotes the total of candidate]

$$\Rightarrow N = \frac{n(H \cup M)}{0.90}$$

Now, $n(H \cup M) = N - n(H^c \cap M^c)$

$= N - 35$

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

$$\Rightarrow N(0.90) = N - 35$$

$$\Rightarrow (0.10)N = 35$$

$$\Rightarrow N = 350$$ Ans

Number 8

$$\text{Probablity} = \frac{\text{Number of successful outcomes}}{\text{Total number of otcomes.}}$$

possible outcome

Total = 780 − 299 = 481

so, We have 481 possible outcomes.

successful outcome

For this 1st we have to find 1 in 3 digits, 2 ~~dit~~ digits, 1 digit.

1 in 3 digis = 0 because number ranges from 300 to 780.

1 in 2 digits:- 311, 411, 511, 611, 711

∴ Total 5 numbes are there.

1 in 1 digit

301, 310, 312, 313, 314, 315, 316, 317, 318, 319, 321, 331, 341, 351, 361, 371 = 16

401, 410, 412 ..... 471 = 16

⋮

701, 710, 712 ..... 771 = 16

$\therefore$ Total succesful outcomes $= 0+5+(5 \times 16)$

$= 85.$

$\therefore$ The probablity of getting 1 at atleast one digit between 300 to 780

is $\dfrac{85}{481}$

Probability $= \dfrac{85}{481} = 0.1767.$

$\boxed{9}$ (a) $\frac{{}^{10}P_6}{2!4!} = 3150$ ways

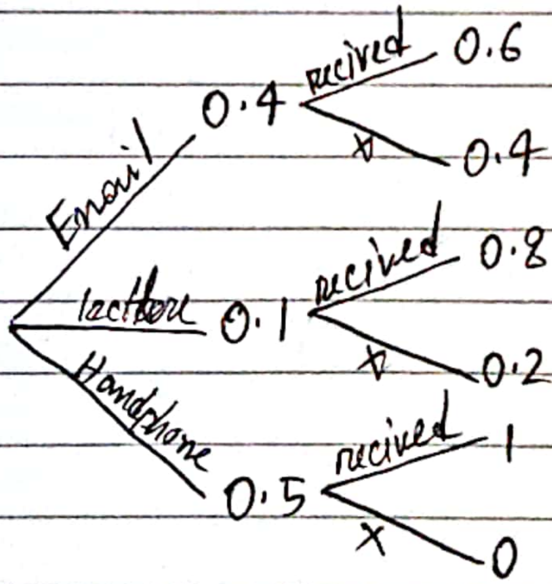
(b) Empty lots are next to each one,

..........4 empty slots

$\frac{7!}{2!4!} \times 4! = 2520$ ways

Probability $= \frac{2520}{3150} = \frac{4}{5}$

$\boxed{10}$



(a) Receiving probitity $= \sum P : P_5$

$= (0.4 \times 0.6 + 0.1 \times 0.8 + 0.5 \times 1.0)$

$= 0.24 + 0.08 + 0.5 = 0.82$

(b) $P(B/A) = \frac{P(B \cap A)}{P(A)}$

$\therefore \frac{0.4 \times 0.6}{0.82} = \frac{0.24}{0.82} = \frac{12}{41}$

$\boxed{12}$ Here, A – Light truck
A' – Cars
B – Fatal Accident
B' – Not a Fatal Accident

Now, $P(B/A') = 20/100000$

$P(B/A) = 25/100000$

$P(A) = 0.4$

As we know that A & A' are complementary events, $P(A') = 1 - P(A)$
$= 1 - 04$
$= 0.6$

We've to compute the additional probability of light truck accident given that it is $(P(A/B))$

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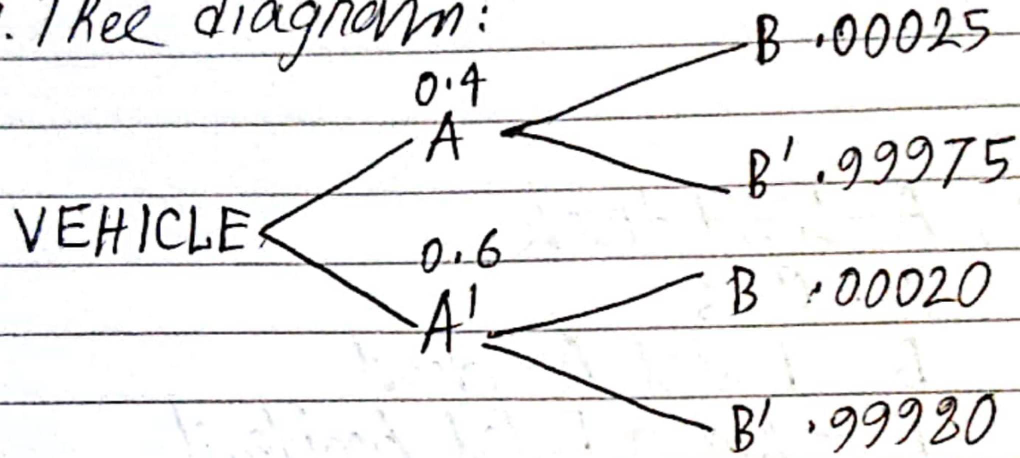
∴ Bayes theorem:

$$P(A/B) = P(B/A)P(A)/P(B/A)P(A)+P(B/A')P(A')$$

∴ Tree diagram:



$P(B/A) = 0.4545$
$P(B/A) = 45.45\%$

So, the probability the accident involved a light truck is 45.45%.

No.

Date

$\boxed{12}$ Here, Total num of letters = 9
Total num of boxes = 4

Now, 9 letter with different colour
4 choices

So, ~~400~~ $4^9 = 262144$

So, 2 letters in boxes
4 choices

$\therefore (4 \times 3^9) = 78732$. So, $(4 \times 1^9) = 4$ ways to put all letters into one box twice.

So, we subtract 3.

Finally, the num of allow assignment of letters to boxes is $= (262144 - 78732 + 4)$
$= 183416$