Assignment 4.1

① 2 red, 3 green, 2 blue balls.
Two random balls can be drawn in $^7C_2$ ways $= \frac{7!}{2!5!} = 21$ ways
Chance of none of balls being blue is $^5C_2 = \frac{5!}{2!3!} = 10$ ways

∴ Probability that two drawn balls are not blue is $= \frac{10}{21} = 0.476$

② ~~Veh~~ Tot vehicles = 100, cars = 60, Vans = 30.
No Lorries = 100 − 90 = 10.

(a) P(Van leaving first) $= \frac{30}{100} = 0.3$

(b) P(Lorry leaving first) $= \frac{10}{100} = 0.1$

(c) P(Car leaving second ~~is~~) $= \frac{60}{99} = 0.61$

③ No. Red ~~bodddde~~ 3, No. green marbles = 7, & no. white mar = 10
∴ ~~P(Box~~ Two balls drawn at random
∴ Red balls can be chosen in $^3C_2$ ways $= \frac{3!}{2!} = 3$ ways
∴ 2 green balls can be chosen in $^7C_2$ ways $= \frac{7!}{2!5!} = 21$ ways
∴ 2 whites can be chosen in $^{10}C_2 = 10!/8!2! = 10 \cdot 9/2 = 45$ ways
∴ Total no. of choise $= ^{20}C_2 = 20!/2!18! = 20 \cdot 19/2 = 190$ ways
∴ Probability of both the marbles being of same color is

$$\frac{3 + 21 + 45}{190} = \frac{69}{190} = 0.36$$

④ No easy T/F = 300, No difficult T/F = 200
No easy MQ = 500, No difficult MQ = 400
∴ No multiple Question = 900
∴ Total No Question = 1400

∴ Q = selected Question is MQ.

∴ P(Q) = 900/1400 = 9/14

∴ E = selected Question is easy

∴ $P(E|Q) = \frac{P(E \cap Q)}{P(Q)}$

∴ P(E ∩ Q) = selected Question is easy MQ Question = 500/1400 = 5/14.

∴ $P(E|Q) = \frac{5/14}{9/14} = 5/9 = 0.556$

⑤ Two dice are thrown. (No. of choice) = 6·6 = 36 ways.

∴ When two dice are different we are left with = 30 choice.

∴ Sum of numbers should 4 ∴ S{(3,1)(1,3)} = 2 ways.

∴ Probality of event sum of numbers should be 4 is = 2/30 = 0.0667

⑥ PD = person has disease

PND = person dosn't have disease

$P(PD) = \frac{0.1\%}{100\%} = 0.0001$ P(PND) = 1 − 0.0001 = 0.999

+ve = Event test is positive

∴ P(test is +ve & person has disease) = P(+ve|PD) = 99% = 0.99

P(test is +ve & pusson is not disease) = P(+ve|PND) = 0.5% = 0.0005

∴ By Bays theorem

P(PD|+ve) i.e P(person being diseased when the test reesult is +ve)

$= \frac{P(PD) \cdot P(+ve|PD)}{P(PD) \cdot P(+ve|PD) + P(PND) \cdot P(+ve|PND)}$

$= \frac{0.0001 \times 0.99}{(0.0001 \times 0.99) + (0.999 \times 0.0005)} = \frac{0.000099}{(0.000099) + 0.0004995}$

$= \frac{0.000099}{0.0005985} = 0.1654$

(7) 2000 scooter driver (SD), 4000 car drivers (CD), 6000 truck drivers (TD)

∴ Total = 12000

if person is selected at random

$P(SD) = 2000/12000 = 1/6$

$P(CD) = 4000/12000 = 1/3$

$P(TD) = 6000/12000 = 1/2$

Let say A is person met with an accident.

$\therefore P(A|SD) = 0.01$

$P(A|CD) = 0.03$

$P(A|TD) = 0.15$

∴ using bayes theorem

$$P(SD|A) = \frac{P(SD)\,P(A|SD)}{P(SD)\,P(A|SD) + P(CD)\cdot P(A|CD) + P(TD)\,P(A|TD)}$$

$$= \frac{1/6 \cdot 0.01}{1/6 \cdot 0.01 + \frac{1}{3}\cdot 0.03 + 1/2 \cdot 0.15}$$

$$= \frac{1/6 \cdot 1/100}{\frac{1}{600} + \frac{3}{300} + \frac{15}{200}} = \frac{1/600}{\frac{1+6+45}{600}} = \frac{1}{52} = 0.0192$$

(8) Let G_1 be Group 1 selection

Let G_2 be Group 2 selection

$\therefore P(G_1) = 0.6$ & $P(G_2) = 0.4$

Let A be product launch event.

$\therefore P(A|G_1) = 0.7$ & $P(A|G_2) = 0.3$

∴ using Byes theorem

$$P(G_2|A) = \frac{P(G_2)\cdot P(A|G_2)}{P(G_2)\cdot P(A|G_2) + P(G_1)\,P(A|G_2)}$$

$$= \frac{0.4 \cdot 0.3}{0.4\cdot 0.3 + 0.6\cdot 0.7} = \frac{12/100}{12/100 + 42/100} = \frac{12}{54} = \frac{2}{9}$$

⑨ Let A be operator A produces defective item
Let B be event the B produces defective item
Let C denote event that C produces defective item.
∴ $P(A) = 1/100$ $P(B) = 5/100$ & $P(C) = 7/100$
∴ Let X denote ~~operator was working~~ defective item is produced event.
∴ $P(X/A)$: probability of operator working & A producing defective item is $5/10$.
$P(X/B) = 3/10$ & $P(X/C) = 2/10$
using Bayes theorem
$P(A/X)$: probability of A producing defective item given that defective item is produced.

$$P(A/X) = \frac{P(A)\,P(X/A)}{P(A)\,P(X/A) + P(B)\,P(X/B) + P(C)\,P(X/C)}$$

$$= \frac{1/100 \cdot 5/10}{1/100 \cdot 5/10 + 5/100 \cdot 3/10 + 7/100 \cdot 2/10}$$

$$= \frac{5}{5+15+14} = \frac{5}{34}$$

10) ∴ There are total 52 cards.
∴ There are 13 diamonds cards.
∴ when two diamonds card got drawn
we have 50 total choices.
& 11 favorable choices.
∴ Probability of lost card being diamond is $= \frac{11}{50}$