2100031140

HOME ASSIGNMENT - 1

① let A_1 be the event by E_1 machine

A_2 be event by E_2 machine

A_3 be event by E_3 machine

then $P(A_1) = 50\% = 1/2$ $P(A/A_1) = 4\% = 1/25$

$P(A_3) = 25\% = 1/4$ $P(A/A_3) = 5\% = 1/20$

The probability that picked bulb is detective $P(A) = (A_1) \cdot P(A/A_1) +$

$P(A_2) \cdot P(A/A_2) + P(A_3) \cdot P(A/A_3)$

$= 1/50 + 1/100 + 1/80$

$= \frac{8+4+5}{400} = \frac{17}{400} = 0.0425$

② let it be D the event that coin is toss with head

a) $P(D) = 1/10$

b) let it be the event that we get a head and we toss a coin $P(D \neq H) = ?$

By Baye's theorem

$$P(D/H) = \frac{P(H/D) \cdot P(D)}{P(H)}$$

$P(H/D) = 1$

2100031140

$P(H) = P(H \cap D) + P(H \cap D^c)$

$P(H/D) \cdot P(D) + P(H/D^c)$

$1 - \frac{1}{10} + \frac{1}{2} \cdot \frac{9}{10}$

$\frac{11}{<0}$

$P(D/H) = 11/20$

if it comes up tails $= 2/11$

if it can't be coin with 2 heads

∴ it must be one of other nine.

3) Raju speak truth $P(Ra) = 2/5$

$P(\bar{R}) = 3/5$

Ramu speak truth $P(Ra) = 3/7$

$P(\bar{Ra}) = 4/7$

Probability $= P(R) \cdot P(\bar{Ra}) + P(\bar{R}) \cdot P(Ra)$

$= (2/5) \cdot (4/7) + (3/5)(3/7)$

$= 8/35 + 9/35$

$= 17/35 \quad = 0.48$

2100031140

7.) No. of breakdown x has a binomial distribution which can approximated by $Pn(\lambda)$

$$\lambda = 2000 \times 0.0004$$
$$= 0.8$$
$$P(x \geq 2) = 1 - P(x \leq 1)$$
$$= 1 - 0.8088$$
$$= 0.1912.$$

8.) The poisson distribution gives probabilities for each possible no. of chocochips but as a cookie can't contain 2 different members. we add the probabilities for the possible value 0, 1, 2 Hence

$$P(r \leq 3) = \frac{e^{-\lambda} \times 0}{0!} + \frac{e^{-\lambda} \lambda^1}{1!} + \frac{e^{-\lambda} \lambda^2}{2!}$$

$$e^{-\lambda}\left(1 + \lambda + \frac{\lambda^2}{2}\right)$$

10.) $P(C) = 0.3$ $P(V/C) = 0.65$

$P(S) = 0.5$ $P(V/S) = 0.82$

$P(C) = 0.2$ $P(V/L) = 0.50$

By Bayes theorem

$$P(S/V) = \frac{P(V/S)\ P(S)}{P(V)} - 1$$

$$= P(V_n)\ (C \cup S \cup L))$$

2100031140

$$P(V_C) + P(V_S) + P(V_L)$$

$$P(V/C) \cdot P(C) + P(V/S) \cdot P(S) + P(V/L) \cdot P(L)$$

$$= 0.65 \times 0.3 + 0.82 \times 0.5 + 0.5 \times 0.2$$

$$= 0.705$$

$$P(S/V) = \frac{0.82 \times 0.5}{0.705}$$

$$= 0.5816$$

9.) Let t be the Event that baby is reunited with its mother need $P(E_1 \cup E_2 E_3)$ where we can use the result

$$\therefore P(E_1) = P(E_2) = P(E_3) = 1$$

Pair wise joint Probabilites are equal to $\frac{1}{6}$

$$\because P(E/E_1) = P(E_2/E_1) \cdot P(E_1) = \frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$$

$$P(E_1 E_1 E_3) = \frac{1}{6}$$

Probability $= \frac{1}{3} + \frac{1}{3} + \frac{1}{3} - \frac{1}{6} - \frac{1}{6} - \frac{1}{6} = \frac{1}{6}$

$$= \frac{1+1+1}{3} = \frac{2}{6}$$

$$= 1 - \frac{1}{3}$$

$$= 2/3.$$

4.) Total no of students $S = 5+6+7 = 18$

Probability of section B $= \frac{6}{18} = \frac{1}{3}$

But from question; there are 6 sections. the age of all 6 are different.

from B section will $\frac{1}{6}$

Probability $= \frac{1}{6}$

5.) No. of ways at least one girl = Tested - (name of selected member is a girl)

$$= \frac{12\times11\times10\times9}{4\times8\times2\times1} - \frac{8\times7\times6\times5}{4\times3\times2\times1}$$

$$= 495 - 70$$

$$= 425$$

No. of ways of selecting exactly girls $= {}^8C_2 \times {}^4C_2$

$$\frac{8\times7}{2\times1} * \frac{4\times3}{2\times1}$$

$$= 28\times6 = 168$$

6.) $P = 0.2$ and $n = 4$

a) $P(x=2) = 6\times(0.2)^2\times(0.8)^2$

$= 6.1536$

$P(x<2) = P(x=0) + P(x=1)$

$= 0.8192$

$P(x>2) = 1.P(x\geq2)$

$1-(0.8192+0.1536) = 0.0272$

2100031140

b.) $n=8$; $P=0.1$

$P(x=2) = {}^{8}C_2 (0.1)^2 (0.9)^6$

$= 0.1488$

$P(x<2) = P(x=0) + P(x=1)$

$= 0.8131$

$P(x>2) = 1 - P(x \leq 2)$

$1 - (0.813 + 0.1488)$

$= 0.0381$

c.) $n=16$, $P=0.05$

$P(x=2) = {}^{16}C_2 (0.05)^2 (0.95)^2$

$= 0.1463$

$P(x<2) = 1 - P(x \leq 2)$

$= 1 - (0.463 + 0.8108)$

$= 0.0429$

d.) $n=64$, $P = 0.0125$

$P(x=2) = {}^{64}C_2 (0.0125)^2 (0.0875)^6$

$= 0.1444$

$P(x<2) = P(x=0) + P(x=1)$

$= 0.8093$

$P(x>2) = 1 - P(x \leq 2)$

$= 1 - (0.1444 + 0.8093)$

$= 0.0463$