Assignment 5

(1.) P: Politician has investment property

LN: Lib/Nat/LNP member.

LG: Labor/Greens member.

O: Other party member.

(a.) $Pr(P^c)$: depics probablity that a politician does not own investment property

$$Pr(P^c) = \frac{124}{224} = 0.553$$

(b.) LG: Politician is a Labor/Greens member.

$$Pr(LG) = \frac{105}{224} = 0.468$$

(c.) P^c/LN = This depicts Lib/Nat/LNP members that do not own investment property

$Pr(P^c/LN)$ = proba. that member does not own property

$$Pr(P^c|LN) = Pr\left(\frac{P^c \text{ and } LN}{Pr(LN)}\right) = \frac{47}{105} = \underline{\underline{0.45}}$$

(d.) P/LG : This depicts Labor/greens members that own investment property

$$Pr(P/LG) = \frac{Pr(P \text{ and } LG)}{Pr(LG)} = \frac{42}{105} = 0.4$$

(e.) O/P^c : This depicts other party members that do not own investment property

$$Pr(O/P^c) = \frac{Pr(O \text{ and } P^c)}{Pr(P^c)}$$

$$= \frac{14}{124} = 0.112$$

(Q.2)

P: Participant takes placebo.

A: Participant takes antibiotic

$$P(P) = \frac{400}{1000} = 0.4$$

$$P(A) = \frac{600}{1000} = 0.6$$

(a) $P(R/P) = .30$ $\quad P(R^c/P) = 1 - P(R/P) = .70$

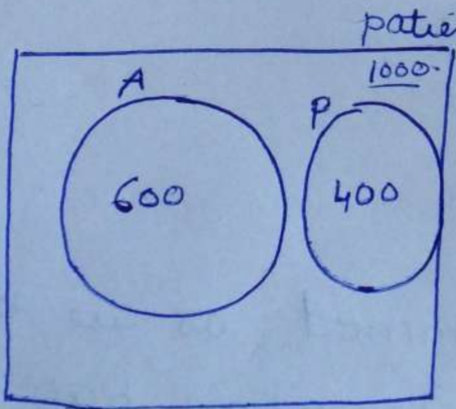
$P(R/A) = .75$ $\quad P(R^c/A) = .25$

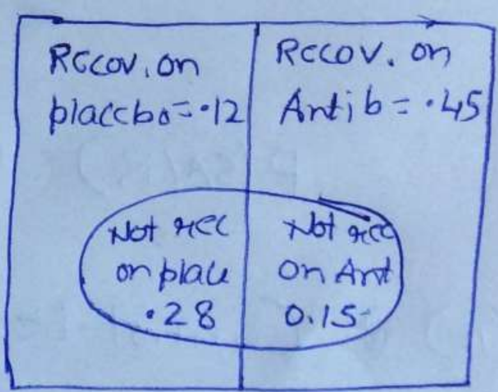
(i) P(ran. did not recover) = $P(R^c)$

$$P(R^c) = 0.70(0.4) + .25(0.6)$$

$$= \underline{0.43}$$

(ii)





(b) S: Participant experience at least one side effect.

$P(S/A) = 0.21$

$P(S/P) = 0.08$

$P(S) = P(S/P)\,P(P) + P(S/A)\,P(A)$

$= 0.08 \times (0.40) + 0.21(0.6) = 0.158$

$P(A/S) = \frac{P(S/A)\,P(A)}{P(S)}$

$P(A/S) = \frac{0.21 \times 0.6}{0.158} = \underline{\underline{0.79}}$

(c) SA: Participant takes 2nd Medicine

$P(SA/R) = \frac{P(SA \cap R)}{P(R)}$

$= \frac{0.078}{0.57}$

$P(SA/R) = 0.136$

(ii) Cannot be determined, as we don't know no. of participants taking placebo & 2nd Medicine.

Q3. Total no. of balls = 10
no. of blue ball = 4
no. of green balls = 6.

P(B) = All balls drawn are blue.

P(3) = probability of getting a 3. on die.

Bayes theoram,

$$P(3/B) = \frac{P(B/3) \cdot P(3)}{P(B)}$$

$$= \frac{\frac{{}^4C_3}{{}^{10}C_3} \times \frac{1}{6}}{P(B)}$$

P(B) → Die 1, 1 blue ball
+ Die 2, 2 blue ball
+ Die 3, 3 blue balls
Die 4, 4 blue balls

$$P(3/B) = \frac{\frac{{}^4C_3}{{}^{10}C_3} \times \frac{1}{6}}{\frac{1}{6}\left(\frac{{}^4C_1}{{}^{10}C_1} + \frac{{}^4C_2}{{}^{10}C_2} + \frac{{}^4C_3}{{}^{10}C_3} + \frac{{}^4C_4}{{}^{10}C_4}\right)}$$

$$P(3/B) = 0.0578$$

~~Q.4~~

Q.4.

No. of outcomes for 4 coin tosses
$= 2^4 = 16.$

No. of outcomes for rolling a die $= 6$

Total no. of outcomes $= 16 \times 6 = 96.$

(a.) X: number of times die rolled + no. of times heads was flipped.

possible $X = 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.$

$P(X=1) =$ 1 on die & no heads of 4 flips
$= \frac{1}{6} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{96}.$

$P(X=2) =$ 2 on die, no heads & 1 on die, 1 heads.
$= \frac{1}{6} \times \left(\frac{1}{2^4}\right) + \frac{1}{6} \times \frac{4}{16} \times 1 = \frac{5}{96}.$

Similarly

$(X=3) = \frac{11}{96}$ $\quad (X=4) = \frac{5}{32}$ $\quad (X=5) = \frac{1}{6}$

$(X=6) = \frac{1}{6}$ $\quad (X=7) = \frac{5}{32}$ $\quad (X=8) = \frac{11}{96}$ $\quad (X=9) = 5/96$

$(X=10) = 1/96$

x	1	2	3	4	5	6	7	8	9	10
P[x]	1/96	5/96	11/96	15/96	16/96	16/96	15/96	11/96	5/96	$\frac{1}{96}$

(b) $E[x] = \Sigma x \, P(x)$

$$= \frac{1}{96}\Big(1(1) + 2(5) + 3(11) + 4(15) + 5(16) + 6(16) + 7(15) + 8(11) + 9(5) + 10(1) \Big)$$

$$E(x) = \frac{1}{96}(528) = \underline{\underline{5.5}}$$

(c) $\text{Var}[x] = \Sigma x^2 P(x) - \left(\Sigma x (Px)\right)^2$

$$= \Sigma x^2 P(x) - \left(E[x]\right)^2$$

$\Sigma x^2 P(x)$

$$= \frac{1}{96}\Big(1^2(1) + 2^2(5) + 3^2(11) + 4^2(15) + 5^2(16) + 6^2(16) + 7^2(15) + 8^2(11) + 9^2(5) + 10^2(1)$$

$$= \frac{1}{96}(3280) = \frac{205}{6}$$

$$\text{var}[x] = \frac{205}{6} - (5.5)^2$$

$$= \frac{47}{12}$$

$$\text{var}[x] = \underline{\underline{3.91}}.$$