Homework 3 Kaitlynn Prescott

① Toy Manufacturer

A_1 = bearing came from suplier 1

A_2 = supplier 2

A_3 = Supplier 3

B = bearing is defective

$P(A_1) = .5,\ P(A_2) = .3,\ P(A_3) = .2$

$P(B|A_1) = .02,\ P(B|A_2) = .03,\ P(B|A_3) = .04$

$$P(B) = \sum_{i=1}^{n} P(B|A_i)P(A_i)$$

$$P(B) = P(B|A_1)P(A_1) + P(B|A_2)P(A_2) + P(B|A_3)P(A_3)$$

$$= (.02)(.5) + (.03)(.3) + (.04)(.2)$$

$$\boxed{P(B) = 0.027 = 2.7\%}$$

② 2R 4W (I) 3R 1W (II)

1 chip transferred to urn II from urn I, then 1 chip picked from urn II.

B_1 = red transferred $(\frac{2}{6})$

B_2 = white transferred $(\frac{4}{6})$

A = red drawn from Urn II

$$P(A) = P(B_1)P(A|B_1) + P(B_2)P(A|B_2)$$

$$= \left(\frac{2}{6}\right)\left(\frac{4}{5}\right) + \left(\frac{4}{6}\right)\left(\frac{3}{5}\right) = \frac{8}{30} + \frac{12}{30}$$

$$= \frac{20}{30} = \frac{2}{3}$$

$$\boxed{P(A) = \frac{2}{3}}$$

(3) 2W 1R (I) 1W 2R (II) 1 chip transferred from Urn I to Urn II. 1 chip then pulled from Urn II.

P(transferred chip is white | red chip pulled) ?

B_1 = white transferred $\left(\frac{2}{3}\right)$

B_2 = red transferred $\left(\frac{1}{3}\right)$

A = red pulled

$$P(B_1|A) = \frac{P(B_1 A)}{P(A)} = \frac{P(B_1)P(A|B_1)}{P(B_1)P(A|B_1)+P(B_2)P(A|B_2)}$$

$$= \frac{\left(\frac{2}{3}\right)\left(\frac{1}{2}\right)}{\left(\frac{2}{3}\right)\left(\frac{1}{2}\right)+\left(\frac{1}{3}\right)\left(\frac{3}{4}\right)} = \frac{\frac{1}{3}}{\frac{1}{3}+\frac{1}{4}} = \frac{4}{7}$$

$$\boxed{P(B_1|A) = \frac{4}{7}}$$

(4) Weather Satellite:

S_0 = Zero sent R_0 = Zero recieved

S_1 = One sent R_1 = One Recieved

$P(R_0|S_0) = .8$ $P(R_1|S_0) = 0.2$ $P(S_0) = .7$

$P(R_1|S_1) = .8$ $P(R_0|S_1) = 0.2$ $P(S_1) = .3$

$$P(S_0|R_1) = \frac{P(S_0 R_1)}{P(R_1)} = \frac{P(S_0)P(R_1|S_0)}{P(S_0)P(R_1|S_0)+P(S_1)P(R_1|S_1)}$$

$$= \frac{(.7)(.2)}{(.7)(.2)+(.3)(.8)} = \frac{(.14)}{(.14)+(.24)}$$

$$\boxed{P(S_0|R_1) = .37}$$

⑤ cervical cancer screening:

~~ce~~ C = "a woman has the disease"

B = "positive biopsy"

$P(C) = 0.0001 \left[\frac{1}{10{,}000}\right]$ $\quad * \left(P(C^c) = 1 - P(C) = .9999\right)$

$P(B|C) = .90$

$P(B|C^c) = 0.001 \left[\frac{1}{1000}\right]$

$$P(C|B) = \frac{P(CB)}{P(B)} = \frac{P(C)P(B|C)}{P(C)P(B|C) + P(C^c)P(B|C^c)}$$

$$= \frac{(0.0001)(.90)}{(0.0001)(.90) + (.9999)(0.001)} = \frac{.00009}{(.00009) + (.0009999)} = 0.0825$$

$$\boxed{P(C|B) = 0.0825 = 8.25\%}$$