FIRST EX.

DAY 3 - IN CLASS SOLUTIONS

1) a) $\binom{5}{0}(.9)^5(.1)^0 = .59049$

b) $\binom{5}{2}(.9)^3(.1)^2 = .0729$

c) $\sum_{k=2}^{5}\binom{5}{k}(.1)^k(.9)^{5-k} = 1 - \sum_{k=0}^{1}\binom{5}{k}(.1)^k(.9)^{5-k} = .08146$

2) A ≡ 1ST CHAIR DEF B ≡ 2ND CHAIR DEF INDEPENDENCE IFF $P(A\cap B) = P(A)P(B)$; $P(B|A) = P(B)$

$P(A) = 50/850$

$P(B\cap A) = 50/850 \times 49/849$

$\Rightarrow P(B|A) = \frac{P(B\cap A)}{P(A)} = 49/849$

BUT $P(B) = \begin{cases} 50/849 & \text{IF A IS NOT DEF} \\ 49/849 & \text{IF A IS DEF.} \end{cases}$

SO $P(B|A) \neq P(B)$ IN ALL CASES.

∴ NOT INDEP!

3) L = CONTAINS LEAD

M = CONTAINS MERCURY

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

$.38 = .32 + .16 - P(L\cap M)$

$\Rightarrow P(L\cap M) = .1$

NOT M.E. SINCE $P(L\cap M) \neq 0$

$P(L)P(M) = (.32)(.16) = .0512 \neq P(L\cap M)$ NOT INDEP!

4) $S = \{HHHH, HHHT, HHTH, THHH, HHTT, THHT, TTHH, TTTT\}$

TO WIN, $\Rightarrow$ HHHH OR HHHT OR THHH

$P(HHHH \cup HHHT \cup THHH) = P(HHHH) + P(HHHT) + P(THHH)$

$= (.7)(.4)(.7) + (.7)(.4)(.3) + (.3)(.4)(.7) = .364$

5) $P(A'\cap B') = a$

$P(B) = b$

$P(A\cup B) = P(A) + P(B) - P(A\cap B)$

$1 - P((A\cup B)') = P(A) + P(B) - P(A)P(B)$

$1 - P(A'\cap B') = P(A)(1 - P(B)) + P(B)$

$1 - a = P(A)(1-b) + b$

$\Rightarrow P(A) = \frac{1-a-b}{1-b}$

SECOND EX.

1) C = USITS CHIROPRACTOR
T = VISITS THERAPIST

$P(C) = P(T) + .14$
$P(C \cap T) = .22$
$P(C' \cap T') = .12$

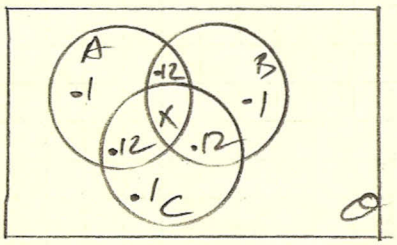
$P(C \cup T) = 1 - P((C \cup T)') = 1 - P(C' \cap T') = .88$
$= P(C) + P(T) - P(C \cap T)$
$= P(T) + .14 + P(T) - .22 = 2P(T) - .08$
$\therefore P(T) = .48$

2) M = INSURES MORE THAN 1 CAR
S = INSURES SPORTS CAR

$P(M) = .7$
$P(S) = .2$
$P(S \mid M) = .15$

$P(M' \cap S') = P((M \cup S)') = 1 - P(M \cup S)$
$= 1 - P(M) - P(S) + P(M \cap S) = 1 - P(M) - P(S) + P(S \mid M) P(M)$
$= 1 - .7 - .2 + (.15)(.7) = .205$

3)



$\frac{1}{3} = P((A \cap B \cap C) \mid (A \cap B))$
$= \frac{P(A \cap B \cap C)}{P(A \cap B)} = \frac{X}{X + .12}$

SOLVE FOR X $\quad X = .06$

WANT $P((A' \cap B' \cap C') \mid A') = P((A \cup B \cup C)' \mid A') = \frac{P((A \cup B \cup C)')}{P(A')}$

$= \frac{1 - P(A \cup B \cup C)}{1 - P(A)} = \frac{1 - 3(.1) - 3(.12) - .06}{1 - .1 - 2(.12) - .06} = .467$

4) $P(A' \cap B') = P((A \cup B)') = 1 - P(A \cup B)$
$= 1 - (P(A) + P(B) - P(A \cap B))$
$= 1 - P(A) - P(B) + P(A) P(B)$ ← INDEP
$= P(A') - P(B)(1 - P(A))$
$= P(A')(1 - P(B)) = P(A') P(B')$