# DSE 210 Worksheet 3

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1a. $Pr(2Hs|1^{st}H) = \frac{Pr(2H \cap 1^{st}H)}{Pr(1H)} = \frac{2/8}{1/2} = \frac{1}{2}$  b. $Pr(2H|1^{st}T) = \frac{Pr(2H \cap 1^{st}T)}{Pr(1^{st}T)} = \frac{1/8}{1/2} = \frac{1}{4}$

c. $Pr(2H|HH\_) = \frac{Pr(2H \cap HH\_)}{Pr(HH\_)} = \frac{1/8}{1/4} = \frac{1}{2}$  d. $Pr(2H|TT\_) = 0$  e. $Pr(2H|H\_T) = \frac{Pr(2H \cap H\_T)}{Pr(H\_T)} = \frac{1/8}{1/4} = 1/2$

3. $Pr(H) = 0.6$  $Pr(S) = 0.8$  $P(H \cup S) = 0.9$  $Pr(H \cup S) = Pr(H) + Pr(S) - Pr(H \cap S)$  $0.9 = 1.4 - P(H \cap S)$
$P(H \cap S) = 0.5$

5a. $p(H|red)$  $P(H) = 13/52 = 1/4$  $P(red) = 26/52 = 1/2$  $P(H \cap red) = 13/52 = 1/4$  $P(H|red) = \frac{P(H \cap red)}{P(red)} = \frac{1/4}{1/2} = 1/2$

b. $P(>10) = 16/52 = 4/13$  $P(>10 \cap H) = 4/52 = 1/13$  $P(H) = 13/52 = 1/4$  $P(>10|H) = \frac{P(>10 \cap H)}{P(H)} = \frac{1/13}{1/4} = \frac{4}{13}$

c. $P(J) = 4/52 = 1/13$  $P(>10) = 16/52 = 4/13$  $P(J \cap >10) = 4/52 = 1/13$  $P(J|>10) = \frac{P(J \cap >10)}{P(>10)} = \frac{1/13}{4/13} = \frac{1}{4}$

7a. $Pr(\Sigma>7|4) = \frac{Pr(\Sigma>7 \cap 4)}{Pr(4)} = \frac{Pr\{(4,4),(4,5),(4,6)\}}{1/6} = \frac{3/36}{1/6} = \frac{1/12}{1/6} = \frac{1}{2}$

b. $Pr(\Sigma>7|1) = \frac{Pr(\Sigma>7 \cap 1)}{Pr(1)} = \frac{Pr\{\}}{1/6} = 0$

c. $Pr(\Sigma 7|>3) = \frac{Pr(\Sigma>7 \cap >7)}{Pr(>3)} = \frac{Pr\{(4,4),(4,5),(4,6),(5,3),(5,4),(5,5),(5,6),(6,2),(6,3),(6,4),(6,5),(6,6)\}}{1/2}$
$= \frac{12/36}{1/2} = \frac{1/3}{1/2} = \frac{2}{3}$

9. $F_1 = 0.25$  $F_2 = 0.35$  $F_3 = 0.4$  $F_{1d} = 0.05$  $F_{2d} = 0.04$  $F_{3d} = 0.02$

a. $Pr(d) = Pr(F_{1d}|F_1)Pr(F_1) + Pr(F_{2d}|F_2)Pr(F_2) + Pr(F_{3d}|F_3)Pr(F_3) = (0.05)(0.25) + (0.04)(0.35) + (0.02)(0.4) = 0.0345$

b. $Pr(F_1|d) = \frac{Pr(F_{1d}|F_1)Pr(F_1)}{Pr(d)} = \frac{0.05 \times 0.25}{0.0345} = 0.362$

11a. $Pr(+) = Pr(+|d_1)Pr(d_1) + Pr(+|d_2)Pr(d_2) + Pr(+|d_3)Pr(d_3) = \frac{1}{3}(0.8) + \frac{1}{3}(0.6) + \frac{1}{3}(0.4) = 0.6$

b. $Pr(d_1|+) = \frac{Pr(+|d_1)Pr(d_1)}{Pr(+)} = \frac{0.8(\frac{1}{3})}{0.6} = 0.44$  $Pr(d_2|+) = \frac{Pr(+|d_2)Pr(d_2)}{Pr(+)} = \frac{0.6(\frac{1}{3})}{0.6} = 0.33$

$Pr(d_3|+) = \frac{Pr(+|d_3)Pr(d_3)}{Pr(+)} = \frac{0.4(\frac{1}{3})}{0.6} = 0.22$

13. $Pr(T|+^c) = \frac{Pr(+^c|T)Pr(T)}{Pr(+^c)} = \frac{(1-Pr(+|T))Pr(T)}{1-Pr(+)} = \frac{(1-5/6)(\frac{1}{3})}{1-[(5/6)(\frac{1}{3})+(1/3)(2/3)]} = \frac{1/18}{1/2} = \frac{1}{9}$

15a. (1) A, B independent (2) A, D independent (3) A, E not independent (4) D, E not independent

b/c $P(A)=1/2$ $P(D)=2/3$ $P(A\cap D)=1/3=\frac{1}{2}\cdot\frac{2}{3}$

b. (1) A, B, C independent (2) A, B, D not independent (3) C, D, E not independent

17a. $Pr(SD|LA)=\frac{Pr(SD\cap LA)}{Pr(LA)}=\frac{0.2}{0.5}=0.4$

b. $Pr(LA)Pr(SD)=0.5\cdot 0.3=0.15\neq Pr(LA\cap SD)=0.2$

The events are not independent.