Tutorial 2

1. **(THE CHESS PROBLEM)**

   (a) i. $P[\text{2nd Rnd Req}] = (0.6)^2 + (0.4)^2 = 0.52$

   ii. $P[\text{Bo Wins 1st Rnd}] = (0.6)^2 = 0.36$

   iii. $P[\text{Al Champ}] = 1 - P[\text{Bo Champ}] - P[\text{Ci Champ}] = 0.8956$

   (b) i. $P[\text{Bo Challenger}|\text{2nd Rnd Req}] = \dfrac{0.36}{0.52} = \dfrac{9}{13}$

   ii. $P[\text{Al Champ}|\text{2nd Rnd Req}] = \dfrac{0.4156}{0.52} = 0.7992$

   (c) $P[(\text{Bo Challenger})|\{(\text{2nd Rnd Req}) \cap (\text{One Game})\}] = \dfrac{(0.6)^2(0.5)}{0.2920} = 0.6164$

2. **(TETRAHEDRAL DICE PROBLEM)**

   (a) $P[\text{Sum of 8 appears before sum of 4 appears}] = P(8)/(P(4) + P(8)) = \frac{1}{4}$

3. A and $B \cup C$ are not necessarily independent. The following is a counterexample.

   Define the following events:

   Let A = first toss is H
   Let B = second toss is H
   Let C = first toss is the same as the second toss

   $P(B \cup C|A) = \frac{1}{2}$, $P(B \cup C) = \frac{1}{4}$. Then $P(B \cup C|A) \neq P(B \cup C)$, so $B \cup C$ and A are not independent in this case.