STA 347F2003 Quiz 1

1. One jar contains blue balls numbered 1 and 2. Another jar contains red balls numbered 1, 2, and 3. A jar is chosen at random, and then a ball is chosen at random from that jar.

   (a) (15 pts) What is $Pr\{2|\text{Red}\}$?

   (b) (15 pts) What is $Pr\{\text{Blue}|3\}$?

   (c) (25 pts) What is $Pr\{2\}$?

   (d) (25 pts) What is $Pr\{\text{Blue}|2\}$?

2. (20 pts) Is it true that $Pr(A|B) + Pr(A^c|B) = 1$? If it is true, then prove it. If it is not true, give a simple counter-example. Begin your answer with the words "The statement is true," or "The statement is false." Hint: You might want to start with $Pr\{B\} = Pr\{B|A\}Pr\{A\} + Pr\{B|A^c\}Pr\{A^c\}$ (Law of Total Probability), which you need not prove.

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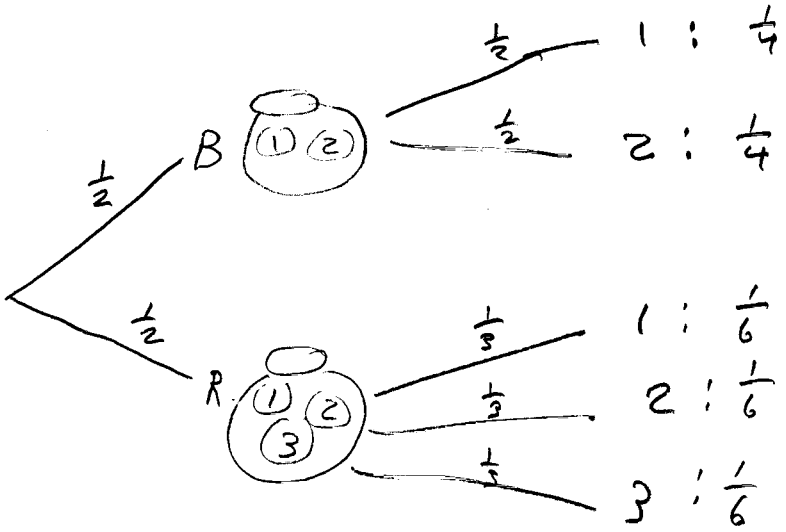
Q1 Answ 1

Jerry's Answers to Quiz One

(1) It is OKAY to make a tree



a) $P_n\{2|R\} = \frac{1}{3}$

b) $P_n\{B|3\} = 0$

c) $P_n\{2\} = \frac{1}{4} + \frac{1}{6} = \frac{3}{12} + \frac{2}{12} = \frac{5}{12}$

Or, $P_n\{2\} = P_n\{2|B\}P_n\{B\} + P_n\{2|R\}P_n\{R\}$

$= \frac{1}{2} \cdot \frac{1}{2} + \frac{1}{3} \cdot \frac{1}{2} = \frac{1}{4} + \frac{1}{6} = \frac{5}{12}$

d) $P_n\{B|2\} = \frac{P_n\{B \cap 2\}}{P_n\{2\}} = \frac{1/4}{5/12} = \frac{3}{5}$

On using Bayes' theorem explicitly is fine

Q1 Answ 2

(2) The statement is true. By the Law of Total Probability,

$$P_r\{B\} = P_r\{B|A\}P_r\{A\} + P_r\{B|A^c\}P_r\{A^c\}$$

$$= \frac{P_r\{A \cap B\}}{P_r\{A\}} P_r\{A\} + \frac{P_r\{A^c \cap B\}}{P_r\{A^c\}} P_r\{A^c\}$$

$$\Rightarrow 1 = \frac{P_r\{A \cap B\}}{P_r\{B\}} + \frac{P_r\{A^c \cap B\}}{P_r\{B\}} = P_r\{A|B\} + P_r\{A^c|B\}$$

done