Rain, weather forecast, not carrying umbrella

I was solving this problem -

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    In a city, half of the days have some rain. The weather forecaster is correct 2/3 of
the time, i.e., the
probability that it rains, given that the forecaster has predicted rain, and the
probability that it does not
rain, given that she has predicted that it wont rain, are both equal to 2/3. When rain is
forecast, Mr.
X takes his umbrella. When rain is not forecast, he takes it with probability 1/3. Find
(a) the
probability that Mr X has no umbrella, given that it rains. (b) the probability that he
brings his
umbrella, given that it doesnt rain.
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So Far what I have done - 1. Probability Model -

A - {It rains}

B - {Forcaster says it rains}

C - {Mr. X carries umbrella}

Now Given -

$$P(A) = 1/2; P(A/B) = 2/3; P(A'/B') = 2/3; P(C/B) = 1; P(C'/B) = 1/3$$

Now P(A'/B') = $(1 - P(A \cup B))/P(B') = 2/3$

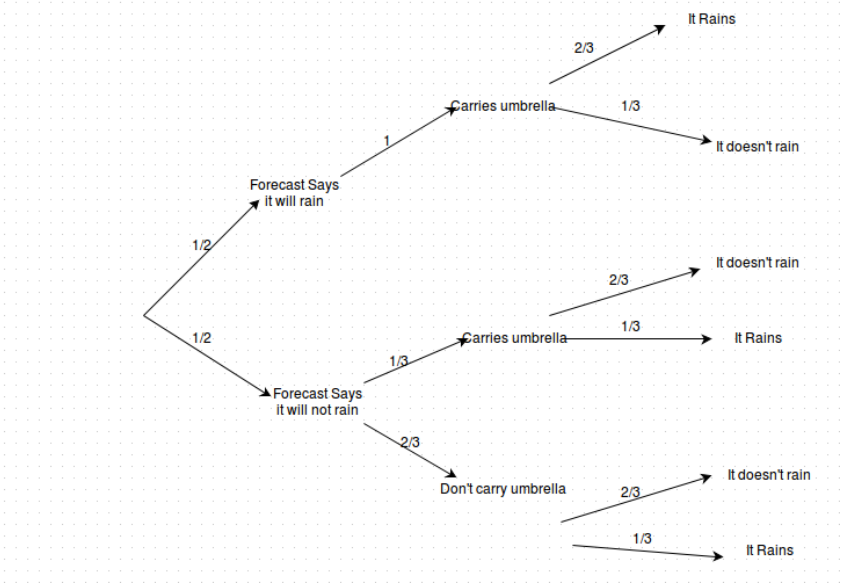
$$\Rightarrow P(A \cup B) = 1/3 + 2/3P(B)$$

Also from P(A/B) I get $P(A \cap B) = 2/3P(B)$

So from here I calculated $P(B) = 1/2$ and using this and P(C/B), P(C'/B) I can find P(C) as

$$P(C) = 2/3$$

I will apply the sequential tree as - Event1 - Weather forecast Event2 - Mr. X carries umbrella (or not depending upon forecast) Event3 - It rains (or not depending upon forecast)



Hence from this the Probabilities for 1st - 1/9 and 2nd should be 5/18 But I am bit uncertain here. can someone please correct me if I have made any mistake.

Thanks

(probability)

asked Nov 4 '14 at 3:23
codeomnitrix
151 8

Any comments??.. – codeomnitrix Nov 4 '14 at 8:57

1 Answer

(a) Perhaps you calculated $P(C' \cap A)$ instead of $P(C' \mid A)$.

Using the probability tree (event $C' \cap A$ has branch 6 only):

$$P(C' \cap A) = \frac{1}{2} \cdot \frac{2}{3} \cdot \frac{1}{3} = \frac{1}{9}.$$

$$\therefore P(C' \mid A) = \frac{P(C' \cap A)}{P(A)} = \frac{1/9}{1/2} = \frac{2}{9}.$$

(b) Similarly with this one. Using the probability tree (event $C \cap A'$ has branches 2 and 3):

$$P(C \cap A') = \frac{1}{2} \cdot 1 \cdot \frac{1}{3} + \frac{1}{2} \cdot \frac{1}{3} \cdot \frac{2}{3} = \frac{5}{18}.$$

$$\therefore P(C \mid A') = \frac{P(C \cap A')}{P(A')} = \frac{5/18}{1/2} = \frac{5}{9}.$$

answered Nov 5 '14 at 13:53
Mick A
7,260 2 5 19

yeah I realized it, forget to update the answer....thanks Mick\ – codeomnitrix Nov 5 '14 at 15:11