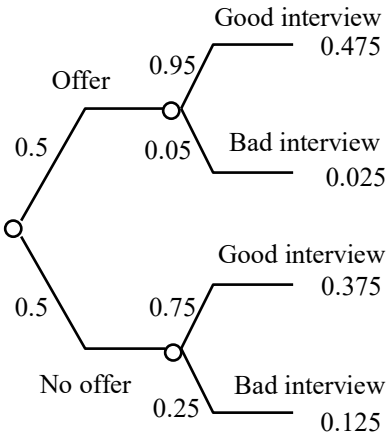
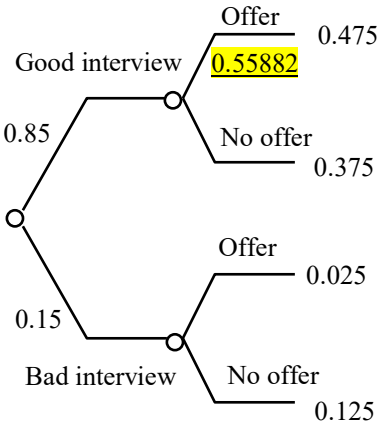
Decision Analysis
Solutions to Homework #1
Probabilistic Thinking

Question 1

Julie's information may be represented by the probability tree on the left. The order of conditioning is not in the correct direction. Hence we flip it to the tree on the right:

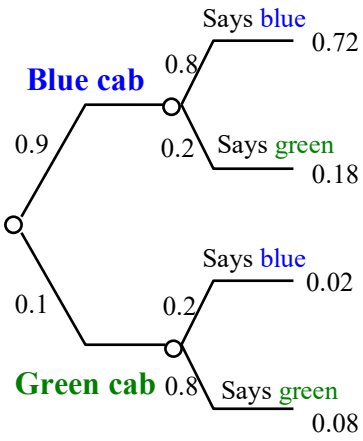




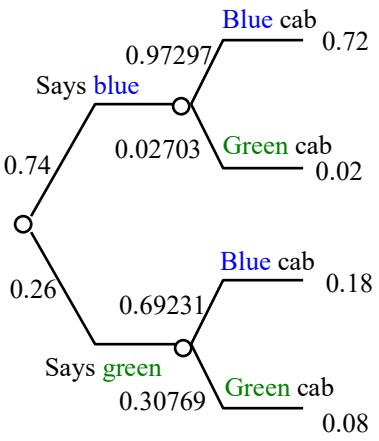
If Julie has a good interview, her chance of receiving an offer = **0.55882**

Question 2

(*a*)



(*b*)



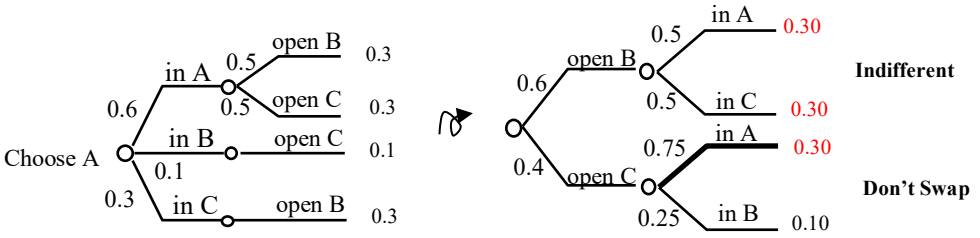
(*c*) If the witness says the cab was green, the judge should assign a probability of 0.308 that the actual cab was green.

(*d*) The witness' true-sighting rate was 80% compared with the correct assessment of 30.8%. This difference would be surprising if you had ignored the prior probability of a green cab, which is 10%.

Psychologists have found that people often ignore the "base rate" in assessing probability, leading to invalid probability values. In this case, ignoring the base rate would lead the judge to assign 80% chance that the cab was green based on the witness's account.

Question 3

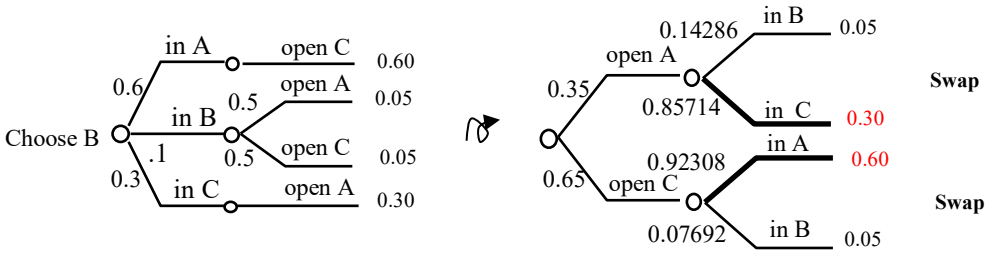
Case 1: If Box A is chosen:



- If host opens B, decision is indifferent as probability of A and C are equal
- If host opens C, decision is don't swap as probability of A > probability of B

  Probability of Win if A is chosen = 0.30 + 0.30 = 0.60

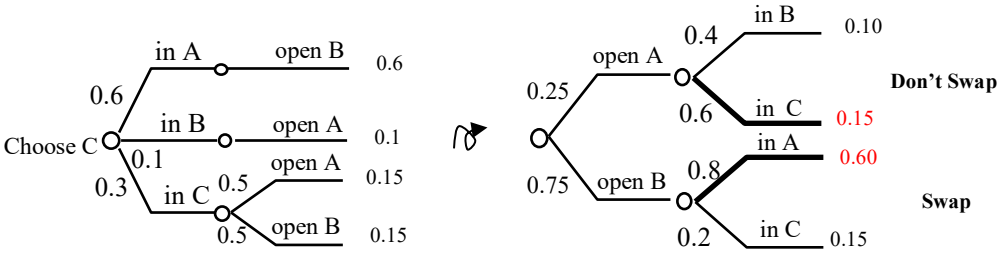
Case 2: If Box B is chosen:



- If host opens A, decision is swap as probability of C > probability of B
- If host opens C, decision is swap as probability of A > probability of B

  Probability of Win if B is chosen = 0.30 + 0.60 = 0.90

Case 3: If Box C is chosen:



- If host opens A, decision is don't swap as probability of C > probability of B
- If host opens B, decision is swap as probability of A > probability of C

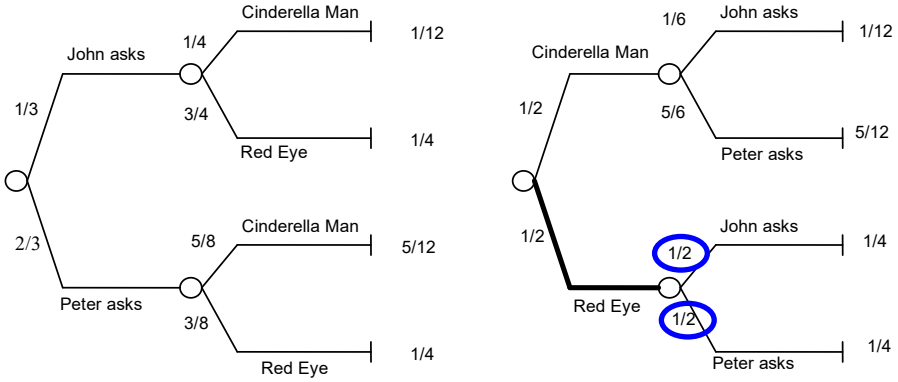
  Probability of Win if C is chosen = 0.15 + 0.60 = 0.75

Conclusion: Choose Box B, and always swap after the host opens either A or C.
Probability of win using this strategy = 0.9

- Note that here we used probabilistic reasoning to find the optimal decision to maximize the probability of winning, by emulating all possible choices in separate trees. The problem can be solved more efficiently using a single decision tree or influence diagrams (Chapters 4 and 5).

Question 4

Draw the probability tree, flip it, and observe the equal probabilities of 0.5.



III. Ella is ***equally likely*** to have seen the movie with either John or Peter