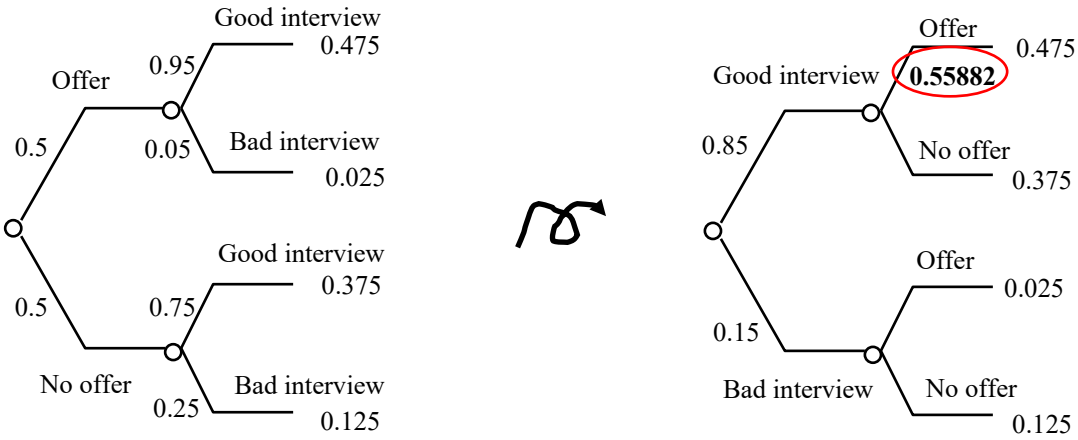
IE5203 Decision Analysis
Solutions to Chapter 2 Exercises

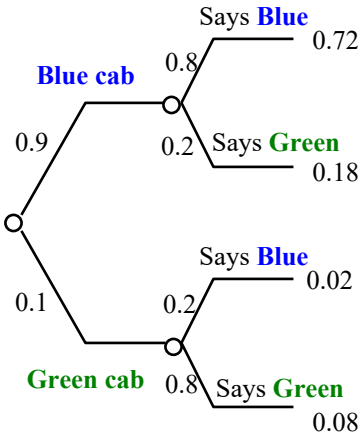
P2.1 Julie's information may be represented by the probability tree on the left. The order of conditioning is not in the correct direction. Hence, we flip to the tree on the right:



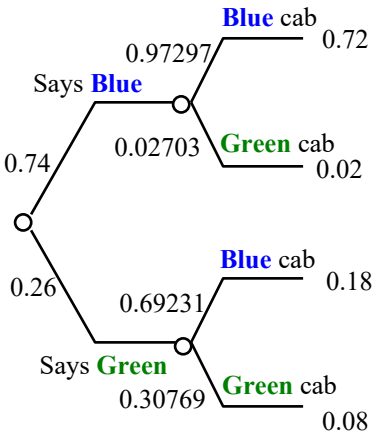
p(Offer | Good interview) = 0.55882

P2.2

(*a*)



(*b*)

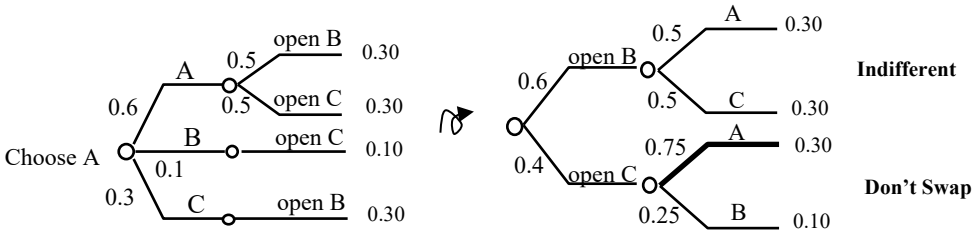


(*c*) If the witness says the cab was green, the judge should assign a probability of 0.30769 that the actual cab was green.

(*d*) The witness' true-sighting rate was 80% compared with the correct assessment of 30.769%. This difference would be surprising if you had ignored the prior probability of a green cab, which is 10%.

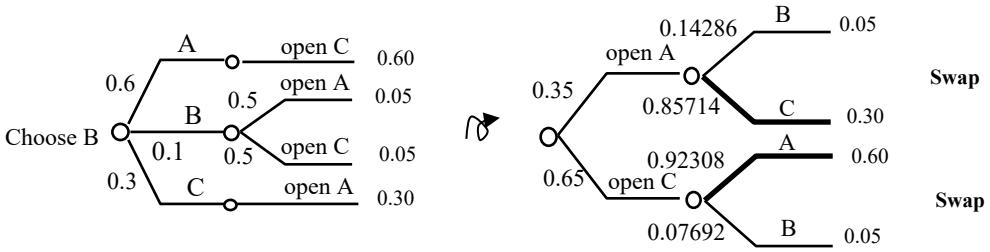
Psychologists have found that people often ignore the "base rate" in assessing probability, leading to invalid probability values. In this case, ignoring the base rate would lead the judge to assign an 80% chance that the cab was green based on the witness' account.

P2.3



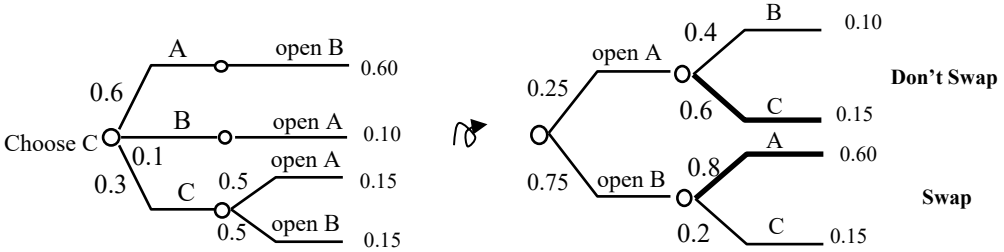
- If Box A is chosen:
  If the host opens B, the decision is indifferent as the probabilities of A and C are equal
  If the host opens C, the decision is not to swap as the probability of A > the probability of B

  Probability of Win on choosing A = 0.30 + 0.30 = 0.60



- If Box B is chosen:
  If the host opens A, the decision is to swap as the probability of C > the probability of B
  If the host opens C, the decision is to swap as the probability of A > the probability of B

  Probability of Win on choosing B = 0.30 + 0.60 = 0.90



- If Box C is chosen:
  If the host opens A, the decision is not to swap as the probability of C > the probability of B
  If the host opens B, the decision is to swap as the probability of A > the probability of C

  Probability of Win on choosing C = 0.15 + 0.60 = 0.75

- Conclusion: Choose Box B, and always swap after the host opens either A or C.
  Probability of winning 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).

P2.4

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

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