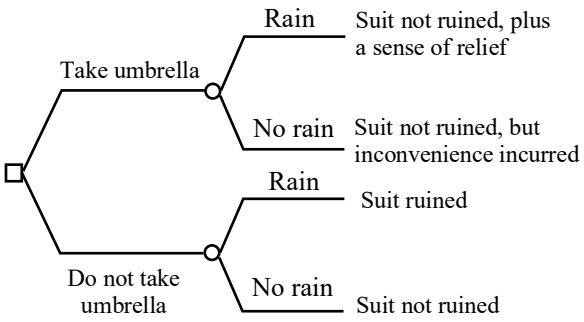
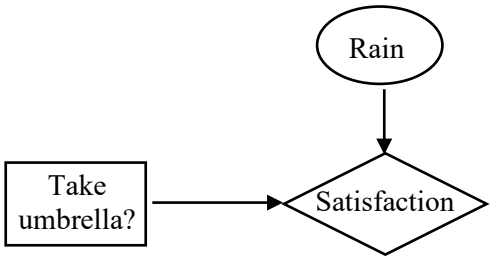
Decision Analysis
Solutions to Homework #4

Question 1

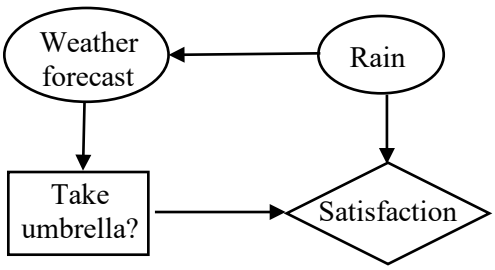
(*a*)



(*b*)



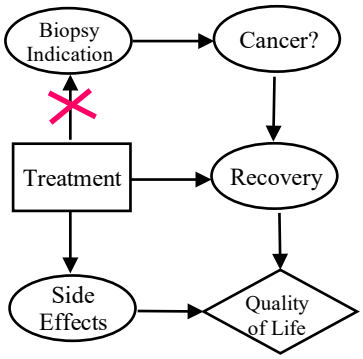
(*c*)



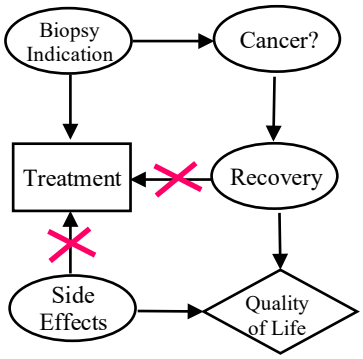
Question 2

The correct influence diagram is (*c*). The other three diagrams are not valid due to the offending arcs indicated.

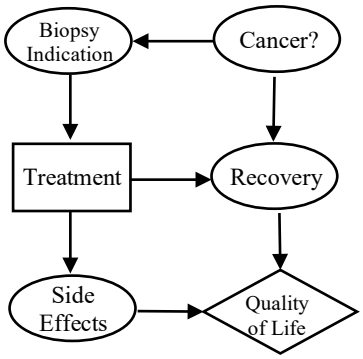
(*a*)



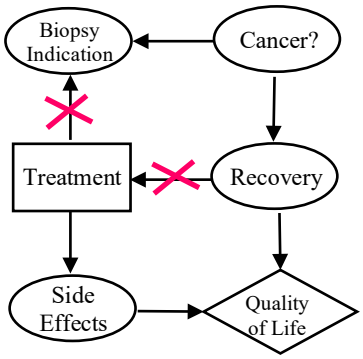
(*b*)



(*c*)

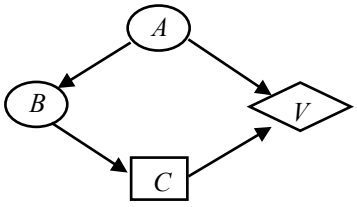


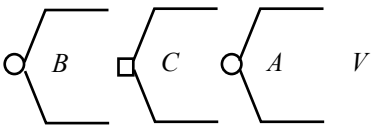
(*d*)



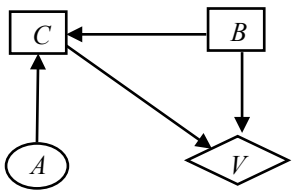
Question 3

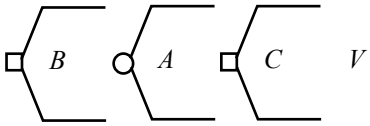
(*a*)



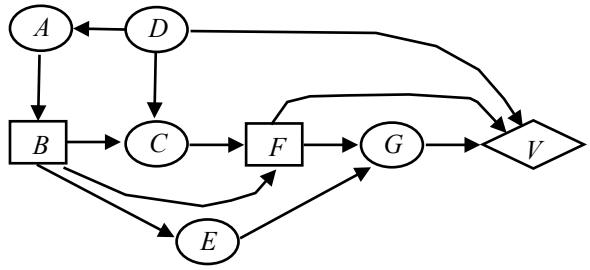


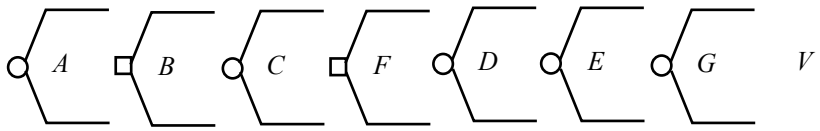
(*b*)





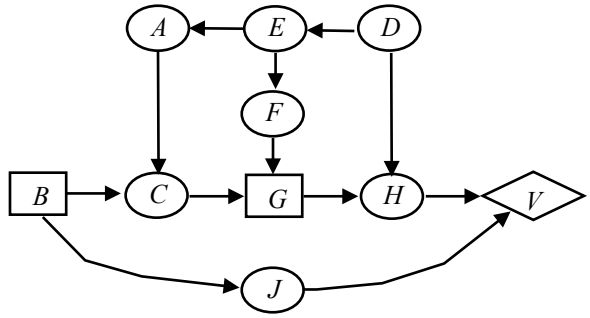
(***c***)

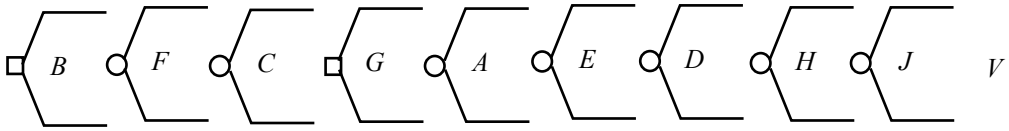




Any permutation of nodes *D*, *E* and *G* is also correct, but some of these would require some tree flipping to get the required conditional probabilities for the decision tree.

(***d***)

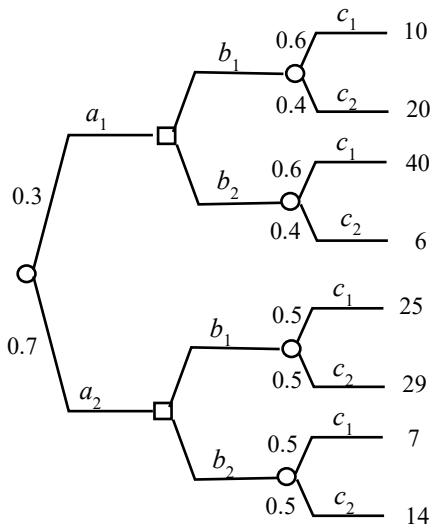




Any permutation of nodes *A, E, D, H* and *J* is also correct but some of these would some require tree flipping to get the required conditional probabilities for the decision tree.

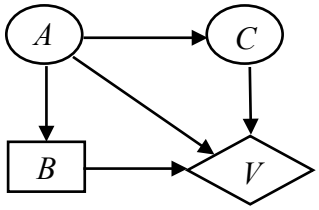
Question 4

(*a*)

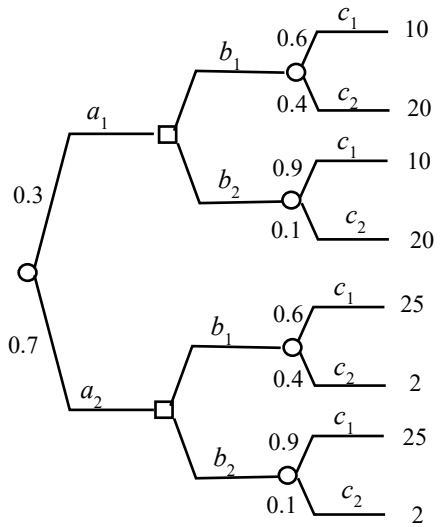


- Information on A is available before decision B.
- C is dependent on A since $p(C_1|A_1) = 0.6 \neq p(C_1|A_2) = 0.5$
- C is independent of decision B given information on A:
  $p(C_1|B_1,A_1) = p(C_1|B_2,A_1) = 0.6$
  $p(C_1|B_1,A_2) = p(C_1|B_2,A_2) = 0.5$
- Value is dependent on all A, B, C (all the numbers are different).

The influence diagram:

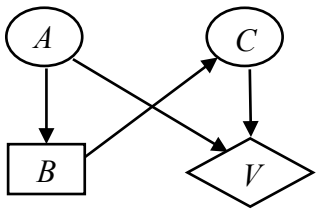


(*b*)

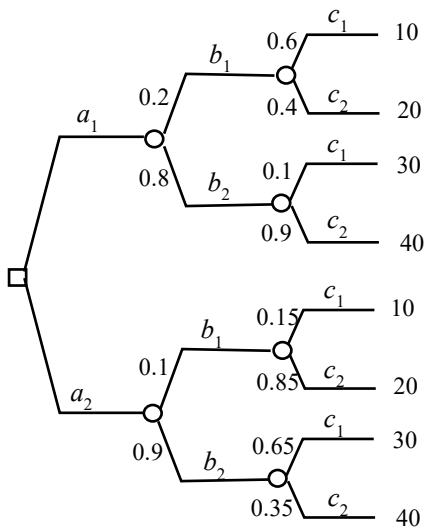


- Info on A is available before decision B.
- C is dependent on decision B
  $p(C_1|B_1) = 0.6 \neq p(C_1|B_2) = 0.9$
- C is independent of A given B
  $p(C_1|A_1,B_1) = p(C_1|A_2,B_1) = 0.6$
  $p(C_1|A_1,B_2) = p(C_1|A_2,B_2) = 0.9$
- Value is independent of B.

The influence diagram:

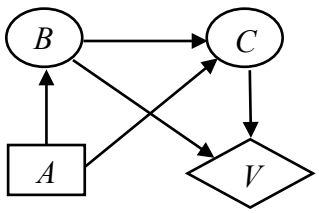


(*c*)

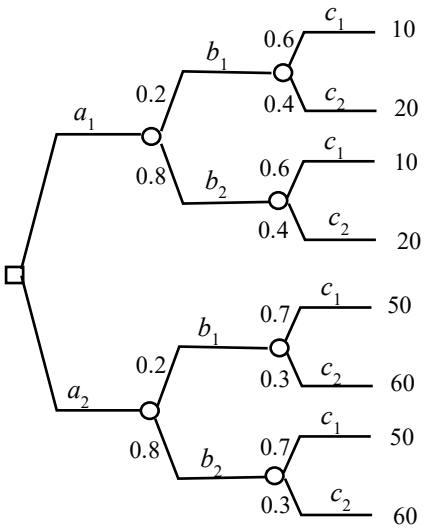


- B is dependent on decision A
  $p(B_1|A_1) = 0.2 \neq p(B_1|A_2) = 0.1$
- C is dependent on B
  $p(C_1|B_1,A_1) = 0.6 \neq p(C_1|B_2,A_1) = 0.1$
- C is dependent on A
  $p(C_1|A_1) = (0.2)(0.6)+(0.8)(0.1) = 0.2 \neq p(C_1|A_2) = (0.1)(0.15)+(0.9)(0.65) = 0.6$
- Value is independent of A.

The influence diagram:



(*d*)



- *B* is independent of decision *A*
  $p(B_1|A_1) = 0.2 = p(B_1|A_2)$
- C is dependent on decision A
  $p(C_1|A_1) = (.2)(.6)+(.8)(.6) = 0.6 \neq p(C_1|A_2) = (.2)(.7)+(.8)(.7) = 0.7$
- *C* is independent of *B* given *A*
  $p(C_1|B_1,A_1) = 0.6 = p(C_1|B_2,A_1)$
  $p(C_1|B_1,A_2) = 0.7 = p(C_1|B_2,A_2)$
- Value is independent of *B*.

The influence diagram: