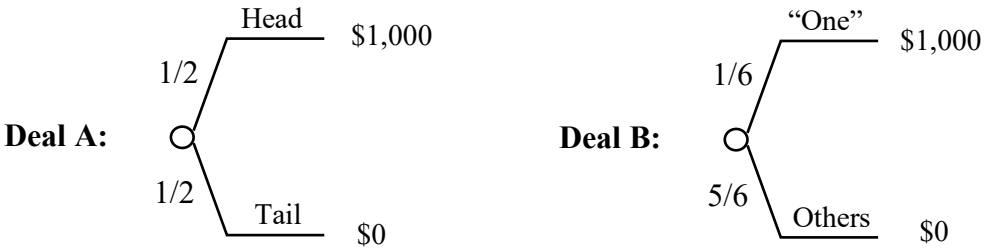
Decision Analysis
Solutions to Homework #2

Question 1



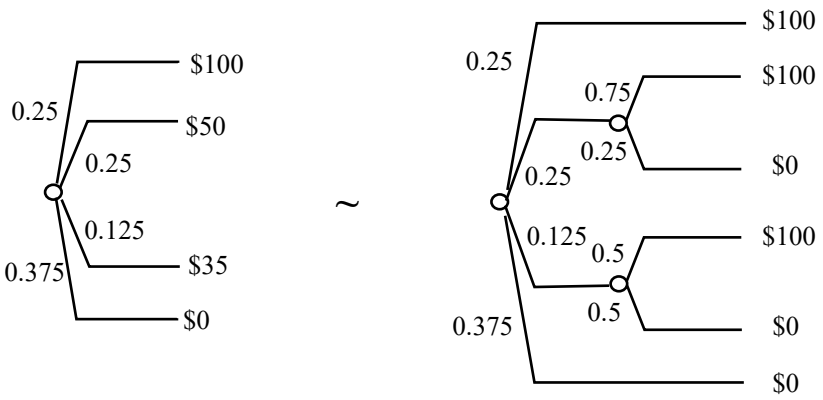
(*a*) I would choose Deal A c/o ***Choice Rule***.

(*b*) The outcomes are bad, but we have made a good decision, c/o *good decision vs. good outcomes*.

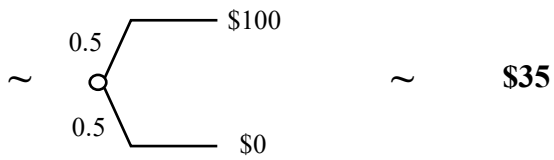
(*c*) Assuming the next roll and flip are independent of the previous rolls and flips, I would still choose Deal A.

Question 2

- Using the substitution rule to replace the \$50 and \$35 outcomes with their respective equivalent deals:



- This can be simplified (decomposition rule) to



- Hence Certainty Equivalent =\$35.

Question 3

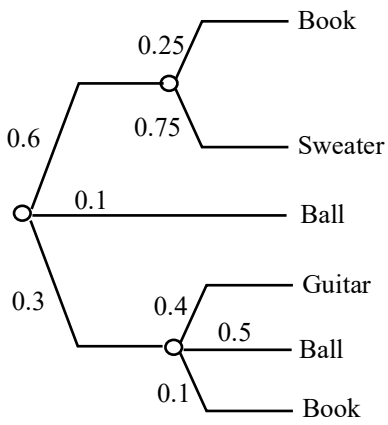
(*a*)

- Given: Guitar $\succ$ Harmonica
- From the 3 relations: Guitar $\succ$ Book $\succ$ Harmonica
  Guitar $\succ$ Sweater $\succ$ Harmonica
  Guitar $\succ$ Ball $\succ$ Harmonica
- By choice rule: Ball (p=0.85) $\succ$ Book ((p=0.7) $\succ$ Sweater ((p=0.2)
- Hence required preference ordering for the 5 individual items is:

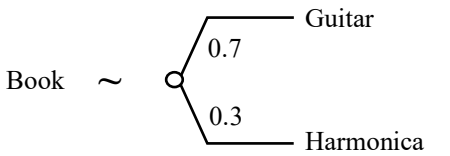
  Guitar $\succ$ Ball $\succ$ Book $\succ$ Sweater $\succ$ Harmonica

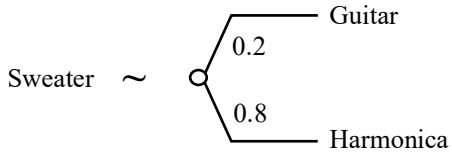
(*b*)

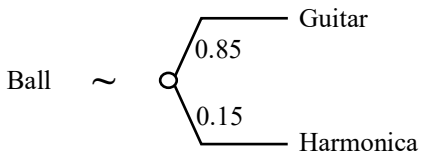
- Given

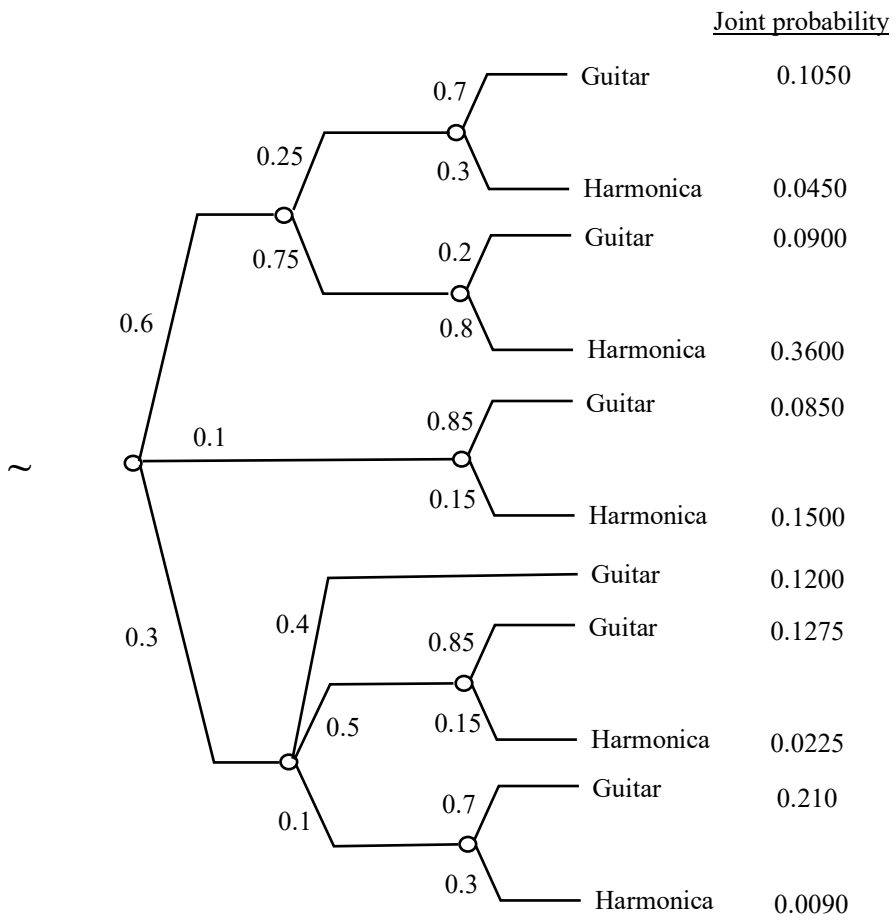


- Substituting the following certainty equivalences into the above:

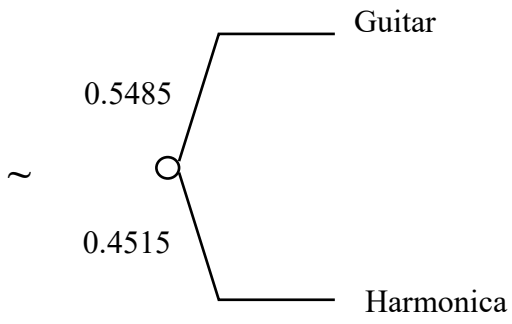








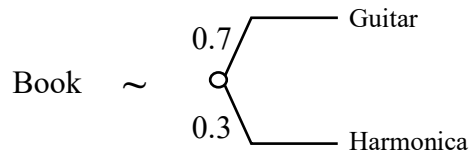
- By Decomposition Rule:



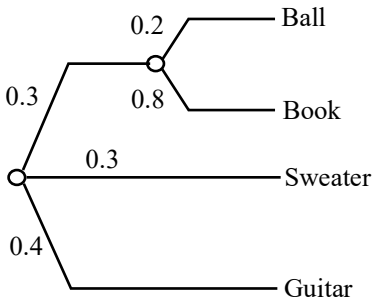
- The required Preference Probability with respect to Guitar-Harmonica Deal = **0.5485**

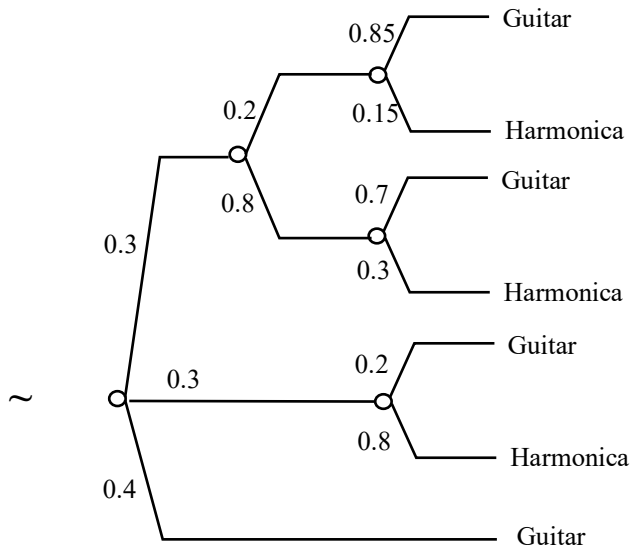
(*c*)

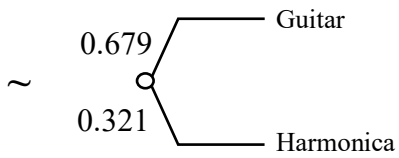
- The Book deal is equivalent to:



- Applying the Substitution and Decomposition rules to the given Deal:







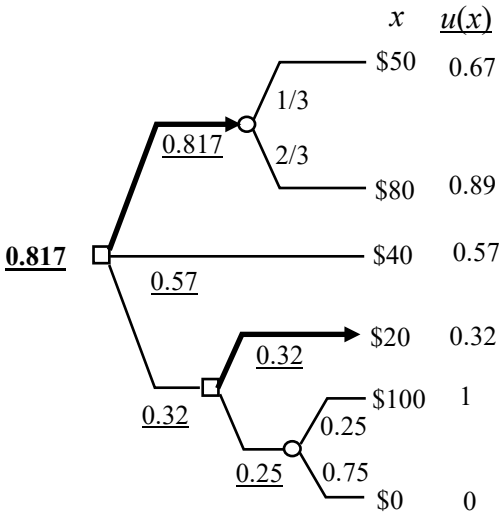
- By the Choice rule, Chris prefers Book to the given Deal since the preference probability for book = 0.7 > 0.679 = preference probability for the Deal.

Question 4

- The given preference probabilities may be interpreted as utility values where $u(\$0) = 0$ and $u(\$100) = 1$.

Value ($\$x$)	$u(x)$
0	0.00
10	0.17
20	0.32
40	0.57
50	0.67
80	0.89
90	0.95
100	1.00

- Rolling back the decision tree and computing the expected utilities:



- The optimal decision is to take the first alternative which has the maximum expected utility of 0.817.

- The certainty equivalent is obtained by converting the expected utility back to its equivalent dollar value.

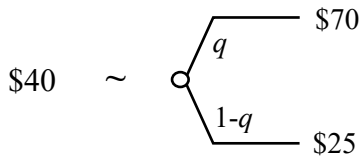
- Hence Kim's CE for the opportunity = $u^{-1}(0.817) \approx \$70$ by interpolation on the table.

Question 5

- Given

Value ($)	Utility
0	0
25	0.3
40	0.5
70	0.8
100	1.0

- We want to find the value of probability q such that Connie's personal indifferent selling price or certainty equivalent for the deal is equal to $40.



- At the point of indifferent between selling and not selling the deal for $40, the utility on the left must be equal to the expected utility on the right:

$$u(\$40) = q\ u(\$70) + (1 - q)\ u(\$25)$$

$$0.5 = 0.8\ q + 0.3\ (1 - q)$$

$$q = 0.4$$