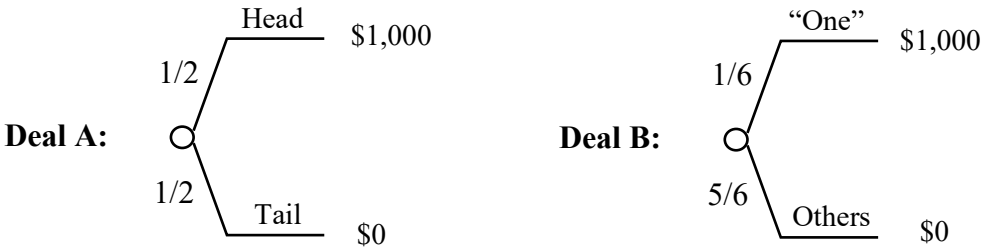
TIE4203 Decision Analysis in Industrial & Operations Management
Solutions to Tutorial #2

Question 1 (P3.1)



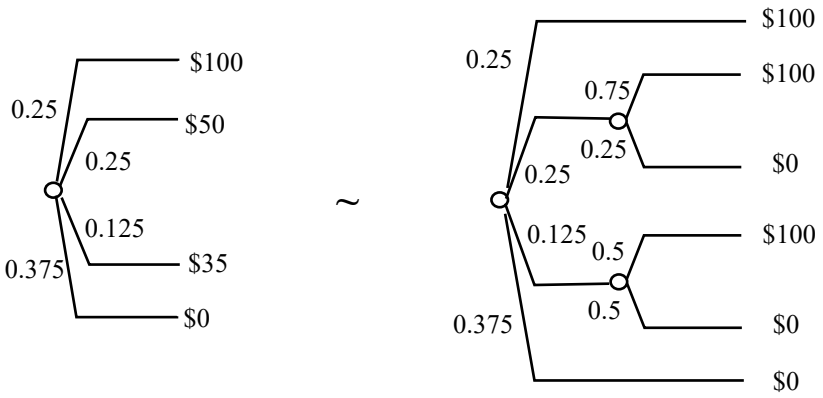
(*a*) I would choose Deal A c/o ***Choice Rule***.

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

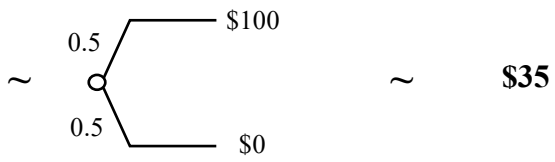
(*c*) Assuming the next roll and flip are independent of the previous rolls and flips, I would still choose Deal A.

Question 2 (P3.2)

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

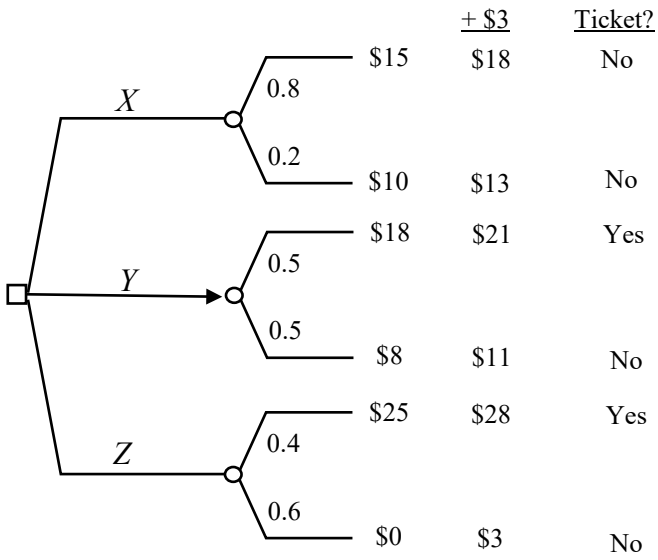


- This can be simplified (decomposition rule) to



- Hence Certainty Equivalent =\$35.

Question 3 (P3.3)



- **Answer**: Since all John cares about is getting a ticket or not, and he prefers getting a ticket to not getting, he should choose Deal *Y* which has the highest probability of getting the preferred outcome. This is direct application of the Choice Rule.

- Alternatively, using Chapter 4 method: let u(Ticket=yes) = 1 and u(Ticket=no) = 0, and compute the expected utilities of Deals *X*, *Y* and *Z*.

- Note that maximizing the expected dollar value would be wrong because John is only concerned with getting or not getting a ticket.

Question 4 (P3.4)

(*a*) By continuity rule:

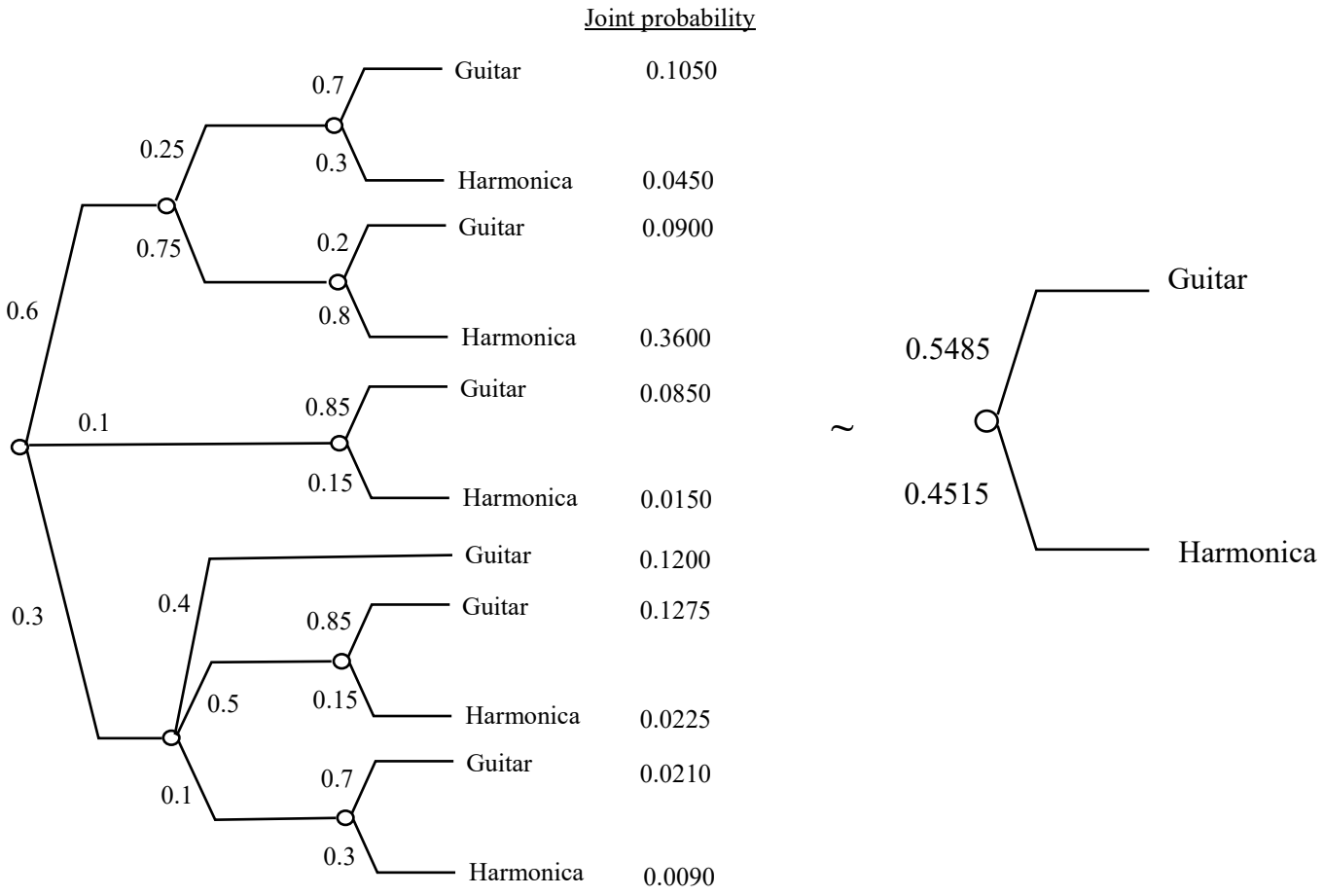
Harmonica $\prec$ Book $\prec$ Guitar
Harmonica $\prec$ Sweater $\prec$ Guitar
Harmonica $\prec$ Ball $\prec$ Guitar

By choice rule:

Sweater $\prec$ Book $\prec$ Ball.

Hence preference ordering: Harmonica $\prec$ Sweater $\prec$ Book $\prec$ Ball $\prec$ Guitar.

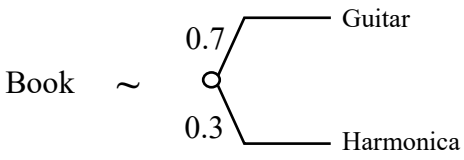
(*b*) Using substitution and decomposition rules:



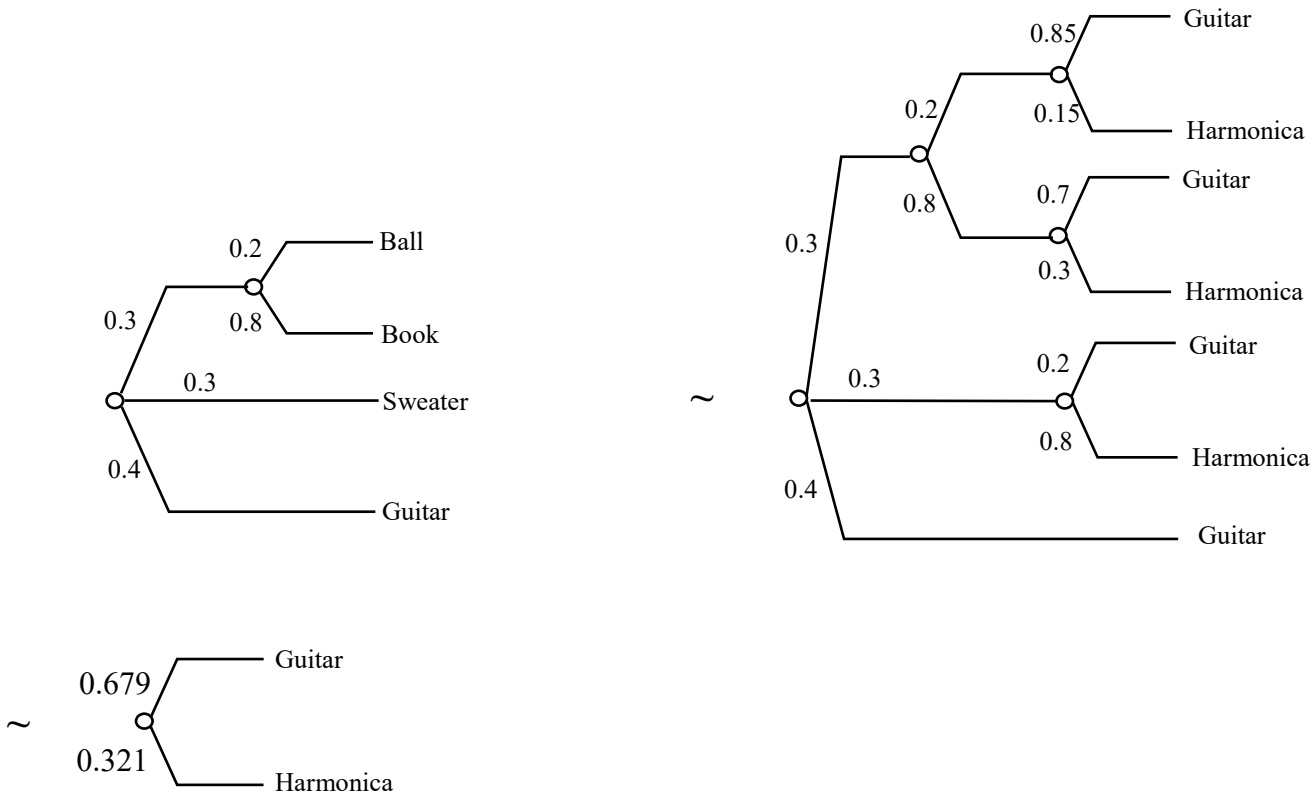
- Preference probability of deal w.r.t. G-H deal = 0.5485

(*c*)

- The Book deal is:



- Applying the substitution and decomposition rules to the given Deal:



- By the Choice rule, Chris prefers Book to the given Deal since $0.7 > 0.679$.

(*d*)

- No, we can't infer anything about Chris's preference for four sweaters vs. one book.

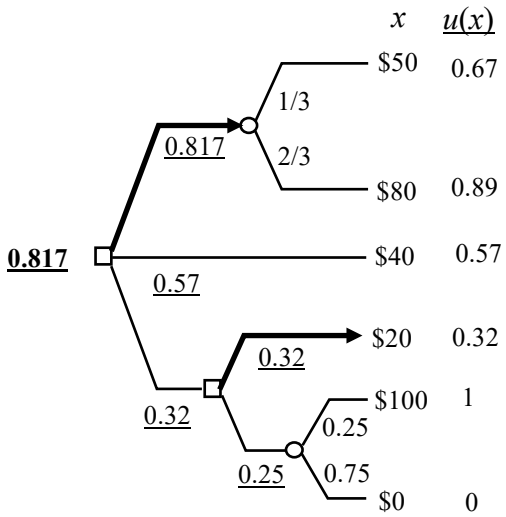
- This is because we do not enough information about Chris's preference for four sweaters as a bundle. It would be wrong to assume that the preference probability for four sweaters (w.r.t. G-H Deal) is four times that of the preference probability for one sweater (w.r.t. G-H Deal).

Question 5 (P4.2)

- If we let $u(\$100) = 1$, and $u(\$0) = 0$, then the preference probabilities are the same as the utilities.

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.

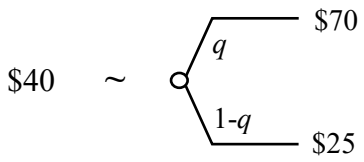
- The certainty equivalent is obtained by converting the expected utility back to its equivalent dollar value.

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

Question 7 (P4.3)

- If we let $u(\$100) = 1$, and $u(\$0) = 0$, then the preference probabilities are the same as the utilities.

- 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.



$$
\begin{aligned}
u(40) &= q\,u(70) + (1 - q)\,u(25) \\
0.5 &= 0.8\,q + 0.3\,(1 - q) \\
q &= 0.4
\end{aligned}
$$