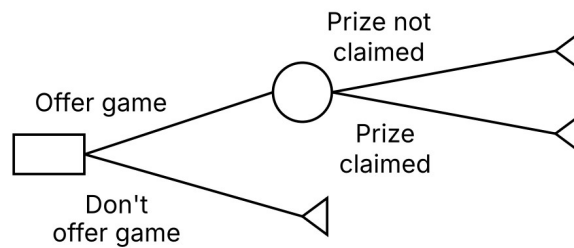


8B Utility

A school fete runs a dice game in which six dice are thrown. The charge is £1 for each attempt and the prize is £2000 for obtaining six sixes in a single throw. There are expected to be 400 attempts during the day, and at most one prize is awarded.

$P(\text{Win})$ on each throw =

$P(\text{Someone wins}) =$



Why the EMV may not be the best criterion here:

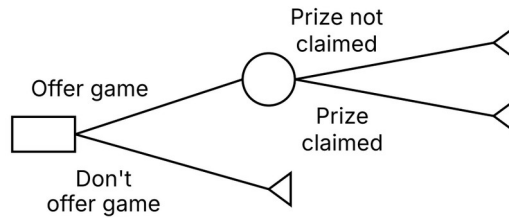
Utility function:

Expected utility, $E(U)$, and utils:

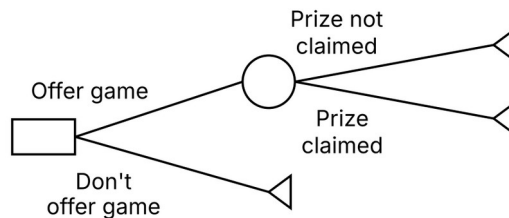
The utility function $u(x) = 1 - e^{-x/R}$, and the effect of R :

1. A school has to decide whether to offer the dice game described above. For a pay-off of £x, the school determines that its utility function is $u(x) = 1 - e^{-\frac{x}{R}}$. Calculate the school's expected utility, given that:

a) $R = 400$

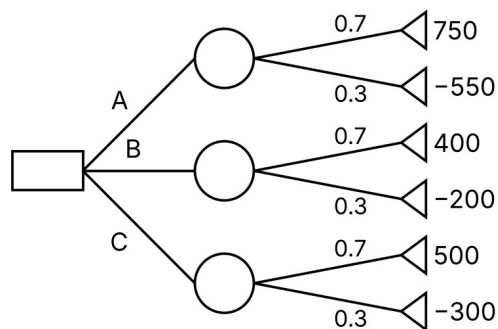


b) $R = 200$



In each case, interpret the results.

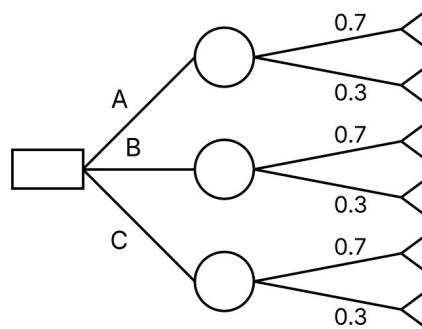
2. A company can choose one of three business options A, B or C. The profits in pounds associated with each outcome are shown on the decision tree below.



a) Using the decision tree, calculate the optimal EMV to determine the best choice.

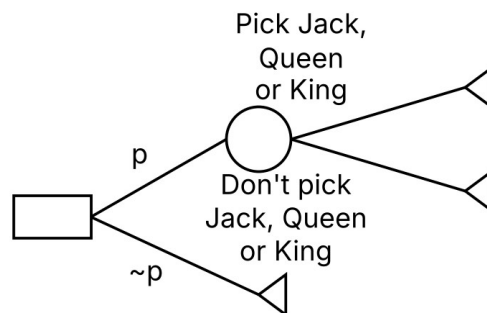
For a profit of £ x , the company's utility is given by $\sqrt{x + 600}$.

b) Using expected utility as the criterion, determine the optimal choice.



3. Tim is considering whether to play a card game. If he picks a Jack, Queen or King, at random from a standard pack of playing cards, then he wins a prize. If he picks any other card, then he loses £5.

a) Draw a decision tree and state Tim's best course of action using the EMV criterion, given that the prize on offer is £12.



Tim only has £5. He uses utility = $\sqrt[3]{\text{money}^2}$ to reflect his risk aversion.

b) Calculate the minimum prize amount that would make it worthwhile for Tim to play the game.