Assignment 2

Due Friday, February 15 at 11:59 pm.

Please submit all work on Canvas as a PDF or Word file. Make sure you clearly label each solution, and include the answers to the in-class quiz at the beginning of the assignment. Scan or take a clear picture of any decisions trees to include it in your submission.

Part 1: Decision Trees

1) Rock-Paper-Scissors Suppose you make a bet of $1 on a game of "Rock-Paper-Scissors" (`https://en.wikipedia.org/wiki/Rock-paper-scissors`), with ties resulting in no money being exchanged.

(a) **Assuming that your opponent is equally likely to choose each of the options, draw the decision tree for this problem. (2 points)**

2) Raffle Suppose that you are deciding whether to buy a $1 raffle ticket. The jackpot is $50,000 and there will be 60,000 tickets sold. In addition, there is a special deal going on in which you can purchase 5 tickets for $4. You have a total of $4 to spend. Assume that all raffle tickets are sold (so the probability of an individual ticket winning is 1/60,000).

(a) **What are the alternatives? (You don't need to consider the case of buying four tickets for $4.) (1 point)**

(b) **Draw the decision tree for this problem. Use a square for a decision node and a circle for an event node. Make sure to include payoffs and probabilities associated with each event. (2 points)**

(c) **What decision should you make based on the expected value criteria? Make sure you show your calculations of all expected values. (2 points)**

3) Investments An investor is considering 4 investments, A, B, C, D. The payoff from each investment is a function of the economic climate over the next 2 years. The economy can be weak or strong. The investor has estimated the probability of a declining economy at 30% and an expanding economy at 70%.

Investment	Weak Economy	Strong Economy
A	-30	120
B	20	60
C	30	35
D	15	30

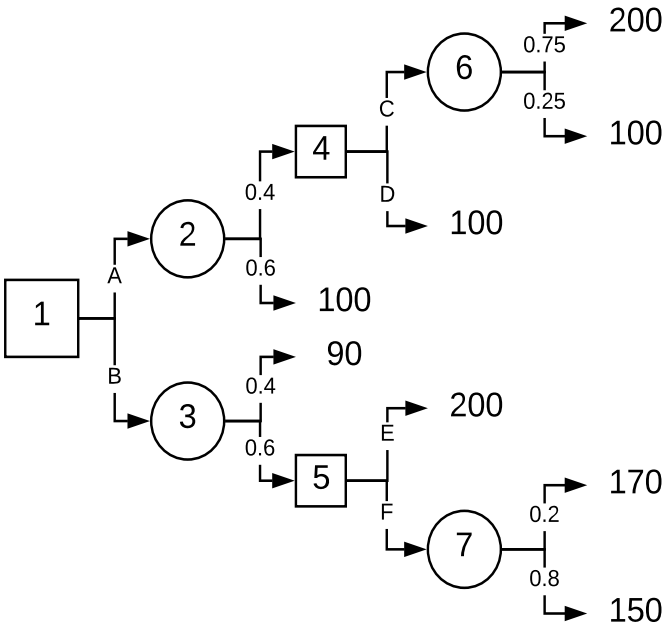
(a) **Draw the decision tree for this problem. Use a square for a decision node and a circle for an event node. Make sure to include payoffs and probabilities associated with each event. (2 points)**

(b) **What decision should the investor make based on the expected value criteria? Make sure you show your calculations of all expected values. (2 points)**

(c) **If the investor can hire a consultant to perfectly predict the economic climate, what is the maximum price that the investor should be willing to pay the consultant? Show your calculations. (1 point)**

Part 2: Multi-Part Decisions

4) Multiple Investments Suppose that you are considering 2 investments, A, B, which can be made now. After these investments are made you can pursue choices C, D, E and F depending on whether you chose A or B originally. You have developed the following decision tree to aid in your selection process.



(a) **What do nodes 1, 4, and 5 represent? What do nodes 2, 3, 6, and 7 represent? (2 points)**

(b) **What are the correct original and subsequent decisions based on an expected value criteria? (2 points)**

(c) **What is the overall expected value for this decision problem? Show your calculations. (2 points)**

5) Basketball Contract Kevin is a famous NBA basketball player who is trying to decide on what kind of contract he should sign. He has two options that he is seriously considering: \$90 million over the next 3 years, or \$33 million for the next year, at which point he could sign another contract. If he takes the one-year contract and does not get injured over the next year, he can sign another one-year contract for \$33 million or take \$62 million over two years. If he signs the one-year contract again and does not get injured over the next year, he can then sign another \$33 million contract. If he gets injured, then any future contracts will only be worth \$5 million per year, but he is still guaranteed

money from contracts he had already signed. He thinks there is a 5% chance that he gets injured in any given year. Assume that the present value of money does not change (no discount for money in future years).

(a) **Draw the decision tree for this problem. (3 points)**

(b) **What are the decisions he should make based on an expected value criteria? (2 points)**

(c) **What is the overall expected value for this decision problem? Show your calculations. (2 points)**

Part 3: Present Discounted Value

6) Multiple Investments, Part 2 Consider the situation described in Question 4. Suppose the second round of investments (C, D, E, or F) happens in the next year, and there is a 10% discount rate (also known as interest rate).

(a) **Draw the new decision tree including the discount rate. (2 points)**

(b) **What are the decisions you should make? (2 points)**

7) Lottery Suppose that you are deciding whether to buy a $1 lottery ticket. The jackpot is $2 million and there is a 1/1,000,000 chance of winning. In addition, you may choose to receive the jackpot as a lump sum immediately or in yearly payments over 10 years. If you choose the lump sum, you get 60% of the money all at once. If you choose the yearly payments, you will receive a payment of $150,000 over 10 years with the first payment made in one year. The interest rate is 3% per year.

(a) **Draw the decision tree for this problem. (2 points)**

(b) **What is the present value of the last payment? (1 point)**

(c) **What decisions should you make according to the expected value criteria? Make sure you specify all decisions that must be made if there are multiple and show calculations for all expected values. (3 points)**