

INST 354

Sang Hwa Lee

September 15, 2022

### LAB 3

**Question 1: Suppose that you are deciding whether to buy a \$1 lottery ticket. The jackpot is 1.2 million and there is a 1/1,000,000 chance of winning.**

**1. What are the alternatives in this decision?**

- In this situation, the alternative is to decide whether to buy a \$1 lottery ticket or not.

**2. What is the objective?**

- The objective is to find a decision on whether buying a lottery ticket is the right decision or not.

**3. What are the possible consequences or future events?**

- There are two main possible outcomes or future events.

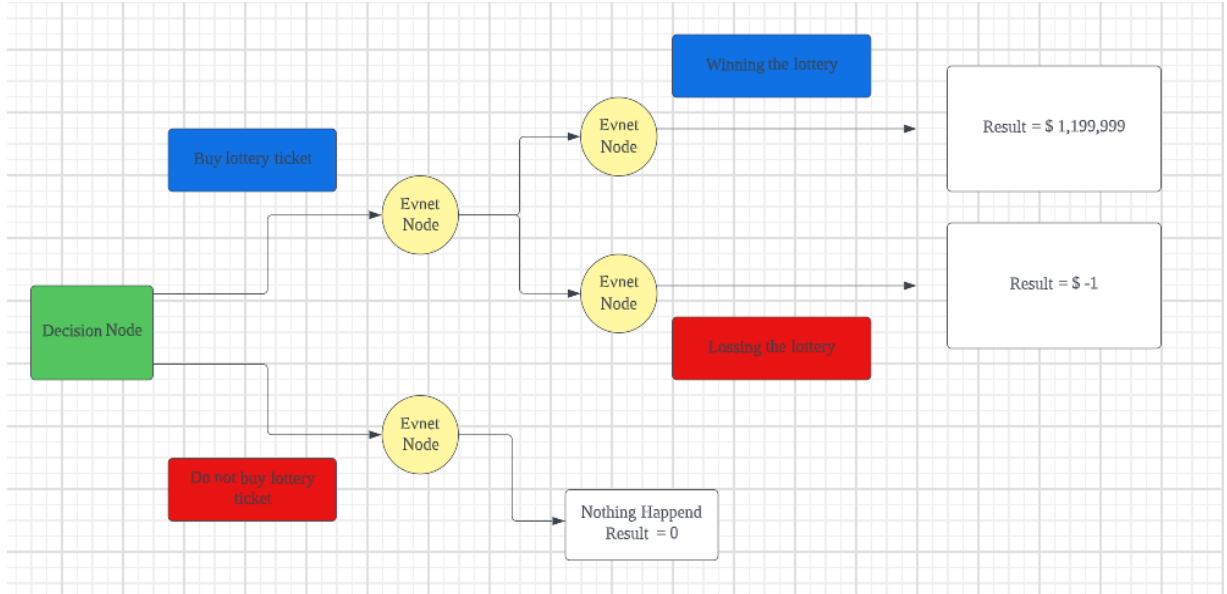
*1. Purchase a lottery ticket. 2. Do not purchase lottery ticket.*

If we consider the results for the event that purchased the lottery ticket,

*1. Win the lottery. 2. No win the lottery (i.e., lose one dollar)*

This can organize the results of possible consequences or future events.

4. Draw the decision tree for this problem.



5. "Roll back" the tree and compute the expected values of each alternative.

1) EV of buying ticket

(Probability of winning \* payoff of winning) + (Probability of losing \* payoff of losing)

$$(1/1,000,000 * 1,199,999) + [(1 - (1/1,000,000)) * (-1)] =$$

$$= (1.199999) + [(1 - (0.000001)) * (-1)]$$

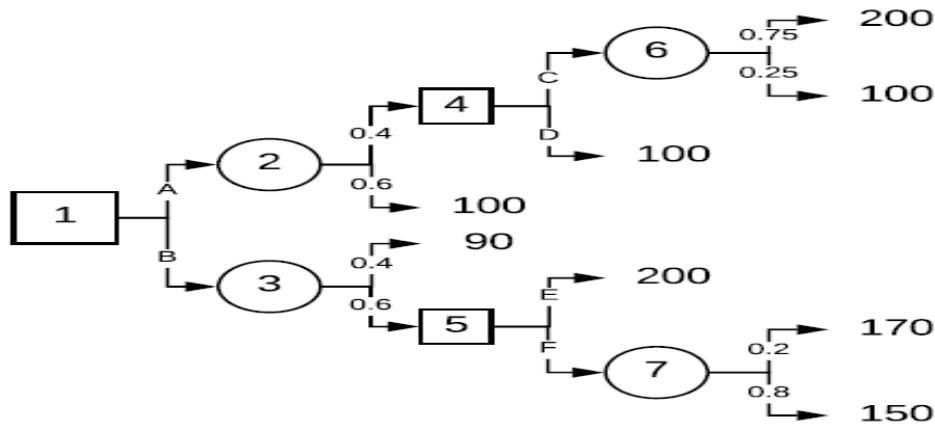
$$= (1.199999) + [(0.999999) * (-1)]$$

$$= (1.199999) + (-0.999999)$$

$$= 0.2$$

2) EV of not buying tickets = 0

## Question 2



1. What do nodes 1, 4, and 5 represent? What do nodes 2, 3, 6, and 7 represent?

1,4,5 – Decision node

2,3,6,7 – Event node

2. What are the correct original and subsequent decisions based on an expected value criteria? Show your calculations.

$$\text{C: } (0.75 * 200) + (0.25 * 100) = 150 + 25 = 175 \quad / \quad \text{D: } 100$$

Then,  $175 > 100 \Rightarrow$  Choose the alternative C

$$\text{E: } 200 \quad / \quad \text{F: } (0.2 * 170) + (0.8 * 150) = 34 + 120 = 154$$

Then,  $200 > 154 \Rightarrow$  Choose the alternative E

$$\text{A: } (0.4 * 175) + (0.6 * 100) = 70 + 60 = 130$$

$$\text{B: } (0.4 * 90) + (0.6 * 200) = 36 + 120 = 156$$

Then,  $156 > 130 \Rightarrow$  Choose the alternative B

3. What is the overall expected value for this decision problem?

**Alternative B** is the best alternative at the first stage.