ECON3113
Microeconomic Theory I

Online Assignment #4 Solution

Online assignment #4

Question 4 pts

Consider the following casino game defined in terms of pay-offs and probabilities. Assume that all you care about is the expected value of your winnings.

Pay-off	$100	$36	$-12
Probability	25%	25%	50%

What is the most that you would pay to play this game? [ans1]

Now suppose that a casino employee tells you in secret that the $100 pay-off never occurs. What is the most that you would pay to play the game now?[ans2]

- Assuming that you only care about the amount you could win, your decision will be determined entirely by the expected pay-off of the game
- The maximum that you will pay is the expected pay-off, so that your expected winnings are zero
- We have:
  - Expected pay-off $= 0.25 \times 100 + 0.25 \times 36 - 0.50 \times 12 = \$28$
  - So if you spend $28 to play the game, your expected winnings are zero
- If the $100 pay off never happens, then the probabilities for pay offs $36 and -$12 become 0.25/0.75=1/3 and 0.50/0.75=2/3
- In this case, the expected pay off is $1/3 \times 36 - 2/3 \times 12 = \$4$, which is the most that you would pay to play the game in this case

Online assignment #4

Question 3 pts

Suppose that we have a fair five sided dice as follows:

Face on top	1	2	3	4	5
Probability	1/5	1/5	1/5	1/5	1/5

Suppose also that we have a signal calls 'Odd' or 'Even' that is correct 60% of the time.

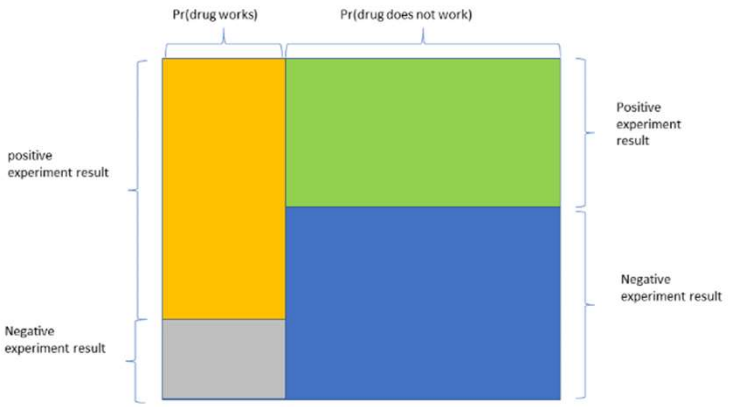
What is the probability that the dice roll is 3 given that the signal has called 'Odd'?

- We have:
  - $\Pr(dice\ roll\ is\ 3\ given\ signal\ has\ called\ 'odd') = \frac{\Pr(dice\ roll\ is\ 3\ and\ signal\ is\ correct)}{\Pr(dice\ roll\ is\ odd\ and\ signal\ is\ correct)+\Pr(dice\ roll\ is\ even\ and\ signal\ is\ incorrect)}$
  - $\Pr(dice\ roll\ is\ 3\ and\ signal\ is\ correct) = \frac{1}{5}\times\frac{6}{10} = \frac{12}{100}$
  - $\Pr(dice\ roll\ is\ odd\ and\ signal\ is\ correct) = \frac{3}{5}\times\frac{6}{10} = \frac{36}{100}$
  - $\Pr(dice\ roll\ is\ even\ and\ signal\ is\ incorrect) = \frac{2}{5}\times\frac{4}{10} = \frac{16}{100}$
  - Therefore:
    - $\Pr(dice\ roll\ is\ 3\ given\ signal\ has\ called\ 'odd') = \frac{12/100}{\frac{36}{100}+\frac{16}{100}} = \frac{12}{52} \approx 0.23$

Online assignment #4

Question 2 pts

In the diagram below, what is the probability that the drug works conditional on a negative experiment result?



- Probability that the drug works conditional on a negative experiment result = Probability that the drug works and a negative experiment result/Probability of a negative experiment result
- This is equal to the grey area/(grey area + blue area)

Online assignment #4

Question 4 pts

In this question, assume that we are using the framework of Weitzman's Sequential Search Model discussed in the lectures.

Suppose that we have two boxes, A and B as follows:

	Box A		Box B	
Pay-off	30	0	10	0
Probability	0.25	0.75	0.8	0.2
Cost	5		2	

Now suppose that we have three strategies to open the boxes, as follows:

Strategy 1: Open both boxes in any case

Strategy 2: Open box B first and then box A only if the prize is zero in box B

Strategy 3: Open box A first and then box B only if the prize is zero in box A

Choose which of the below shows:

(i) Box with highest expected value

(ii) Strategy with the highest expected value

(iii) The expected value in your answer to (ii)

- Expected value of Box A $= 0.25 \times 30 - 5 = 2.5$
- Expected value of Box B $= 0.80 \times 10 - 2 = 6$
  - So Box B has the higher expected value
- Expected value of Strategy 1 $= 0.25 \times 30 + (1 - 0.25) \times 0.80 \times 10 - 5 - 2 = 6.5$
- Expected value of Strategy 2 $= 0.80 \times 10 - 2 + (1 - 0.80) \times (0.25 \times 30 - 5) = 6.5$
- Expected value of Strategy 3 $= 0.25 \times 30 - 5 + (1 - 0.25) \times (0.80 \times 10 - 2) = 7$
  - So Strategy 3 has the highest expected value, which is 7

Online assignment #4

Question 3 pts

Suppose that it is the pre-Covid era, and that we are deciding which movie to go and see. Our choice depends on two factors: (i) the movie's rating (1-10) on Rotten Tomatoes and (ii) How much money the movie has taken at the (US) box office (normalised between 1-10).

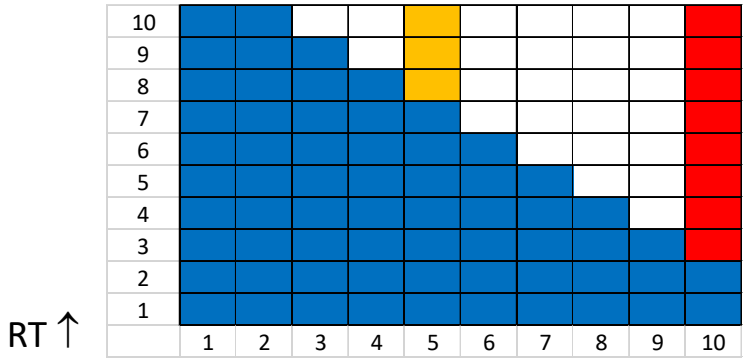
A movie is considered if and only if it makes the Cut, c:

$$Box\ Office\ (BO)\ +\ Rotten\ Tomatoes\ (RT) \geq c$$

Suppose that $c = 13$.

Assume that the probabilities of BO and RT are distributed uniformly (eg Pr(BO=1)=10% etc) and that BO and RT are statistically independent.

What is the expected RT score given that a movie is amongst those that you are considering and that its BO score is (i)10 and (ii) 5?



Given that a movie is amongst those that we are considering:

(i) Expected RT score given BO $= 10$ is $\frac{1}{8} \times [3 + 4 + 5 + 6 + 7 + 8 + 9 + 10] = \frac{52}{8} = 6.5$

(ii) Expected RT score given BO $= 5$ is $1/3 \times [8 + 9 + 10] = 9$

Online assignment #4

Question 2 pts

Choose the correct options in the following statement:

A[ans1] is a complete description of an outcome in the environment that is relevant to us. The set of all possible[ans2] is called the[ans3]. A(n)[ans4] is a subset of the[ans5].

- The text should read:
  - A state is a complete description of an outcome in the environment that is relevant to us. The set of all states is called the state space. An event is a subset of the state space.