CSC520 Fall 2021 Assignment 4
Due October 27th at 11:59pm

This assignment consists of two questions which involve written answers and code. In order to complete the assignment you must submit a written report in pdf form detailing your answers to the questions as well as your code. As discussed in class all work *must* be your own. You may not use third party libraries or example code to complete the assignment with the exception of csv file loaders. All reports must be clear and well written. All code must be clear, readable, and well-commented. Upload your report as a file called `<unityid>-Assign4.pdf` and your sourcecode in a zip called `<unityid>-Assign4.zip`.

Question 2 Graphplan Planning (85 points)

For this assignment your task is to implement the two stages)graph construction and plan extraction) of the GraphPlan algorithm using either Java or Python. You have been given a text file containing a simple planning problem in PDDL format. Your task is to build code that will:

1. Read in the file for processing.

2. Generate a graphplan graph in memory representing the problem, printing out the steps taken and listing all of the mutex arcs found at each level.

3. Extract a plan from it (if any can be extracted) and present the partial order.

Your code should be called as follows:

```
python GraphPlan.py <InFile>
```

Your code should be clean and well-written. On execution your code should log the steps taken (e.g. each layer generated) as it goes. On completion you should print the partial list to the user as an ordered list of lists:

```
[(Act1), (Act2, Act3), ...]
```

You may use standard libraries to support your graph structure *provided they are installed on the vcl* and you may use regular expressions to support file processing. You are encouraged to draw the graph by hand and use sample problems from class to test your code.

Question 1 Decision Theory (20 points)

Consider the sample decision theory problem below and the associated followup questions.

> You are considering buying a $300,000 house. Because it is older, there is a 20% chance the house has serious structural problems and it would need to be torn down leaving you with only the lot value ($30,000). Otherwise it will be worth the asking price. You need to pay a $10,000 deposit to get it inspected. There is a 10% chance the inspection will find problems if they exist. Or you can pay $5,000 more for a premium inspection which has a 30% chance of finding problems. If any problems are found you will get your $10,000 deposit back.

1. Draw a complete decision tree for the problem as stated showing the value of each outcome as well as the best decision to make in each case.

2. Now, building on the decision tree above, suppose that you had to buy a house but you were given a choice of 3 homes, one at the top end of your budget ($800k), one in the middle ($500k), and the current choice. Each house has a chance of serious defects but the same lot value. However the middle and upper houses have a lower chance of the inspection finding anything because the paint is new (standard inspection 5% premium 20%). Show the expanded decision tree with outcomes and decision values.

3. Finally, suppose that you have a chance that a new slaughterhouse will be built near your home which would cut the value down by $100k. The odds of this would be different for each house. What is the *minimum* chance of this happening that would make the house choices have equal value? Show the expanded tree and decision values along with your answer.