Course Name: Simulation and Modelling	Course Code: CS4056
Semester: Spring Section: BSE 6A/B	Instructor Name: Shahid Ashraf

Question 1

Suppose you have an innovative product that you have been selling for the past year. You have decided to apply for a patent to protect your IP, but you also did that in order to increase sales as you are aware that businesses deem a patented product more worthy. Let's make the following assumptions:

- There is a 50% chance that your product gets patented

- If it does get patented, your sales go up by 25% - 75%, with 50% being the most likely case.

- Without a patent you expect to sell between $1 - $ 9 million next year, with $3 million being the most likely case.

- We do not have to consider any costs or expenses

Suppose a wholesaler offers to buy your entire production and inventory for the year for $6 million (you won't be able to sell anything else), would you accept the offer? carry out MonteCarlo Simulation 100000 times and find

- Average sales we would expect if we don't accept the wholesaler's deal

- The probability of selling more than $6 million (offered deal)

- Is it a good deal.

```python
import numpy as np
# Specify number of monte carlo simulations
N_ROUNDS = 100
results = []
for rnd in range(N_ROUNDS):
    prob_patent = np.random.randint(0, 2)
    base_sales = round(np.random.triangular(1e6, 3e6, 9e6)
        / 1000000, 2)
    patent_markup = np.random.triangular(0.25, 0.5, 0.75)
    sales = round(base_sales + (base_sales
        * prob_patent * patent_markup), 2)

    results.append(sales)
```

Question 2

- Carry out the above simulation with N= 10000,N=1000, compare all three results.

- Suppose we require to achieve sales of +11 Million, What % chance does Montecarlo simulation promise to achieve this number