1. Binomial tree option pricing

Write a **function** to estimate the price of a standard **European** option. It receives all required inputs as **function arguments** including the number of steps and the type of option (Call or Put)

A. The program should display the tree.
B. Report a comparison of your results with the results obtained by DerivaGem only for one sample.

2. Gap option & Standard option using Monte Carlo simulation

In this problem, the goal is to determine two types of options prices by using Monte Carlo simulation. you are required to **randomly** select **10** European call options **exercise prices** and S_0. Then, you estimate the prices of both **gap** and **standard** call using Monte Carlo simulation approach, assume that the asset S(t) follows the Geometric Brownian motion. Simulate at least 1000 paths for each estimation. The option price corresponds to the average value of its discounted future payouts under the risk- neutral probability.

A. Report the results in only **one** table that includes following results: (hint: pandas DataFrame can be used for this purpose)
   I. Stock price
   II. Strike price (K_1)
   III. Second strike price (K_2)
   IV. Gap option price using Monte Carlo
   V. Standard option prices using Monte Carlo
   VI. Standard option prices using BSM model
   VII. Column 4 – Column 5
   VIII. $(K_2 - K_1)e^{-rt}N(d_2)$

B. Plot one of the path price movement in Monte Carlo
C. Compare seventh and eighth columns.
D. Is GBM-based estimation reliable? (hint: it can be resulted from comparison of fourth and fifth columns)

S_0	K_1	K_2	T	Volatility	Risk-free rate
Lognormal distribution with **μ=95 , σ=10**	Integers in range **[80,90]**	Integers in range **[90,100]**	**1 year**	**25%**	**12%**

Gap option:
If $S_T \geq K_1 \Longrightarrow call\ payoff = S_T - K_2$