Consider the above two-step binomial tree, with each step being three months, $\Delta t = 0.25$. The stock price is shown on the tree. The continuously compounding interest rate is assumed to be constant at 5% per year. There is no dividend or other payoffs from the security. The $(A), (B), \ldots, (F)$ are just notations so that you know which node I am talking about. You can also use them to explain your answers.

1. Consider an at-the-money spot ($K = S_t$) call option with three-month maturity.
   (a) List all the possible stock prices at the call option expiration under the binomial model.
   (b) What is the payoff to this call option at the expiration at each possible stock price level?
   (c) Calculate the fair value and delta of the option, using whichever method you feel comfortable with.
   (d) Suppose a market maker is willing to make the call option market at $3.5$, with zero bid-ask spread, and you can trade without transaction cost on the stock at $100$, and the bond at 5% rate. Can you do an arbitrage trading to lock in money under the binomial assumption? How?

2. Try a similar example on a $102$-strike three-month put.
   (a) What is the payoff to this put option at the expiration at each possible stock price level?
   (b) Calculate the fair value and delta of this put option.
   (c) Suppose a market maker is willing to make the put option market at $2.5$, with zero bid-ask spread, and you can trade without transaction cost on the stock at $100$, and the bond at 5% rate. Can you do an arbitrage trading to lock in money under the binomial assumption? How?

3. Value a three-month put at strike $90$.

4. Value a three-month put at strike $110$.

5. Value a six-month call at strike $100$.
   (a) List all the possible stock prices at the call option expiration under the binomial model.
   (b) What is the payoff to this call option at the expiration at each possible stock price level?
   (c) Calculate the fair value and delta of this call option.