Practice Exercises
Decision Tree Models

1. Insurance Coverage

The owner of a small business is considering whether to buy an insurance policy to cover hail damage on his inventory of goods stored in open air. Thunderstorms sometimes produce golf ball sized hail that can create serious damage. The potential damage from hail in the next year is estimated as follows:

Hail damage (in $1,000s)	0	15	50	70	100
Probability	.25	.10	.30	.25	.10

The business owner has three alternatives for dealing with this risk:

- buying an insurance policy for $47,000 that would cover 100% of any losses that occur;
- buying an insurance policy for $21,000 with a $35,000 deductible, i.e., that would cover the part of losses exceeding $35,000;
- self-insuring, in which case he will not have to pay any insurance premium but will pay for any losses that occur.

a) Build a decision tree model to analyze this decision.

b) What is the best decision based on expected value?

c) Is the Expected Value an appropriate decision criterion here? Discuss.

d) Which alternative is riskier?

2. Contract Bid

HydrauSpec can bid on a government contract for 100,000 high-pressure valves to be used in the hydraulic systems of aircraft. They estimate that these valves could be manufactured by their existing equipment at a cost of £12 per unit. However, one of their engineers has suggested a new process for manufacturing the valves. The unit cost for the new process will be £8 if all goes well. If complications arise however, the cost would be prohibitive, so they would have to return to the old process. The engineers estimate the probability of no complications at 0.6 and the probability of complications at 0.4. The investment required for the new process is £100,000, which would not be recoverable.

The company must make its bid on the contract before the new process can be fully developed and tested. Bids of £16 and £14 are under consideration and the estimated probabilities of obtaining the contract with each bid are 0.5 and 0.7, respectively. If HydrauSpec's bid is rejected, there is no possibility of submitting a second bid.

Build a decision tree to help HydrauSpec determine an optimal bidding and production strategy.

3. Selling Shares and Option Value

Omar must decide between selling his 10,000 shares of ADZ, Inc. now and holding them until after the earnings are reported in two weeks. He can keep them no longer than two weeks because he needs the cash, and he believes the price will either go up by 20% (to $12 per share) or down by 10% (to $9) at the end of the two weeks. He thinks that the current price of $10 will not change until after the announcement on earnings. He believes that a price increase is slightly more likely than a decrease, and he assesses the probabilities as 60% and 40%, respectively.

a) Draw a decision tree to represent Omar's decision. Based on expected value, what is the best alternative?

b) Suppose a European Put Option is available on the shares, with a strike price of $10 and an expiration date two weeks from now. This Option would give Omar the right, but not the obligation, to sell his shares at the price of $10 in two weeks. Add to the decision tree to represent the alternative of having the Put Option. Based on expected value, how much is this option worth?

c) Examine how the option value calculated in (b) changes as a function of the share price decrease (create a table or graph of option value when share price downside variation changes from 0% to 40%).