Discussion Questions

1. Identify the six steps in the decision process.
2. Give an example of a good decision you made that resulted in a bad outcome. Also give an example of a bad decision you made that had a good outcome. Why was each decision good or bad?
3. What is the *equally likely* decision model?
4. Discuss the differences between decision making under certainty, under risk, and under uncertainty.
5. What is a decision tree?
6. Explain how decision trees might be used in several of the 10 OM decisions.

1.The 6 steps of the decision process are:
a. Clearly define the problem and the factors that influence it.
b. Develop specific and measurable objectives. **c.** Develop a model.
d. Evaluate each alternative solution. **e.** Select the best alternative. **f.** Implement the solution.

2.The purpose of this question is to make students use a personal experience to distinguish between good and bad decisions. A "good" decision is one that is based on logic and all available information. A "bad" decision is one that is not based on logic and all available information. It is possible for an unfortunate or undesired outcome to result from a "good" decision (witness a patient expiring after open-heart surgery). It is also possible to have a favorable or desirable outcome result from a "bad" decision (you win at Blackjack, even though you drew a card when you already held an "18").

3.The **equally likely** model selects the alternative with the highest *average* value; it assumes each state of nature is equally likely to occur.

4.The basic difference between decision making under certainty, risk, or uncertainty is based on the nature and amount of chance or risk that is involved in making the decision. Decision making under **certainty** assumes that we know with complete confidence the outcomes that result from our choice of each alternative. Decision making under **risk** implies that we do not know the specific outcome that will result from our choice of a particular alternative, but that we do know the set of *possible* outcomes, and that we are able to objectively measure or estimate the probability of occurrence of each of the outcomes in the set. Decision making under **uncertainty** implies that we do not know the specific outcome that will result from our choice of a particular alternative; we know only the set of *possible* outcomes and are unable to objectively measure or estimate the probability of occurrence of any of the outcomes in the set.

5. A decision tree is a graphic display of the decision process that indicates decision alternatives, states of nature and their respective probabilities, and payoffs for each combination of alternative and states of nature.

6. Decision trees can be used to aid decision making in such areas as capacity planning, new product analysis, location analysis, scheduling, and maintenance.

7. What is the expected value of perfect information?
8. What is the expected value *with* perfect information?
9. Identify the five steps in analyzing a problem using a decision tree.
10. Why are the maximax and maximin strategies considered to be optimistic and pessimistic, respectively?
11. The expected value criterion is considered to be the rational criterion on which to base a decision. Is this true? Is it rational to consider risk?
12. When are decision trees most useful?

Discussion Questions

7. EVPI is the difference between payoff under certainty and maximum EMV under risk.

8. Expected value with perfect information is the expected return if we have perfect information about the states of nature before a decision has to be made.

9. Decision tree steps:

1. Define the problem
2. Structure or draw the decision tree
3. Assign probabilities to the states of nature
4. Estimate payoffs for each possible combination of alternatives and states of nature
5. Solve the problem by computing the EMV for each state of nature node.

10. Maximax considers only the best outcomes, while maximin considers only worst-case scenarios.

11. Expected values is useful for repeated decisions because it is an averaging process. However, it averages out the extreme outcomes. A rational decision maker is concerned with these extreme outcomes and will incorporate them into the decision-making process.

12. Decision trees are most useful for sequences of decisions under risk.

••• **A.2** Even though independent gasoline stations have been having a difficult time, Susan Helms has been thinking about starting her own independent gasoline station. Susan's problem is to decide how large her station should be. The annual returns will depend on both the size of her station and a number of marketing factors related to the oil industry and demand for gasoline. After a careful analysis, Susan developed the following table:

Size of First Station	Good Market ($)	Fair Market ($)	Poor Market ($)
Small	50,000	20,000	−10,000
Medium	80,000	30,000	−20,000
Large	100,000	30,000	−40,000
Very large	300,000	25,000	−160,000

For example, if Susan constructs a small station and the market is good, she will realize a profit of $50,000.

a) Develop a decision table for this decision, like the one illustrated in Table A.2 earlier.
b) What is the maximax decision?
c) What is the maximin decision?
d) What is the equally likely decision?
e) Develop a decision tree. Assume each outcome is equally likely then find the highest EMV. Px

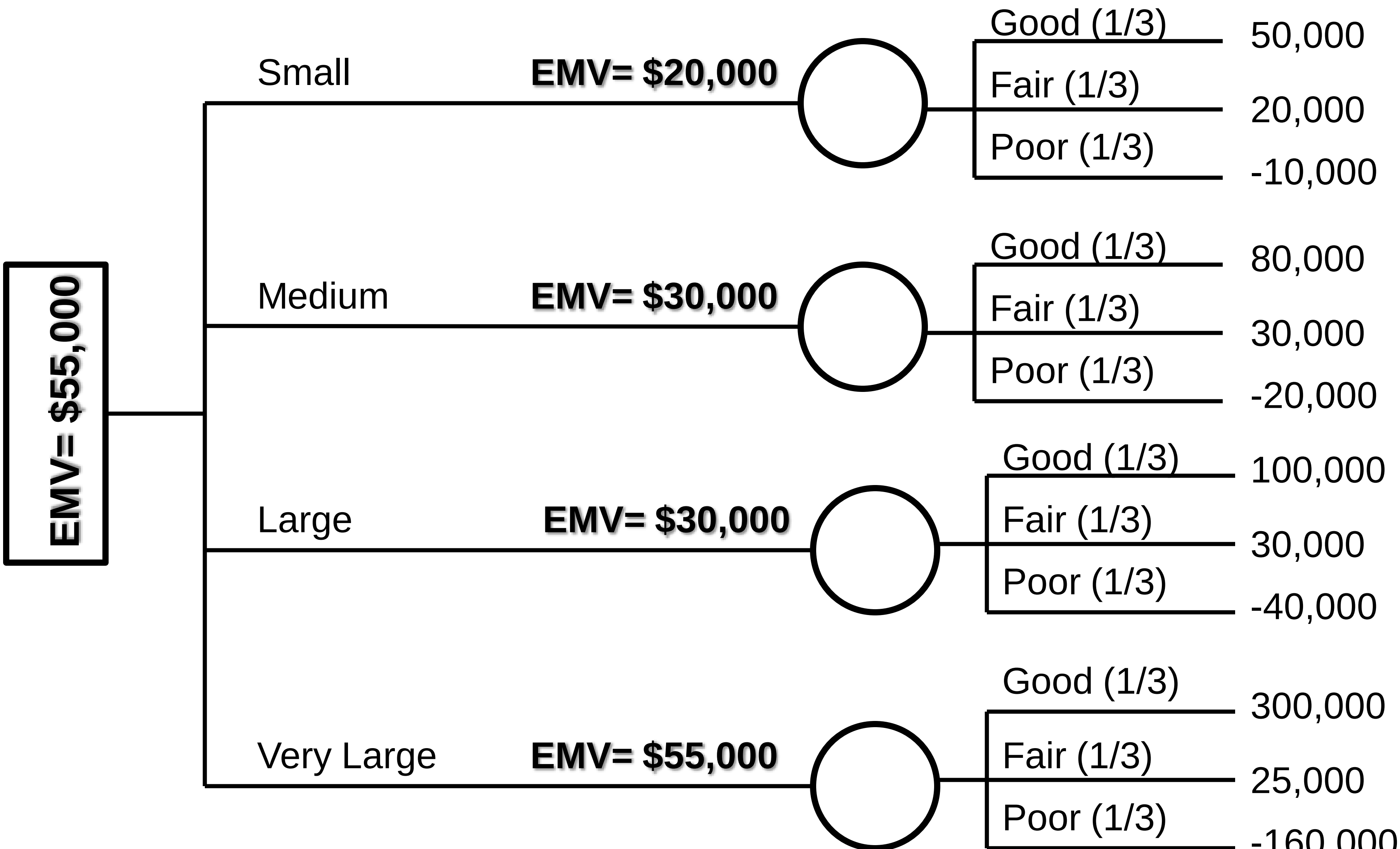
EXERCISE A.2

Option	Good Market	Fair Market	Poor Market	Row Min	Row Max	Row Avg.
Small	50,000	20,000	-10,000	-10 k	50 k	20 k
Medium	80,000	30,000	-20,000	-20 k	80 k	30 k
Large	100,000	30,000	-40,000	-40 k	100k	30 k
Very Large	300,000	25,000	-160,000	-160 k	300k	55 k

Maximin = -10,000 (Small Station)
Maximax = 300,000 (Very Large Station)
Equally Likely = 55,000 (Very Large Station)

EXERCISE A.2

(e)



• **A.3** Clay Whybark, a soft-drink vendor at Hard Rock Cafe's annual Rockfest, created a table of conditional values for the various alternatives (stocking decision) and states of nature (size of crowd):

	States of Nature (demand)		
Alternatives	**Big**	**Average**	**Small**
Large stock	\$22,000	\$12,000	–\$2,000
Average stock	\$14,000	\$10,000	\$6,000
Small stock	\$ 9,000	\$ 8,000	\$4,000

The probabilities associated with the states of nature are 0.3 for a big demand, 0.5 for an average demand, and 0.2 for a small demand.

a) Determine the alternative that provides Clay Whybark the greatest expected monetary value (EMV).

b) Compute the expected value of perfect information (EVPI).

EXERCISE A.3

(a)

EMV(large stock) = 0.3(22) + 0.5(12) + 0.2(–2) =**12.2**

EMV(average) = 0.3(14) + 0.5(10) + 0.2(6) =**10.4**

EMV(small) = 0.3(9) + 0.5(8) + 0.2(4) = **7.5**

Maximum EMV is large inventory = **12.2** = **$12,200**

(b)

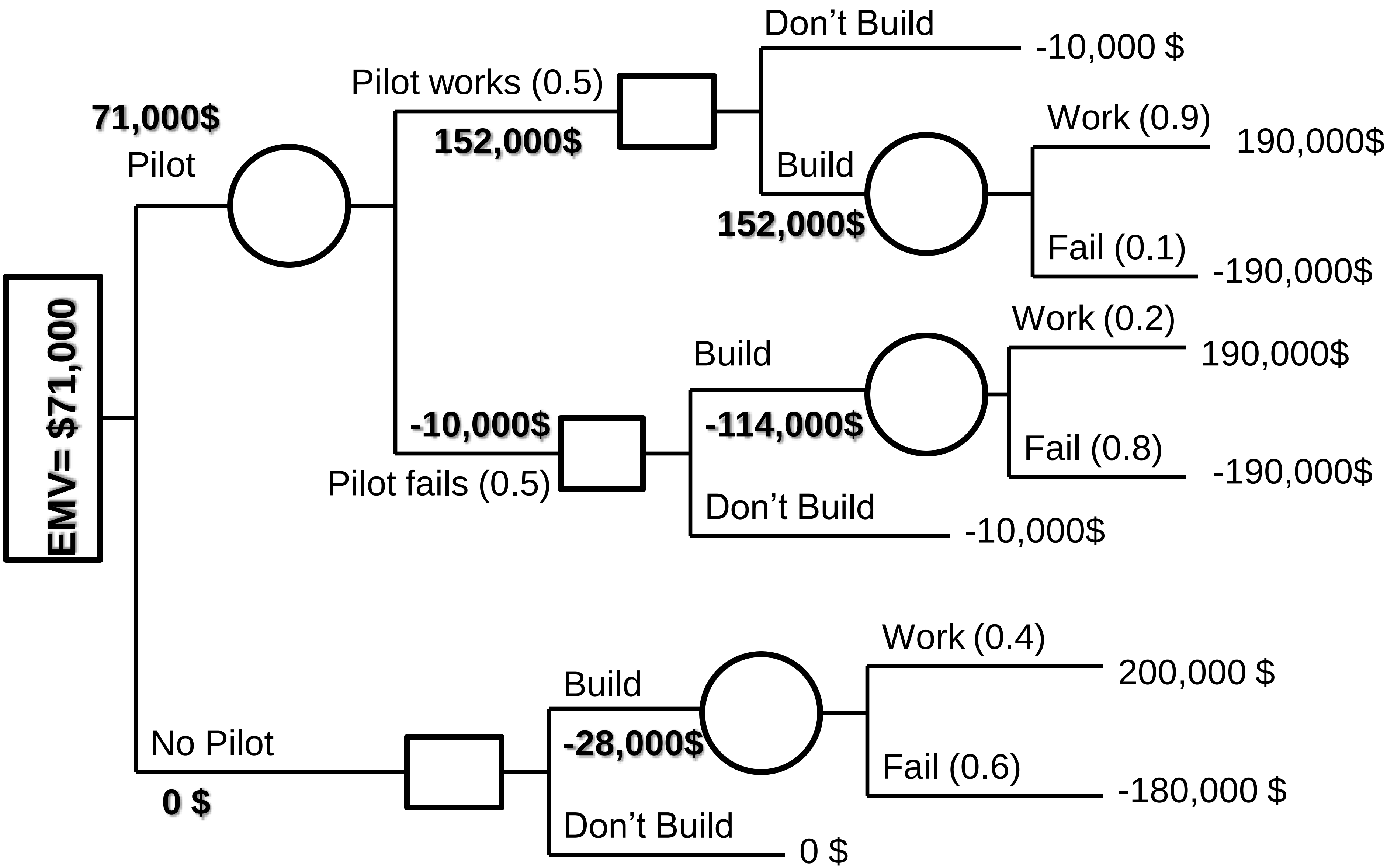
EVwPI= 0.3(22) + 0.5(12) + 0.2(6) = 13,800

EVPI = EVwPI – EMV_{max} =13,800 – 12,200 = $1,600

••• **A.13** Ronald Lau, chief engineer at South Dakota Electronics, has to decide whether to build a new state-of-the-art processing facility. If the new facility works, the company could realize a profit of $200,000. If it fails, South Dakota Electronics could lose $180,000. At this time, Lau estimates a 60% chance that the new process will fail.

The other option is to build a pilot plant and then decide whether to build a complete facility. The pilot plant would cost $10,000 to build. Lau estimates a 50-50 chance that the pilot plant will work. If the pilot plant works, there is a 90% probability that the complete plant, if it is built, will also work. If the pilot plant does not work, there is only a 20% chance that the complete project (if it is constructed) will work. Lau faces a dilemma. Should he build the plant? Should he build the pilot project and then make a decision? Help Lau by analyzing this problem. PX

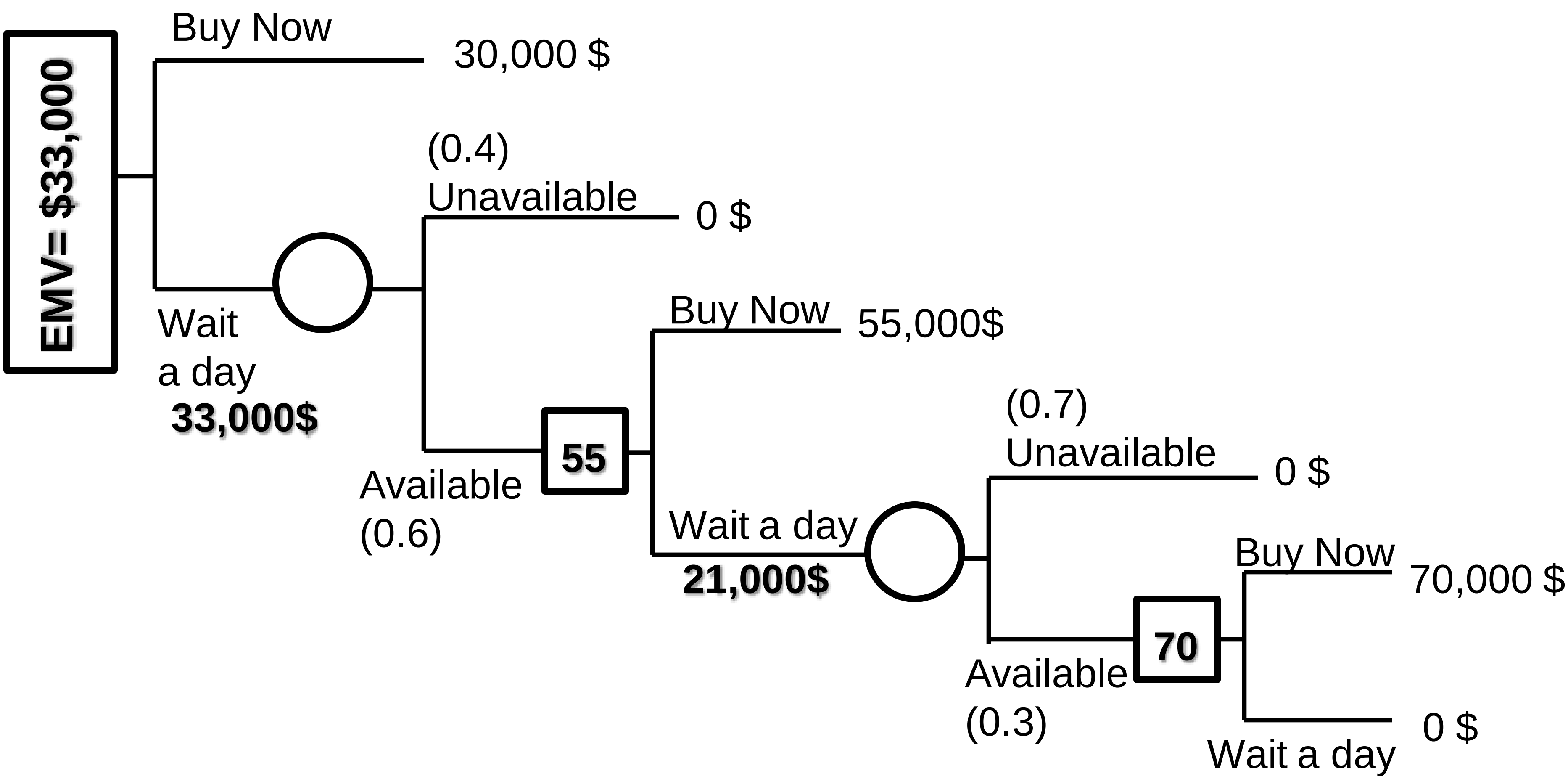
EXERCISE A.13



•••• **A.21** Jeff Kaufmann's machine shop sells a variety of machines for job shops. A customer wants to purchase a model XPO2 drilling machine from Jeff's store. The model XPO2 sells for \$180,000, but Jeff is out of XPO2s. The customer says he will wait for Jeff to get a model XPO2 in stock. Jeff knows that there is a wholesale market for XPO2s from which he can purchase an XPO2. Jeff can buy an XPO2 today for \$150,000, or he can wait a day and buy an XPO2 (if one is available) tomorrow for \$125,000. If at least one XPO2 is still available tomorrow, Jeff can wait until the day after tomorrow and buy an XPO2 (if one is still available) for \$110,000.

There is a 0.40 probability that there will be no model XPO2s available tomorrow. If there are model XPO2s available tomorrow, there is a 0.70 probability that by the day after tomorrow, there will be no model XPO2s available in the wholesale market. Three days from now, it is certain that no model XPO2s will be available on the wholesale market. What is the maximum expected profit that Jeff can achieve? What should Jeff do?

EXERCISE A.21



Quiz

You walking in the street at night with a case of 39,000$ and a mugger blocked your way asking for your money. You have the choice either to give away your money and leave in peace or like a man you stand up to him. If you would stand up to him, there’s a chance of 80% that the mugger might run away. However, if you both had a fight, your chance of beating him is 45%.

Construct a decision tree and recommend a course of action.

HW

A.22

A.23

A.24