PROGRAM 3.2A
Excel QM Results for Thompson Lumber Example

	A	B	C	D	E	F	G	H	I
1	Thompson Lumber								
2									
3	Decision Tables								
4									
5									
6									
7	Profit	Favorable Market	Unfavorable Market		EMV	Minimum	Maximum		
8	Probability	0.5	0.5						
9	Large plant	200000	-180000		10000	-180000	200000		
10	Small plant	100000	-20000		40000	-20000	100000		
11	Do nothing	0	0		0	0	0		
12				Maximum	40000	0	200000		
13									
14	Expected Value of Perfect Information								
15	Column best	200000	0		100000	<-Expected value WITH perfect information			
16					40000	<-Best expected value			
17					60000	<-Expected value OF perfect information			
18									
19	Regret								
20		Favorable Market	Unfavorable Market		Expected	Maximum			
21	Probability	0.5	0.5						
22	Large plant	0	180000		90000	180000			
23	Small plant	100000	20000		60000	100000			
24	Do nothing	200000	0		100000	200000			
25				Minimum	60000	100000			

To see the formulas, hold down the control key (Ctrl) and press the ` (grave accent) key, which is usually found above the Tab key.

Enter the profits in the main body of the data table. Enter probabilities in the first row if you want to compute the expected value.

PROGRAM 3.2B
Key Formulas in Excel QM for Thompson Lumber Example

	E	F	G
9	=SUMPRODUCT($B$8:$C$8,B9:C9)	=MIN(B9:C9)	=MAX(B9:C9)
10	=SUMPRODUCT($B$8:$C$8,B10:C10)	=MIN(B10:C10)	=MAX(B10:C10)
11	=SUMPRODUCT($B$8:$C$8,B11:C11)	=MIN(B11:C11)	=MAX(B11:C11)
12	=MAX(E9:E11)	=MAX(F9:F11)	=MAX(G9:G11)
13			
14			
15	=SUMPRODUCT($B$8:$C$8,B15:C15)	<-Expected value W	
16	=E12	<-Best expected val	
17	=E15-E12	<-Expected value O	
18			
19			
20	Expected	Maximum	
21			
22	=SUMPRODUCT($B$8:$C$8,B22:C22)	=MAX(B22:C22)	
23	=SUMPRODUCT($B$8:$C$8,B23:C23)	=MAX(B23:C23)	
24	=SUMPRODUCT($B$8:$C$8,B24:C24)	=MAX(B24:C24)	
25	=MIN(E22:E24)	=MIN(F22:F24)	

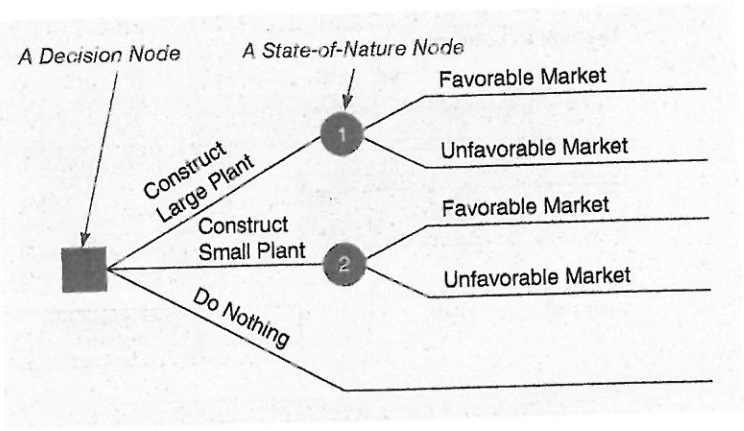
3.8 Decision Trees

Any problem that can be presented in a decision table can also be graphically illustrated in a **decision tree**. All decision trees are similar in that they contain *decision points* or **decision nodes** and *state-of-nature points* or **state-of-nature nodes**:

- A decision node from which one of several alternatives may be chosen
- A state-of-nature node out of which one state of nature will occur

In drawing the tree, we begin at the left and move to the right. Thus, the tree presents the decisions and outcomes in sequential order. Lines or branches from the squares (decision nodes) represent alternatives, and branches from the circles represent the states of nature. Figure 3.2 gives the basic decision tree for the Thompson Lumber example. First, John decides whether to construct a large plant, a small plant, or no plant. Then, once that decision is made, the possible states of nature or outcomes (favorable or unfavorable market) will occur. The next step is to put the payoffs and probabilities on the tree and begin the analysis.

FIGURE 3.2
Thompson's Decision Tree



Analyzing problems with decision trees involves five steps:

Five Steps of Decision Tree Analysis

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 EMVs for each state-of-nature node. This is done by working backward, that is, starting at the right of the tree and working back to decision nodes on the left. Also, at each decision node, the alternative with the best EMV is selected.

The final decision tree with the payoffs and probabilities for John Thompson's decision situation is shown in Figure 3.3. Note that the payoffs are placed at the right side of each of the tree's branches. The probabilities are shown in parentheses next to each state of nature. Beginning with the payoffs on the right of the figure, the EMVs for each state-of-nature node are then calculated and placed by their respective nodes. The EMV of the first node is $10,000. This represents the branch from the decision node to construct a large plant. The

FIGURE 3.3
Completed and Solved Decision Tree for Thompson Lumber