

a. Assume that you are responsible for designing a machine shop. How would you determine an acceptable level of noise? What costs and risks should you weigh?

5.12 Epidemiological data indicate that only a handful of patients have contracted the AIDS (acquired immune deficiency syndrome) virus from health care workers. Many, though, have called for the periodic testing of all health care workers in an effort to protect or at least reduce the risks to the public. Identify the costs and benefits associated with such a program. Develop an implementation plan for nationwide testing. How would you go about measuring the costs of the plan? What are the costs and risks of not testing?

5.13 As chief industrial engineer in a manufacturing facility, you are contemplating the replacement of the spreadsheet procedures that you are now using for production scheduling and inventory control with a material requirements planning system. A number of options are available. You can do it all at once and throw out the old system, you can phase in the new system over time, you can run both systems simultaneously, and so on. Identify the costs, benefits, and risks with each approach. Construct a decision tree for the problem. Assume that the benefits of any option depend on the future state of the economy, which may be "good" or "bad" with probabilities 0.7 and 0.3, respectively.

5.14 The daily demand for a particular type of printed circuit board in an assembly shop can assume one of the following values: 100, 120 or 130 with probabilities 0.2, 0.3 and 0.5. The manager of the shop thus is limiting her alternatives to stocking one of the three levels indicated. If she prepares more boards than are needed in the same day, then she must reprocess those remaining at a cost price of 55 cents/board. Assuming that it costs 60 cents to prepare a board for assembly and that each board produces \$1.05 in revenue, find the optimal stocking level by using a decision tree model.

5.15 In Exercise 5.14, suppose that the owner wishes to consider her decision problem over a 2-day period. Her alternatives for the second day are determined as follows. If the demand in day 1 is equal to the amount stocked, then she will continue to order the same quantity on the second day. Otherwise, if the demand exceeds the amount stocked, then she will have the options to order higher levels of stock on the second day. Finally, if day 1's demand is less than the amount stocked, then she will have the options to order any of the lower levels of stock for the second day. Express the problem as a decision tree, and find the optimal solution using the cost data given in Exercise 5.14.

5.16 Zingtronics Corp. has completed the design of a new graphic-display unit for computer systems and is about to decide on whether it should produce one of the major components internally or subcontract it to another local firm. The advisability of which action to take depends on how the market will respond to the new product. If demand is high, then it is worthwhile to make the extra investment for special facilities and equipment needed to produce the component internally. For low demand, it is preferable to subcontract. The analyst assigned to study the problem has produced the following information on costs (in thousands of dollars) and probability estimates of future demand for the next 5-year period:

Action	Future demand		
	Low	Average	High
Produce	\$140	\$120	\$90
Subcontract	\$100	\$110	\$160
Probability	0.10	0.60	0.30

- Prepare a decision tree that describes the structure of this problem.
- Select the best action on the basis of the initial probability estimates for future demand.