1. **Motion pictures**

    The manager of a motion picture studio faces three marketing choices for a new film. He can either sell the film to a TV network for 10 million dollars or distribute the film as an "A" feature, or distribute the film as a "B" feature. The values associated with distributing the film as an "A" or "B" feature depends on whether the film is a box office success or not and are summarized in the table given below (all figures are in millions of dollars).

BOX OFFICE RESULT	DISTRIBUTE AS "A" FEATURE	DISTRIBUTE AS "B" FEATURE
Success	50	30
Failure	-20	-10

    The probability of box office success has been assessed at 0.3.
    a. Construct a decision tree describing the decision problem. Clearly indicate the decision nodes, event nodes, probabilities, and monetary outcomes. What is the optimal decision and what is its expected monetary value?
    b. Suppose that the motion picture company could somehow learn in advance if the movie will be a box office success or not. How much would that information be worth to the company?
    c. A consultant suggested that an expenditure of 2 million dollars on a promotional campaign over the planning horizon will effectively increase the probability of a box office success to 0.4. Is it a good investment?
    d. The consultant reconsiders its promotion strategy and comes up with a plan to target a more selected crowd and will sell this campaign to you at 2 million dollars. How much has the success probability to increase to make it an offer worth considering?

2. **The Rider Club**

    The Rider Club, has a small side business selling tractor lawn-mowers to their high-end members. Rider buys the mowers at a price of $4,800. Rider offers an installment plan at a net present value of $5,400 to their customers. The default rate of the customers on the installment plan is 10%. On average, Rider recovers $1,400 from defaulters. (Non-defaulters pay the full value of $5,400.)
    Assume that customers who sign up for the installment plan would not buy tractor lawn-mowers from Rider if they were not offered the installment plan.

    a. Would you recommend offering the proposed installment plan or should they stop offering it? What is the expected monetary value of the installment plan?
    b. What is the expected value of information about a customer being a defaulter (D) or a non-defaulter (ND)?
    c. The company can buy credit-rating information on customers before signing them up for an installment plan. This information will indicate whether a customer is a high-risk (HR)

or a low-risk (LR). The credit-rating service claims the following conditional probabilities (obtained from historical frequencies): $P(HR|D) = 0.65$ and $P(LR|ND) = 0.7$. The rating service charges $20 per customer for this information. Should Rider buy this information?

3. **Rusty Properties**

   Rusty Properties is planning to build a condominium development in El Segundo, California. The company is trying to decide between building a small, medium, or large development. The payoffs received for each size of development will depend on the market demand for condominiums in the area, which could be low or high. The payoff matrix (given in $1,000) for this decision problem is:

Size of Development	Market Demand	
	Low	High
Small	300	300
Medium	200	500
Large	-400	900

   The owner of the company estimates a 25% chance that market demand will be low.
   a. What decision should be made to maximize the expected monetary value?
   b. Suppose the probability for low market demand was unknown. For what range in probabilities should the company build a large development? For what range would the medium development be optimal?

4. **Cable Television**

   A cable television company is considering extending its services to a rural community. The company's managing director believes that there is a 0.60 chance that profits from the service will be high and amount to $760,000 in the first year (case H), and a 0.40 chance that profits will be low and amount to $400,000 for the year (case L). An alternative operation promises a sure profit of $500,000 for the period in question (case A).

   a. Construct the decision tree and determine the optimal decision.
   b. The company may test the potential of the rural market at a cost of $25,000. The test has a 90% probability of correctly detecting the state of nature, i.e. of forecasting high in case H and forecasting low in case L. Determine
      i. the joint probability of the test yielding a high forecast and observing high profits;
      ii. the (marginal) probability of the test yielding a high forecast;
      iii. the probability of observing high profits given a high forecast;
      iv. and the probability of observing high profits given a low forecast.
   c. Would you recommend to do the test described in part b?
   d. The test provider considers changing its prices. What is the maximum price the company could charge for you to be interested in buying the test?