**Decision Analysis Sample Exam**

**Problem 1:** National Foods has developed a new sports beverage it would like to advertise on Super Bowl Sunday. National’s advertising agency can purchase one, two or three 30-second commercials advertising the drink and estimates that the return will be based on Super Bowl viewership. Viewership, in turn, is based on fans’ perception of whether the game is “dull”, “average”, “above average”, or “exciting”.

National Foods’ ad agency has constructed the following payoff table giving its estimate of the expected profit resulting from purchasing one, two, or three advertising sports. (Another possible decision is for National Foods not to advertise at all during the Super Bowl.) The states of nature correspond to the game being “dull”, “average”, above average”, or “exciting”.

|  |  |  |
| --- | --- | --- |
| Number of 30-second Commercials Purchased | Perceived Game Excitement |  |
|  | Dull | Average | Above average | Exciting |
| One | -2 | 3 | 7 | 13 |
| Two | -5 | 6 | 12 | 18 |
| Three | -9 | 5 | 13 | 22 |

a. What is the optimal decision if the National Foods advertising manager is optimistic?

b. What is the optimal decision if the National Foods advertising manager is pessimistic?

c. What is the optimal decision if the National Foods advertising manager wishes to minimize the firm’s maximum regret?

**Problem 2:** Consider the data given in problem 1 for National Foods. Based on past Super Bowl games, suppose the decision maker believes that the following probabilities hold for the states of nature:

P(Dull game) = .20, P(Average Game) = .40, P(Above Average Game) = .30,

P(Exciting Game) = .10

a. Using the expected value criterion, determine how many commercials National Foods should purchase.

b. Based on the probabilities given here, determine the expected value of perfect information.

**Problem 3:** Consider the data given in problem 2 and 3 for the National Foods. The firm can hire the noted sport’s pundit Jim Worden to give his opinion as to whether or not the Super Bowl game will be interesting. Suppose the following probabilities hold for Jim’s predictions:

P (Jim predicts game will be interesting | game is dull) = .15

P (Jim predicts game will be interesting | game is average = .25

 P (Jim predicts game will be interesting | game is above average = .50

 P (Jim predicts game will be interesting | game is exciting = .80

 P (Jim predicts game will not be interesting | game is actually dull) = .85

 P (Jim predicts game will not be interesting | game is average) = .75

 P(Jim predicts game will not be interesting | game is above average) = .50

 P (Jim predicts game will not be interesting | game is exciting) = .20

(You may graph a decision tree, in order to makes the problem transparent)

1. Jim predict the game will be interesting, what is the If probability the game will be dull?
2. What is the national’s strategy if Jim predicts the game will be (i) Interesting or (ii) not interesting?
3. What is expected value of Jim’s information?

**Problem 4:** Steve Greene is considering purchasing fire insurance for his home. According to statistics for Steve’s county, Steve estimates the damage from fire to his home in a given year is as follows:

 Amount of Damage Probability

0 .975

$10,000 .010

$20,000 .008

$30,000 .004

$50,000 .002

$100,000 .001

a. If Steve is risk neutral, how much should he be willing to pay for the fire insurance?

Suppose Steve’s utility values are as follows:

Amount of Loss ($1000s)

 100 50 30 20 10 1 0

Utility 0 .65 .75 .8 .95 .995 1

b. What is the expected utility corresponding to fire damage?

c. Determine approximately how much Steve would be willing to pay for the fire insurance?