**Module F: Decision-Making Tools**

**Practice Problems**

**MULTIPLE CHOICE**

Mitchell’s Air Operations offers maintenance and repair services for business jets located in Los Angeles. They are considering whether they should expand their operations. Mitchell has decided that they have a number of options—four to be precise. They can keep their current facilities; they can modify their facilities to make them more efficient; they can expand their current facility; or they can rent additional space. The decision as to which option they should select is predicated upon the estimation of the direction of the economy for the next four years. Mitchell’s Air Operations developed the following decision matrix.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Future Air Traffic** | | |
|  | Down | Same | Up |
| Keep As Is | $ (40,000) | $ 70,000 | $ 100,000 |
| Remodel | $ (60,000) | $ 65,000 | $ 200,000 |
| Expansion | $ (150,000) | $ 50,000 | $ 400,000 |
| Rent | $ (50,000) | $ 60,000 | $ 80,000 |

1. What option should Mitchell’s Air Operations make based on Maximax criterion?

|  |  |
| --- | --- |
| a. | Keep As Is |
| b. | Remodel |
| c. | Expansion |
| d. | Rent |

ANS: C PTS: 1 DIF: Easy

2. What option should Mitchell’s Air Operations make based on Maximin criterion?

|  |  |
| --- | --- |
| a. | Keep As Is |
| b. | Remodel |
| c. | Expansion |
| d. | Rent |

ANS: A PTS: 1 DIF: Easy

3. What option should Mitchell’s Air Operations make based on Laplace criterion?

|  |  |
| --- | --- |
| a. | Keep As Is |
| b. | Remodel |
| c. | Expansion |
| d. | Rent |

ANS: C PTS: 1 DIF: Medium

4. What option should Mitchell’s Air Operations make based on Hurwicz criterion with an alpha = .4?

|  |  |
| --- | --- |
| a. | Keep As Is |
| b. | Remodel |
| c. | Expansion |
| d. | Rent |

ANS: C PTS: 1 DIF: Medium

5. What option should Mitchell’s Air Operations make based on Hurwicz criterion with an alpha = .6?

|  |  |
| --- | --- |
| a. | Keep As Is |
| b. | Remodel |
| c. | Expansion |
| d. | Rent |

ANS: C PTS: 1 DIF: Medium

6. What option should Mitchell’s Air Operations make based on Hurwicz criterion with an alpha = .8?

|  |  |
| --- | --- |
| a. | Keep As Is |
| b. | Remodel |
| c. | Expansion |
| d. | Rent |

ANS: C PTS: 1 DIF: Medium

7. What option should Mitchell’s Air Operations make based on Minimax Regret criterion?

|  |  |
| --- | --- |
| a. | Keep As Is |
| b. | Remodel |
| c. | Expansion |
| d. | Rent |

ANS: C PTS: 1 DIF: Hard

8. Mitchell’s Air Operations has hired two economic consultants to provide insights as to the likelihood of the future states of the economy. The first economist estimates that there is a 20% chance that the economy will trend *Down*, a 50% chance that the economy will stay the *Same*, and a 30% chance that the economy will trend *Up*. What option should Mitchell’s Air Operations make based on this first economist’s estimates?

|  |  |
| --- | --- |
| a. | Keep As Is |
| b. | Remodel |
| c. | Expansion |
| d. | Rent |

ANS: C PTS: 1 DIF: Medium

9. Mitchell’s Air Operations has hired two economic consultants to provide insights as to the likelihood of the future states of the economy. The second economist estimates that there is a 10% chance that the economy will trend *Down*, a 30% chance that the economy will stay the *Same*, and a 60% chance that the economy will trend *Up*. What option should Mitchell’s Air Operations make based on this second economist’s estimates?

|  |  |
| --- | --- |
| a. | Keep As Is |
| b. | Remodel |
| c. | Expansion |
| d. | Rent |

ANS: C PTS: 1 DIF: Medium

10. What would be the value of perfect information for the first economist?

|  |  |
| --- | --- |
| a. | $ 23,000 |
| b. | $ 32,000 |
| c. | $ 78,000 |
| d. | $147,000 |

ANS: B PTS: 1 DIF: Hard

11. What would be the value of perfect information for the second economist?

|  |  |
| --- | --- |
| a. | $ 17,000 |
| b. | $ 34,000 |
| c. | $ 77,000 |
| d. | $257,000 |

ANS: A PTS: 1 DIF: Hard

Arnold Greenjeans runs a small farm. He is determining what crop to plant for the upcoming year. The choice of what crop to plant will depend on the anticipated weather conditions. Arnold sat down and developed a decision matrix (see below) that shows his anticipated profit for each crop under each weather condition.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Weather Conditions** | | | |
|  | Drought | Normal | | Rainy |
| Soy | $ 600,000 | | $ 750,000 | $ 400,000 |
| Wheat | $ 400,000 | | $ 650,000 | $ 780,000 |
| Corn | $ 350,000 | | $ 500,000 | $ 700,000 |
| Rye | $ 500,000 | | $ 600,000 | $ 650,000 |

12. What crop should Mr. Greenjeans plant based on the Maximax criterion?

|  |  |
| --- | --- |
| a. | Soy |
| b. | Wheat |
| c. | Corn |
| d. | Rye |

ANS: B PTS: 1 DIF: Easy

13. What crop should Mr. Greenjeans plant based on the Maximin criterion?

|  |  |
| --- | --- |
| a. | Soy |
| b. | Wheat |
| c. | Corn |
| d. | Rye |

ANS: D PTS: 1 DIF: Easy

14. What crop should Mr. Greenjeans plant based on the Laplace criterion?

|  |  |
| --- | --- |
| a. | Soy |
| b. | Wheat |
| c. | Corn |
| d. | Rye |

ANS: B PTS: 1 DIF: Medium

15. What crop should Mr. Greenjeans plant based on the Hurwicz criterion with an alpha = .3?

|  |  |
| --- | --- |
| a. | Soy |
| b. | Wheat |
| c. | Corn |
| d. | Rye |

ANS: D PTS: 1 DIF: Medium

16. What crop should Mr. Greenjeans plant based on the Hurwicz criterion with an alpha = .6?

|  |  |
| --- | --- |
| a. | Soy |
| b. | Wheat |
| c. | Corn |
| d. | Rye |

ANS: B PTS: 1 DIF: Medium

17. Mr. Greenjeans consulted with a meteorologist at the local university concerning the likelihood associated with the future weather conditions. She said there was a 10% chance of drought, an 80% chance of the weather remaining norma,l and a 10% chance of a rainy season. Based on these odds, what should Mr. Greenjeans plant?

|  |  |
| --- | --- |
| a. | Soy |
| b. | Wheat |
| c. | Corn |
| d. | Rye |

ANS: A PTS: 1 DIF: Medium

18. Mr. Greenjeans consulted with a copy of the Farmer’s Almanac concerning the likelihood associated with the future weather conditions. It said the there was a 30% chance of drought, a 50% chance of the weather remaining normal, and a 20% chance of a rainy season. Based on these odds, what should Mr. Greenjeans plant?

|  |  |
| --- | --- |
| a. | Soy |
| b. | Wheat |
| c. | Corn |
| d. | Rye |

ANS: A PTS: 1 DIF: Medium

19. Given the results for the meteorologist’s forecast, what would be the value of perfect information?

|  |  |
| --- | --- |
| a. | $26,000 |
| b. | $38,000 |
| c. | $46,000 |
| d. | $52,000 |

ANS: B PTS: 1 DIF: Hard

20. Given the results for the Farmer’s Almanac’s forecast, what would be the value of perfect information ?

|  |  |
| --- | --- |
| a. | $56,000 |
| b. | $62,000 |
| c. | $76,000 |
| d. | $92,000 |

ANS: C PTS: 1 DIF: Hard

Capital Construction is looking at the upcoming state election. Control of both the state senate and the house are up for grabs in this election. Capital Construction is planning to bid on a number of possible projects. Given the state laws, Capital Construction can only work on one contract at a time. Having reviewed the candidates’ positions, Capital Construction developed a decision matrix that identifies the possible profits for Capital Construction if the Democrats win both the senate and the house, or if the Republicans win both the senate and the house, or if the two parties split—one party wins the senate and the other party wins the house. Their matrix is provided below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | **State Election Outcomes** | | |
|  | Democrats | | Republicans | Split |
| Project A | $ 1,000,000 | | $ 600,000 | $ 800,000 |
| Project B | $ 2,500,000 | | $1,800,000 | $2,000,000 |
| Project C | $ 1,300,000 | | $3,000,000 | $1,800,000 |
| Project D | $ 1,500,000 | | $ - | $2,500,000 |

21. What project should be bid on based on the Maximax criterion?

|  |  |
| --- | --- |
| a. | Project A |
| b. | Project B |
| c. | Project C |
| d. | Project D |

ANS: C PTS: 1 DIF: Easy

22. What project should be bid on based on the Maximin criterion?

|  |  |
| --- | --- |
| a. | Project A |
| b. | Project B |
| c. | Project C |
| d. | Project D |

ANS: B PTS: 1 DIF: Easy

23. What project should be bid on based on the Laplace criterion?

|  |  |
| --- | --- |
| a. | Project A |
| b. | Project B |
| c. | Project C |
| d. | Project D |

ANS: B PTS: 1 DIF: Medium

24. What project should be bid on based on the Hurwicz criterion with an alpha = .3?

|  |  |
| --- | --- |
| a. | Project A |
| b. | Project B |
| c. | Project C |
| d. | Project D |

ANS: B PTS: 1 DIF: Medium

25. What project should be bid on based on the Hurwicz criterion with an alpha = .8?

|  |  |
| --- | --- |
| a. | Project A |
| b. | Project B |
| c. | Project C |
| d. | Project D |

ANS: C PTS: 1 DIF: Medium

26. What project should be bid on based on the Minimax Regret criterion?

|  |  |
| --- | --- |
| a. | Project A |
| b. | Project B |
| c. | Project C |
| d. | Project D |

ANS: D PTS: 1 DIF: Hard

27. The CEO of Capital Construction consulted a pollster to see what were the odds for the three possible outcomes. The pollster estimated that the odds of the Democrats winning both the senate and house was 20%, while the odds of the Republicans winning both was 30%, and that there was a 50% chance that there would be a split between the two parties. Based on this information, what project should be bid on?

|  |  |
| --- | --- |
| a. | Project A |
| b. | Project B |
| c. | Project C |
| d. | Project D |

ANS: C PTS: 1 DIF: Medium

28. The CEO of Capital Construction was concerned that pollsters haven‘t been useful in recent elections. Almost as a joke, he consulted a psychic to see what were the odds for the three possible outcomes. The psychic estimated that the odds of the Democrats winning both the senate and house was 25%, while the odds of the Republicans winning both was 45%, and that there was a 30% chance that there would be a split between the two parties. Based on this information, what project should be bid on?

|  |  |
| --- | --- |
| a. | Project A |
| b. | Project B |
| c. | Project C |
| d. | Project D |

ANS: C PTS: 1 DIF: Medium

29. Given the results for the pollster’s forecast what would be the value of perfect information?

|  |  |
| --- | --- |
| a. | $510,000 |
| b. | $590,000 |
| c. | $675,000 |
| d. | $715,000 |

ANS: B PTS: 1 DIF: Hard

30. Given the results for the psychic’s forecast what would be the value of perfect information?

|  |  |
| --- | --- |
| a. | $510,000 |
| b. | $580,000 |
| c. | $675,000 |
| d. | $715,000 |

ANS: A PTS: 1 DIF: Hard

Lightning Airlines is planning on purchasing 30 new aircraft for their major routes. They plan on purchasing one type of aircraft to simplify operations and maintenance. They are examining four broad categories of aircraft:regional, single aisle, twin aisle, and jumbo. The selection of what type to consider will be heavily based on the next decade’s air traffic growth rate. Lightning Airlines conducted an economic analysis and determined their possible profits (over the next ten years) for each category of aircraft for four possible growth rates. The analysis is provided below.

Growth Rates on Major Routes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | -2% | 2% | | 4% | 7% |
| Regional | $20,000,000 | $ 35,000,000 | $ 40,000,000 | | $ (90,000,000) |
| Single Aisle | $(50,000,000) | $ 75,000,000 | $100,000,000 | | $150,000,000 |
| Twin Aisle | $(150,000,000) | $ 45,000,000 | $375,000,000 | | $500,000,000 |
| Jumbo | $(200,000,000) | $(50,000,000) | $200,000,000 | | $350,000,000 |

31. What type of aircraft would be selected by the Maximax criterion?

|  |  |
| --- | --- |
| a. | Regional |
| b. | Single Aisle |
| c. | Twin Aisle |
| d. | Jumbo |

ANS: C PTS: 1 DIF: Easy

32. What type of aircraft would be selected by the Maximin criterion?

|  |  |
| --- | --- |
| a. | Regional |
| b. | Single Aisle |
| c. | Twin Aisle |
| d. | Jumbo |

ANS: B PTS: 1 DIF: Easy

33. What type of aircraft would be selected by the Laplace criterion?

|  |  |
| --- | --- |
| a. | Regional |
| b. | Single Aisle |
| c. | Twin Aisle |
| d. | Jumbo |

ANS: C PTS: 1 DIF: Medium

34. What type of aircraft would be selected by the Hurwicz criterion with an alpha = .2?

|  |  |
| --- | --- |
| a. | Regional |
| b. | Single Aisle |
| c. | Twin Aisle |
| d. | Jumbo |

ANS: B PTS: 1 DIF: Medium

35. What type of aircraft would be selected by the Hurwicz criterion with an alpha = .5?

|  |  |
| --- | --- |
| a. | Regional |
| b. | Single Aisle |
| c. | Twin Aisle |
| d. | Jumbo |

ANS: C PTS: 1 DIF: Medium

36. What type of aircraft would be selected by the Hurwicz criterion with an alpha = .8?

|  |  |
| --- | --- |
| a. | Regional |
| b. | Single Aisle |
| c. | Twin Aisle |
| d. | Jumbo |

ANS: C PTS: 1 DIF: Medium

37. Lightning Airlines used the International Air Transport Association (IATA) forecast for the traffic growth. The IATA estimates that there is a 20% chance that traffic on the major routes would decline by 2%, a 30% chance that traffic would grow by 2%, a 40% chance that traffic would grow by 4%, and a 10% chance traffic would grow by 7%. Based on these values, what type of aircraft should Lightning Airlines buy?

|  |  |
| --- | --- |
| a. | Regional |
| b. | Single Aisle |
| c. | Twin Aisle |
| d. | Jumbo |

ANS: C PTS: 1 DIF: Medium

38. Lightning Airlines used the Aviation Week forecast for the traffic growth. The Aviation week estimates that there is a 10% chance that traffic on the major routes would decline by 2%, a 20% chance that traffic would grow by 2%, a 50% chance that traffic would grow by 4%, and a 20% chance traffic would grow by 7%. Based on these values what type of aircraft should Lightning Airlines buy?

|  |  |
| --- | --- |
| a. | Regional |
| b. | Single Aisle |
| c. | Twin Aisle |
| d. | Jumbo |

ANS: C PTS: 1 DIF: Medium

39. Given the results for the IATA’s forecast, what would be the value of perfect information?

|  |  |
| --- | --- |
| a. | $18,000,000 |
| b. | $23,000,000 |
| c. | $32,000,000 |
| d. | $43,000,000 |

ANS: D PTS: 1 DIF: Hard

40. Given the results for the Aviation Week’s forecast, what would be the value of perfect information?

|  |  |
| --- | --- |
| a. | $18,000,000 |
| b. | $23,000,000 |
| c. | $32,000,000 |
| d. | $43,000,000 |

ANS: B PTS: 1 DIF: Hard

Anton Ebersoll received a windfall and needs to invest it for tax reasons. He went to his brother-in-law, Edward Dante, who is a financial advisor. Edward prepared a matrix that illustrated the possible returns on investment for different investment strategies under different economic conditions. That matrix is given below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Market Change** | | | |
|  | Major Downturn | Downturn | Upturn | Major Upturn |
| Contrarian | 20% | 10% | 5% | -15% |
| Risk Averse | 2% | 4% | 7% | 10% |
| Growth | -10% | -8% | 13% | 20% |
| Aggressive | -25% | -20% | 11% | 35% |

41. Given these values, what investment strategy should Anton adopt based on using the Maximax criterion?

|  |  |
| --- | --- |
| a. | Contrarian |
| b. | Risk Averse |
| c. | Growth |
| d. | Aggressive |

ANS: D PTS: 1 DIF: Easy

42. What type of investment strategy would be selected by the Maximin criterion?

|  |  |
| --- | --- |
| a. | Contrarian |
| b. | Risk Averse |
| c. | Growth |
| d. | Aggressive |

ANS: B PTS: 1 DIF: Easy

43. What type of investment strategy would be selected by the Laplace criterion?

|  |  |
| --- | --- |
| a. | Contrarian |
| b. | Risk Averse |
| c. | Growth |
| d. | Aggressive |

ANS: B PTS: 1 DIF: Medium

44. What type of investment strategy would be selected by the Hurwicz criterion with an alpha = .2?

|  |  |
| --- | --- |
| a. | Contrarian |
| b. | Risk Averse |
| c. | Growth |
| d. | Aggressive |

ANS: B PTS: 1 DIF: Medium

45. What type of investment strategy would be selected by the Hurwicz criterion with an alpha = .5?

|  |  |
| --- | --- |
| a. | Contrarian |
| b. | Risk Averse |
| c. | Growth |
| d. | Aggressive |

ANS: B PTS: 1 DIF: Medium

46. What type of investment strategy would be selected by the Hurwicz criterion with an alpha = .8?

|  |  |
| --- | --- |
| a. | Contrarian |
| b. | Risk Averse |
| c. | Growth |
| d. | Aggressive |

ANS: D PTS: 1 DIF: Medium

47. What type of investment strategy would be selected by the Minmax Regret criterion?

|  |  |
| --- | --- |
| a. | Contrarian |
| b. | Risk Averse |
| c. | Growth |
| d. | Aggressive |

ANS: B PTS: 1 DIF: Hard

48. Anton Ebersoll reads the financial press and came across an article that stated that the probability that there would be a major downturn would be 10%; the probability of a downturn would be 30%; the probability of an upturn would be 40%; and that the probability of a major upturn would be 20%. Based on these numbers, what investment strategy should Anton Ebersoll adopt?

|  |  |
| --- | --- |
| a. | Contrarian |
| b. | Risk Averse |
| c. | Growth |
| d. | Aggressive |

ANS: B PTS: 1 DIF: Medium

49. Anton Ebersoll read a report by the Council of Economic Advisors and it stated that the probability that there would be a major downturn would be 5%; the probability of a downturn would be 20%; the probability of an upturn would be 60%; and that the probability of a major upturn would be 15%. Based on these numbers, what investment strategy should Anton Ebersoll adopt?

|  |  |
| --- | --- |
| a. | Contrarian |
| b. | Risk Averse |
| c. | Growth |
| d. | Aggressive |

ANS: C PTS: 1 DIF: Medium

50. Anton Ebersoll read a report by the Council of Economic Advisors and it stated that the probability that there would be a major downturn would be 5%; the probability of a downturn would be 20%; the probability of an upturn would be 60%; and that the probability of a major upturn would be 15%. Given the results for the forecast, what would be the value of perfect information?

|  |  |
| --- | --- |
| a. | 3.50% |
| b. | 5.75% |
| c. | 6.80% |
| d. | 7.35% |

ANS: D PTS: 1 DIF: Hard