

True/False

1. In a decision-making situation, the events that may occur in the future are known as states of nature.

Ans: True, LO: 1, Bloom: K, Difficulty: Easy, AACSB: None

2. When probabilities are assigned to states of nature the situation is referred to as decision-making under uncertainty.

Ans: False, LO: 1, Bloom: K, Difficulty: Easy, AACSB: None

3. The outcome of a decision is referred to as a payoff.

Ans: True, LO: 1, Bloom: K, Difficulty: Easy, AACSB: None

4. The most widely used decision-making criterion for situations with risk is expected value.

Ans: True, LO: 1, Bloom: K, Difficulty: Easy, AACSB: None

5. A decision criterion in which the decision payoffs are weighted by a coefficient of optimism is known as the Hurwicz criterion.

Ans: True, LO: 1, Bloom: K, Difficulty: Moderate, AACSB: None

6. The LaPlace criterion is a decision criterion in which each state of nature is weighted equally.

Ans: True, LO: 1, Bloom: K, Difficulty: Moderate, AACSB: None

7. A sequential decision tree is a graphical method for analyzing decision situations that require a sequence of decisions over time.

Ans: True, LO: 1, Bloom: K, Difficulty: Easy, AACSB: None

8. A decision criterion that results in the maximum of the minimum payoffs is called a maximin criterion.

Ans: True, LO: 1, Bloom: K, Difficulty: Moderate, AACSB: None

9. Quantitative methods are tools available to operations managers to help make a decision or recommendation.

Ans: True, LO: 1, Bloom: K, Difficulty: Moderate, AACSB: None

10. Quantitative methods are tools available to operations managers to help make a decision but not a recommendation.

Ans: False, LO: 1, Bloom: K, Difficulty: Moderate, AACSB: None

11. Decision analysis is a quantitative technique supporting decision-making with uncertainty.

Ans: True, LO: 1, Bloom: K, Difficulty: Moderate, AACSB: None

12. A payoff table is a quantitative technique supporting decision-making under uncertainty.

Ans: True, LO: 1, Bloom: K, Difficulty: Moderate, AACSB: None

Multiple-Choice

13. When probabilities can be assigned to the occurrence of states of nature in the future, the situation is referred to as

- a. decision-making under risk.
- b. decision-making under certainty.
- c. decision-making under uncertainty.
- d. None of these answers is correct.

Ans: A, LO: 1, Bloom: K, Difficulty: Easy, AACSB: None

14. Which of the following techniques is the most widely used decision-making criterion under risk?

- a. maximax criterion
- b. minimax regret criterion
- c. expected value criterion
- d. Hurwicz criterion

Ans: C, LO: 1, Bloom: K, Difficulty: Moderate, AACSB: None

15. The maximum value of perfect information to the decision maker is known as

- a. the expected value of perfect information.
- b. the expected value of imperfect information.
- c. the minimum of the minimax regret.
- d. None of these answers is correct.

Ans: A, LO: 1, Bloom: K, Difficulty: Easy, AACSB: None

16. Fairco, a family business, is considering making an investment in its manufacturing operation. Three decisions are under consideration: (1) a large investment; (2) a medium investment; and (3) a small investment. The business believes that there are three possible future outcomes for its product: (1) increasing demand; (2) stable demand; and (3) decreasing demand. The following payoff table describes the decision situation.

States of Nature			
Decision	Increasing Demand	Stable Demand	Decreasing Demand
Large Investment	\$1,000,000	\$400,000	-\$600,000
Medium Investment	\$500,000	\$300,000	-\$200,000
Small Investment	\$250,000	\$125,000	\$25,000

The best decision for Fairco using the maximax criterion would be to

- a. make the large investment.
- b. make the medium investment.
- c. make the small investment.
- d. choose increasing demand.

Ans: A, LO: 1, Bloom: K, Difficulty: Moderate, AACSB: None

Solution: Fairco assumes increasing demand. The maximax equals \$1,000,000. Make the large investment.

17. Fairco, a family business, is considering making an investment in its manufacturing operation. Three decisions are under consideration: (1) a large investment; (2) a medium investment; and (3) a small investment. The business believes that there are three possible future outcomes for its product: (1) increasing demand; (2) stable demand; and (3) decreasing demand. The following payoff table describes the decision situation.

States of Nature			
Decision	Increasing Demand	Stable Demand	Decreasing Demand
Large Investment	\$1,000,000	\$400,000	-\$600,000
Medium Investment	\$500,000	\$300,000	-\$200,000
Small Investment	\$250,000	\$125,000	\$25,000

The best decision for Fairco using the maximin criterion would be to

- a. make the large investment.
- b. make the medium investment.
- c. make the small investment.
- d. choose stable demand.

Ans: C, LO: 1, Bloom: K, Difficulty: Moderate, AACSB: None

Solution: Fairco assumes decreasing demand. The maximin is \$25,000. Make the small investment.

18. Fairco, a family business, is considering making an investment in its manufacturing operation. Three decisions are under consideration: (1) a large investment; (2) a medium investment; and (3) a small investment. The business believes that there are three possible future outcomes for its product: (1) increasing demand; (2) stable demand; and (3) decreasing demand. The following payoff table describes the decision situation.

States of Nature			
Decision	Increasing Demand	Stable Demand	Decreasing Demand
Large Investment	\$1,000,000	\$400,000	-\$600,000
Medium Investment	\$500,000	-\$300,000	-\$200,000
Small Investment	\$250,000	\$125,000	\$25,000

The best decision for Fairco using the minimax regret decision criterion would be to

- a. make the large investment.
- b. make the medium investment.
- c. make the small investment.
- d. choose decreasing demand.

Ans: B, LO: 1, Bloom: K, Difficulty: Moderate, AACSB: None

Solution: The maximum regret for each decision are:

Large Investment \$625,000

Medium Investment \$500,000

Small Investment \$750,000

Decision: Make the medium investment because \$500,000 is the minimum.

19. Fairco, a family business, is considering making an investment in its manufacturing operation. Three decisions are under consideration: (1) a large investment; (2) a medium investment; and (3) a small investment. The business believes that there are three possible future outcomes for its product: (1) increasing demand; (2) stable demand; and (3) decreasing demand. The following payoff table describes the decision situation.

States of Nature			
Decision	Increasing Demand	Stable Demand	Decreasing Demand
Large Investment	\$1,000,000	\$400,000	-\$600,000
Medium Investment	\$500,000	\$300,000	-\$200,000
Small Investment	\$250,000	\$125,000	\$25,000

The best decision for Fairco using the Hurwicz criterion with a coefficient of optimism equal to 0.80 would be to

- a. make the large investment.
- b. make the medium investment.
- c. make the small investment.
- d. choose stable demand.

Ans: A, LO: 1, Bloom: K, Difficulty: Moderate, AACSB: None

Solution:

Large Investment \$680,000

Medium Investment \$360,000

Small Investment \$205,000

The maximum is \$680,000. Make the large investment.

20. Fairco, a family business, is considering making an investment in its manufacturing operation. Three decisions are under consideration: (1) a large investment; (2) a medium investment; and (3) a small investment. The business believes that there are three possible future outcomes for its product: (1) increasing demand; (2) stable demand; and (3) decreasing demand. The following payoff table describes the decision situation.

States of Nature			
Decision	Increasing Demand	Stable Demand	Decreasing Demand
Large Investment	\$1,000,000	\$400,000	-\$600,000
Medium Investment	\$500,000	\$300,000	-\$200,000
Small Investment	\$250,000	\$125,000	\$25,000

The best decision for Fairco using the equal likelihood criterion would be to

- a. make the large investment.
- b. make the medium investment.
- c. make the small investment.
- d. choose increasing demand.

Ans: A, LO: 1, Bloom: K, Difficulty: Moderate, AACSB: None

Solution:

Large Investment \$266,667

Medium Investment \$200,000

Small Investment \$133,333

The maximum is \$266,667. Choose the large investment.

21. Fairco, a family business, is considering making an investment in its manufacturing operation. Three decisions are under consideration: (1) a large investment; (2) a medium investment; and (3) a small investment. The business believes that there are three possible future outcomes for its product: (1) increasing demand; (2) stable demand; and (3) decreasing demand. The business believes that the probability for increasing, stable and decreasing product demand are 0.4, 0.5, and 0.1, respectively. The following payoff table describes the decision situation.

States of Nature			
Decision	Increasing Demand (0.4)	Stable Demand (0.5)	Decreasing Demand (0.1)
Large Investment	\$1,000,000	\$400,000	-\$600,000
Medium Investment	\$500,000	\$300,000	-\$200,000
Small Investment	\$250,000	\$125,000	\$25,000

The expected value for the large investment decision is

- a. \$700,000.
- b. \$540,000.
- c. \$330,000.
- d. \$165,000.

Ans: B, LO: 1, Bloom: K, Difficulty: Moderate, AACSB: None

Solution: The expected value for Large Investment: $\$400,000 + \$200,000 - \$60,000 = \$540,000$

22. Fairco, a family business, is considering making an investment in its manufacturing operation. Three decisions are under consideration: (1) a large investment; (2) a medium investment; and (3) a small investment. The business believes that there are three possible future outcomes for its product: (1) increasing demand; (2) stable demand; and (3) decreasing demand. The business believes that the probability for increasing, stable and decreasing product demand are 0.4, 0.5, and 0.1, respectively. The following payoff table describes the decision situation.

States of Nature			
Decision	Increasing Demand (0.4)	Stable Demand (0.5)	Decreasing Demand (0.1)
Large Investment	\$1,000,000	\$400,000	-\$600,000
Medium Investment	\$500,000	\$300,000	-\$200,000
Small Investment	\$250,000	\$125,000	\$25,000

The expected value for the small investment decision is

- a. \$540,000.
- b. \$400,000.
- c. \$330,000.
- d. \$165,000.

Ans: D, LO: 1, Bloom: K, Difficulty: Moderate, AACSB: None

The expected value for

Small Investment $\$100,000 + 62,500 + \$2,500 = \$165,000$

23. Fairco, a family business, is considering making an investment in its manufacturing operation. Three decisions are under consideration: (1) a large investment; (2) a medium investment; and (3) a small investment. The business believes that there are three possible future outcomes for its product: (1) increasing demand; (2) stable demand; and (3) decreasing demand. The business believes that the probability for

increasing, stable and decreasing product demand are 0.4, 0.5, and 0.1, respectively. The following payoff table describes the decision situation.

States of Nature			
Decision	Increasing Demand (0.4)	Stable Demand (0.5)	Decreasing Demand (0.1)
Large Investment	\$1,000,000	\$400,000	-\$600,000
Medium Investment	\$500,000	\$300,000	-\$200,000
Small Investment	\$250,000	\$125,000	\$25,000

The expected value for the medium investment decision is

- a. \$600,000.
- b. \$540,000.
- c. \$330,000.
- d. \$165,000.

Ans: C, LO: 1, Bloom: K, Difficulty: Moderate, AACSB: None

Solution: The expected value for

Medium Investment $\$200,000 + \$150,000 - \$20,000 = \$330,000$

24. Fairco, a family business, is considering making an investment in its manufacturing operation. Three decisions are under consideration: (1) a large investment; (2) a medium investment; and (3) a small investment. The business believes that there are three possible future outcomes for its product: (1) increasing demand; (2) stable demand; and (3) decreasing demand. The business believes that the probability for increasing, stable and decreasing product demand are 0.4, 0.5, and 0.1, respectively. The following payoff table describes the decision situation.

States of Nature			
Decision	Increasing Demand (0.4)	Stable Demand (0.5)	Decreasing Demand (0.1)
Large Investment	\$1,000,000	\$400,000	-\$600,000
Medium Investment	\$500,000	\$300,000	-\$200,000
Small Investment	\$250,000	\$125,000	\$25,000

If the expected value criterion is used, then the best decision would be to

- a. make the large investment.
- b. make the medium investment.
- c. make the small investment.
- d. choose the stable demand.

Ans: A, LO: 1, Bloom: K, Difficulty: Moderate, AACSB: None

Solution: The expected values are

Large Investment $\$540,000$

Medium Investment $\$333,000$

Small Investment $\$170,000$

The maximum is \$540,000. Make the large investment.

25. Fairco, a family business is considering making an investment in its manufacturing operation. Three decisions are under consideration: (1) a large investment; (2) a medium investment; and (3) a small investment. The business believes that there are three possible future outcomes for its product: (1) increasing demand; (2) stable demand; and (3) decreasing demand. The business believes that the probability for increasing, stable and decreasing product demand are 0.4, 0.5, and 0.1, respectively. The following payoff table describes the decision situation.

Decision	States of Nature		
	Increasing Demand (0.4)	Stable Demand (0.5)	Decreasing Demand (0.1)
Large Investment	\$1,000,000	\$400,000	-\$600,000
Medium Investment	\$500,000	\$300,000	-\$200,000
Small Investment	\$250,000	\$125,000	\$25,000

The expected value of perfect information for Fairco is

- a. \$602,500.
- b. \$540,000.
- c. \$62,500.
- d. \$25,000.

Ans: C, LO: 1, Bloom: K, Difficulty: Hard, AACSB: None

Solution: \$602,500-\$540,000=\$62,500

26. Kallie Inc., a small parts manufacturer, has just engineered a new product for the automotive industry. In order to produce the part the company can expand existing facilities, acquire a competitor, or subcontract production. The company believes the product will either experience high market demand or low market demand. The following payoff table describes the company's decision situation.

Decision	States of Nature	
	High Demand	Low Demand
Expand Facilities	\$2,000,000	-\$1,250,000
Acquire Competitor	\$750,000	-\$500,000
Subcontract Production	\$250,000	\$25,000

The best decision for Kallie Inc. using the maximax decision criterion is to

- a. expand facilities.
- b. acquire competitor.
- c. subcontract production.
- d. select high demand.

Ans: A, LO: 1, Bloom: K, Difficulty: Moderate, AACSB: None

Solution: Kallie Inc. assumes expand facilities. The maximax is \$2,000,000. Select high demand.

27. Kallie Inc., a small parts manufacturer, has just engineered a new product for the automotive industry. In order to produce the part the company can expand existing

facilities, acquire a competitor, or subcontract production. The company believes the product will either experience high market demand or low market demand. The following payoff table describes the company's decision situation.

Decision	States of Nature	
	High Demand	Low Demand
Expand Facilities	\$2,000,000	-\$1,250,000
Acquire Competitor	\$750,000	-\$500,000
Subcontract Production	\$250,000	\$25,000

The best decision for Kallie Inc. using the maximin decision criterion is to

- expand facilities.
- acquire competitor.
- subcontract production.
- select high demand.

Ans: C, LO: 1, Bloom: K, Difficulty: Moderate, AACSB: None

Solution: Kallie Inc. assumes expand facilities. The maximin is \$250,000. Select subcontract production.

28. Kallie Inc., a small parts manufacturer, has just engineered a new product for the automotive industry. In order to produce the part the company can expand existing facilities, acquire a competitor, or subcontract production. The company believes the product will either experience high market demand or low market demand. The following payoff table describes the company's decision situation.

Decision	States of Nature	
	High Demand	Low Demand
Expand Facilities	\$2,000,000	-\$1,250,000
Acquire Competitor	\$750,000	-\$500,000
Subcontract Production	\$250,000	\$25,000

The best decision for Kallie Inc. using the minimax regret decision criterion is to

- expand facilities.
- acquire competitor.
- subcontract production.
- select high demand.

Ans: B, LO: 1, Bloom: K, Difficulty: Moderate, AACSB: None

Solution: The minimax regret for each decision is

Expand Facilities \$1,275,000
 Acquire Competitor \$1,250,000
 Subcontract Production \$1,750,000

The minimum is acquire competitor.

29. Kallie Inc., a small parts manufacturer, has just engineered a new product for the automotive industry. In order to produce the part the company can expand existing

facilities, acquire a competitor, or subcontract production. The company believes the product will either experience high market demand or low market demand. The following payoff table describes the company's decision situation.

Decision	States of Nature	
	High Demand	Low Demand
Expand Facilities	\$2,000,000	-\$1,250,000
Acquire Competitor	\$750,000	-\$500,000
Subcontract Production	\$250,000	\$25,000

The regret that is associated with the decision to acquire competitor when demand is low is

- a. \$0.
- b. \$525,000.
- c. \$1,250,000.
- d. \$1,275,000.

Ans: B, LO: 1, Bloom: K, Difficulty: Moderate, AACSB: None

Solution: $\$25,000 + \$500,000 = \$525,000$

30. Kallie Inc., a small parts manufacturer, has just engineered a new product for the automotive industry. In order to produce the part the company can expand existing facilities, acquire a competitor, or subcontract production. The company believes the product will either experience high market demand or low market demand. The following payoff table describes the company's decision situation.

Decision	States of Nature	
	High Demand	Low Demand
Expand Facilities	\$2,000,000	-\$1,250,000
Acquire Competitor	\$750,000	-\$500,000
Subcontract Production	\$250,000	\$25,000

The best decision for Kallie Inc., using the Hurwicz decision criterion with a coefficient of optimism equal to 0.3 is to

- a. expand facilities.
- b. acquire competitor.
- c. subcontract production.
- d. make no decision.

Ans: C, LO: 1, Bloom: K, Difficulty: Moderate, AACSB: None

Solution: The weighted values of each decision

Expand Facilities -\$275,000

Acquire Competitor -\$125,000

Subcontract Production \$92,500

Select the maximum – subcontract production.

31. Kallie Inc., a small parts manufacturer, has just engineered a new product for the automotive industry. In order to produce the part the company can expand existing

facilities, acquire a competitor, or subcontract production. The company believes the product will either experience high market demand or low market demand. The following payoff table describes the company's decision situation.

Decision	States of Nature	
	High Demand	Low Demand
Expand Facilities	\$2,000,000	-\$1,250,000
Acquire Competitor	\$750,000	-\$500,000
Subcontract Production	\$250,000	\$25,000

The value of the Hurwicz decision criterion for subcontract production when the coefficient of optimism is 0.30 is

- a. \$92,500.
- b. \$182,500.
- c. \$250,000.
- d. \$275,000.

Ans: A, LO: 1, Bloom: K, Difficulty: Moderate, AACSB: None

Solution: $\$75,000 + \$12,500 = \$92,500$

32. Kallie Inc., a small parts manufacturer, has just engineered a new product for the automotive industry. In order to produce the part the company can expand existing facilities, acquire a competitor, or subcontract production. The company believes the product will either experience high market demand or low market demand. The following payoff table describes the company's decision situation.

Decision	States of Nature	
	High Demand	Low Demand
Expand Facilities	\$2,000,000	-\$1,250,000
Acquire Competitor	\$750,000	-\$500,000
Subcontract Production	\$250,000	\$25,000

The best decision for Kallie Inc. using the equal likelihood criterion is to

- a. expand facilities.acquire competitor.
- b. subcontract production.
- c. select high demand.

Ans: A, LO: 1, Bloom: K, Difficulty: Moderate, AACSB: None

Solution:

Expand Facilities	\$325,000
Acquire Competitor	\$125,000
Subcontract Production	\$137,500

The maximum is \$325,000. Select expand facilities.

33. Kallie Inc., a, small parts manufacturer, has just engineered a new product for the automotive industry. In order to produce the part the company can expand existing facilities, acquire a competitor, or subcontract production. The company believes the product will either experience high market demand or low market demand, with

probabilities of 0.6 and 0.4, respectively. The following payoff table describes the company's decision situation.

Decision	States of Nature	
	High Demand (0.6)	Low Demand (0.4)
Expand Facilities	\$2,000,000	-\$1,250,000
Acquire Competitor	\$750,000	-\$500,000
Subcontract Production	\$250,000	\$25,000

The expected value for the expand facilities decision is

- a. \$250,000.
- b. \$160,000.
- c. \$700,000.
- d. \$1,200,000.

Ans: C, LO: 1, Bloom: K, Difficulty: Moderate, AACSB: None

Solution: $\$1,200,000 - \$500,000 = \$700,000$

34. Kallie Inc., a small parts manufacturer, has just engineered a new product for the automotive industry. In order to produce the part the company can expand existing facilities, acquire a competitor, or subcontract production. The company believes the product will either experience high market demand or low market demand, with probabilities of 0.6 and 0.4, respectively. The following payoff table describes the company's decision situation.

Decision	States of Nature	
	High Demand (0.6)	Low Demand (0.4)
Expand Facilities	\$2,000,000	-\$1,250,000
Acquire Competitor	\$750,000	-\$500,000
Subcontract Production	\$250,000	\$25,000

The expected value for the acquire competitor decision is

- a. \$250,000.
- b. \$160,000.
- c. \$700,000.
- d. \$1,200,000.

Ans: A, LO: 1, Bloom: K, Difficulty: Moderate, AACSB: None

Solution: $\$450,000 - \$200,000 = \$250,000$

35. Kallie Inc., a small parts manufacturer, has just engineered a new product for the automotive industry. In order to produce the part the company can expand existing facilities, acquire a competitor, or subcontract production. The company believes the product will either experience high market demand or low market demand, with probabilities of 0.6 and 0.4, respectively. The following payoff table describes the company's decision situation.

Decision	States of Nature	
	High Demand (0.6)	Low Demand (0.4)
Expand Facilities	\$2,000,000	-\$1,250,000
Acquire Competitor	\$750,000	-\$500,000
Subcontract Production	\$250,000	\$25,000

The expected value for the subcontract production decision is

- a. \$250,000
- b. \$160,000
- c. \$700,000
- d. \$1,200,000

Ans: B, LO: 1, Bloom: K, Difficulty: Moderate, AACSB: None

Solution: $\$150,000 + \$410,000 = \$160,000$

36. A small parts manufacturer has just engineered a new product for the automotive industry. In order to produce the part the company can expand existing facilities, acquire a competitor, or subcontract production. The company believes the product will either experience high market demand or low market demand, with probabilities of 0.6 and 0.4, respectively. The following payoff table describes the company's decision situation.

Decision	States of Nature	
	High Demand (0.6)	Low Demand (0.4)
Expand Facilities	\$2,000,000	-\$1,250,000
Acquire Competitor	\$750,000	-\$500,000
Subcontract Production	\$250,000	\$25,000

The best decision according to the expected value criterion is

- a. Acquire Competitor.
- b. Expand Facilities.
- c. Subcontract Production.
- d. High Demand

Ans: B, LO: 1, Bloom: K, Difficulty: Moderate, AACSB: None

Solution:

Expand Facilities \$700,000

Acquire Facilities \$250,000

Subcontract Production \$160,000

Maximum = \$700,000. Select expand facilities.

37. Kallie Inc., a small parts manufacturer, has just engineered a new product for the automotive industry. In order to produce the part the company can expand existing facilities, acquire a competitor, or subcontract production. The company believes the product will either experience high market demand or low market demand, with

probabilities of 0.6 and 0.4, respectively. The following payoff table describes the company's decision situation.

Decision	States of Nature	
	High Demand (0.6)	Low Demand (0.4)
Expand Facilities	\$2,000,000	-\$1,250,000
Acquire Competitor	\$750,000	-\$500,000
Subcontract Production	\$250,000	\$25,000

The expected value of perfect information for Kallie Inc.is

- a. \$1,210,000.
- b. \$700,000.
- c. \$510,000..
- d. \$312,500

Ans: C, LO: 1, Bloom: K, Difficulty: Hard, AACSB: None

Solution: \$1,210,000-\$700,000=\$510,000

Short Answer

38. What is decision analysis?

Ans: Below, LO: 1, Bloom: K, Difficulty: Moderate, AACSB: None

Ans: Decision analysis is a set of quantitative techniques for decision-making situations in which uncertainty exists. Decision analysis is a generic technique that can be applied to a number of different types of operational decision-making areas. The study of decision analysis is useful because it provides a structured, systematic approach to decision-making that many decision makers follow intuitively without ever consciously thinking about it. Thus, decision analysis represents not only a collection of decision-making techniques but also an analysis of the logic underlying decision-making.

Difficulty: Moderate

Feedback: Decision Analysis