

Introduction to Management Science, 13e, Global Edition (Taylor)
Chapter 1 Management Science

1) A management science solution can be either a recommended decision or information that helps a manager make a decision.

Answer: TRUE

Diff: 2 Page Ref: 25

Section Heading: The Management Science Approach to Problem Solving

Keywords: model, management science techniques

AACSB: Analytical thinking

2) A variable is a value that is usually a coefficient of a parameter in an equation.

Answer: FALSE

Diff: 1 Page Ref: 23

Section Heading: The Management Science Approach to Problem Solving

Keywords: variable

AACSB: Analytical thinking

3) Parameters are known, constant values that are usually coefficients of variables in equations.

Answer: TRUE

Diff: 1 Page Ref: 23

Section Heading: The Management Science Approach to Problem Solving

Keywords: parameter

AACSB: Analytical thinking

4) Data are pieces of information from the problem environment.

Answer: TRUE

Diff: 1 Page Ref: 24

Section Heading: The Management Science Approach to Problem Solving

Keywords: data

AACSB: Analytical thinking

5) A model is a mathematical representation of a problem situation including variables, parameters, and equations.

Answer: TRUE

Diff: 1 Page Ref: 23

Section Heading: The Management Science Approach to Problem Solving

Keywords: model, management science techniques

AACSB: Analytical thinking

6) A management science technique usually applies to a specific model type.

Answer: TRUE

Diff: 1 Page Ref: 23

Section Heading: The Management Science Approach to Problem Solving

Keywords: models, management science techniques

AACSB: Analytical thinking

7) The first step of the management science process is to define the problem.

Answer: FALSE

Diff: 2 Page Ref: 22

Section Heading: The Management Science Approach to Problem Solving

Keywords: management science process

AACSB: Analytical thinking

8) The term *big data* refers to numbers of large magnitude, i.e., greater than or equal to one billion.

Answer: FALSE

Diff: 1 Page Ref: 27

Section Heading: Management Science and Business Analytics

Keywords: big data, analytics

AACSB: Application of knowledge

9) A key component of business analytics is the recent availability of large amounts of data.

Answer: TRUE

Diff: 1 Page Ref: 27

Section Heading: Management Science and Business Analytics

Keywords: big data, analytics

AACSB: Application of knowledge

10) Business analytics brings together the disciplines of information systems, management science, statistics, and mathematical modeling.

Answer: TRUE

Diff: 1 Page Ref: 27

Section Heading: Management Science and Business Analytics

Keywords: big data, analytics

AACSB: Application of knowledge

11) Management science modeling techniques provide results that are known with certainty.

Answer: FALSE

Diff: 2 Page Ref: 38

Section Heading: Management Science Modeling Techniques

Keywords: management science modeling techniques, certainty

AACSB: Analytical thinking

12) The term *sensitivity analysis* refers to testing how a problem solution reacts to changes in one or more of the model parameters.

Answer: TRUE

Diff: 1 Page Ref: 32

Section Heading: Model Building: Break-Even Analysis

Keywords: sensitivity analysis, parameter changes

AACSB: Application of knowledge

13) Variable costs depend on the number of items produced.

Answer: TRUE

Diff: 1 Page Ref: 29

Section Heading: Model Building: Break-Even Analysis

Keywords: variable cost, break-even analysis

AACSB: Application of knowledge

14) Fixed cost is the difference between total cost and total variable cost.

Answer: TRUE

Diff: 1 Page Ref: 29

Section Heading: Model Building: Break-Even Analysis

Keywords: total cost, break-even analysis

AACSB: Application of knowledge

15) The break-even point is the volume that equates total revenue with total cost.

Answer: TRUE

Diff: 1 Page Ref: 30

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

16) In general, an increase in price increases the break-even point if all costs are held constant.

Answer: FALSE

Diff: 1 Page Ref: 32

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

17) If variable costs increase, but price and fixed costs are held constant, the break-even point will decrease.

Answer: FALSE

Diff: 2 Page Ref: 32

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

18) Managers utilize spreadsheets to conduct their own analyses in management science studies.

Answer: TRUE

Diff: 2 Page Ref: 34

Section Heading: Computer Solution

Keywords: spreadsheets

AACSB: Analytical thinking

19) Management science techniques focus primarily on observation, model construction, and implementation to find an appropriate solution to a problem.

Answer: FALSE

Diff: 2 Page Ref: 36

Section Heading: Management Science Modeling Techniques

Keywords: management science modeling techniques, steps of the scientific method

AACSB: Analytical thinking

20) Management science modeling techniques focus on model construction and problem solution.

Answer: TRUE

Diff: 2 Page Ref: 36

Section Heading: Management Science Modeling Techniques

Keywords: management science model techniques, model construction, problem solution

AACSB: Analytical thinking

21) A typical objective function might be written as $3S + 2R + 5Z \leq 20$.

Answer: FALSE

Diff: 2 Page Ref: 24

Section Heading: The Management Science Approach to Problem Solving

Keywords: objective function

AACSB: Analytical thinking

22) Decision Support Systems (DSS) use computers to help decision makers address complex problems.

Answer: TRUE

Diff: 1 Page Ref: 41

Section Heading: Management Science Models in Decision Support Systems

Keywords: decision making, management science

AACSB: Application of knowledge

23) In both an objective function and a constraint, the decision variables are represented by numbers.

Answer: FALSE

Diff: 1 Page Ref: 24

Section Heading: The Management Science Approach to Problem Solving

Keywords: decision variables

AACSB: Analytical thinking

24) A DSS is a type of ERP system.

Answer: FALSE

Diff: 2 Page Ref: 42

Section Heading: The Management Science Approach to Problem Solving

Keywords: DSS, ERP

AACSB: Analytical thinking

25) A key element of a decision support system (DSS) is the person using the system.

Answer: TRUE

Diff: 2 Page Ref: 41

Section Heading: Management Science Models in Decision Support Systems

Keywords: decision support systems

AACSB: Analytical thinking

26) An ERP system is software that is capable of connecting functions and processes across an entire company.

Answer: TRUE

Diff: 1 Page Ref: 42

Section Heading: The Management Science Approach to Problem Solving

Keywords: ERP, enterprise resource planning

AACSB: Analytical thinking

27) A company may use an intranet for communication among its own business units that are scattered geographically.

Answer: TRUE

Diff: 1 Page Ref: 42

Section Heading: The Management Science Approach to Problem Solving

Keywords: intranet

AACSB: Analytical thinking

28) _____ are pieces of information from the problem environment.

Answer: Data

Diff: 1 Page Ref: 24

Section Heading: The Management Science Approach to Problem Solving

Keywords: data

AACSB: Application of knowledge

29) A(n) _____ is a functional relationship including variables, parameters, and equations.

Answer: model

Diff: 1 Page Ref: 24

Section Heading: The Management Science Approach to Problem Solving

Keywords: model

AACSB: Application of knowledge

30) _____ is the term used to describe a collection of numbers that is massive in size.

Answer: Big data

Diff: 1 Page Ref: 27

Section Heading: Management Science and Business Analytics

Keywords: big data, analytics

AACSB: Application of knowledge

31) _____ uses large amounts of data with management science techniques and modeling to help managers make decisions.

Answer: Business analytics

Diff: 1 Page Ref: 27

Section Heading: Management Science and Business Analytics

Keywords: big data, analytics

AACSB: Application of knowledge

32) Management science techniques include _____ techniques, models that are represented as diagrams, presenting a pictorial representation of the system being analyzed.

Answer: network

Diff: 1 Page Ref: 36

Section Heading: Management Science Modeling Techniques

Keywords: management science, networks

AACSB: Application of knowledge

33) An increase in output typically results in an increase in the _____ cost.

Answer: total variable, total

Diff: 1 Page Ref: 29

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

34) _____ techniques provide results that contain uncertainty, unlike mathematical programming techniques which are deterministic.

Answer: Probabilistic

Diff: 1 Page Ref: 38

Section Heading: Management Science Modeling Techniques

Keywords: management science techniques, probabilistic techniques

AACSB: Analytical thinking

35) _____ costs are independent of the volume of goods produced and remain constant.

Answer: Fixed

Diff: 1 Page Ref: 29

Section Heading: Model Building: Break-Even Analysis

Keywords: fixed cost, break-even analysis

AACSB: Analytical thinking

36) Total revenue minus total cost equals _____.

Answer: profit

Diff: 1 Page Ref: 29

Section Heading: Model Building: Break-Even Analysis

Keywords: profit, break-even analysis

AACSB: Analytical thinking

- 37) The _____ is the volume that equates total revenue with total cost.
Answer: break-even point
Diff: 1 Page Ref: 29
Section Heading: Model Building: Break-Even Analysis
Keywords: break-even analysis
AACSB: Analytical thinking
- 38) A(n) _____ represents a limitation to achieving maximum profits due to limited resources.
Answer: constraint
Diff: 1 Page Ref: 24
Section Heading: The Management Science Approach to Problem Solving
Keywords: constraint, model development
AACSB: Analytical thinking
- 39) One way to test how a management science model reacts to changes in its parameters is to conduct _____ analysis.
Answer: sensitivity
Diff: 1 Page Ref: 32
Section Heading: Model Building: Break-Even Analysis
Keywords: sensitivity analysis
AACSB: Analytical thinking
- 40) _____ consist of models that are represented as diagrams rather than as strictly mathematical techniques.
Answer: Networks
Diff: 2 Page Ref: 36
Section Heading: Management Science Modeling Techniques
Keywords: network flow models
AACSB: Analytical thinking
- 41) A management science technique that does not assume that all parameters are known with certainty is a(n) _____ technique.
Answer: probabilistic
Diff: 2 Page Ref: 38
Section Heading: Management Science Modeling Techniques
Keywords: probabilistic techniques
AACSB: Analytical thinking
- 42) A(n) _____ is a computer-based system that helps decision-makers address complex problems that involve different parts of an organization and operations.
Answer: decision support system, DSS
Diff: 1 Page Ref: 41
Section Heading: Management Science Models in Decision Support Systems
Keywords: decision support systems
AACSB: Analytical thinking

43) The databases, management science models, and internet interact with the decision maker via the _____.

Answer: user interface

Diff: 2 Page Ref: 42

Section Heading: Management Science Models in Decision Support Systems

Keywords: decision support system, user interface

AACSB: Analytical thinking

44) _____ systems connect the business functions of an entire company.

Answer: Enterprise resource planning, ERP

Diff: 1 Page Ref: 41

Section Heading: Management Science Models in Decision Support Systems

Keywords: ERP, enterprise resource planning

AACSB: Analytical thinking

45) The steps of the management science process are:

A) problem definition, model construction, observation, model solution, implementation.

B) observation, problem definition, model construction, model solution, implementation.

C) model construction, problem definition, observation, model solution, implementation.

D) observation, implementation, problem definition, model construction, model solution.

Answer: B

Diff: 1 Page Ref: 22

Section Heading: The Management Science Approach to Problem Solving

Keywords: steps of sci method, problem solving approach, management sci process

AACSB: Analytical thinking

46) A model is a functional relationship that includes:

A) variables.

B) parameters.

C) equations.

D) all of the above

Answer: D

Diff: 1 Page Ref: 23

Section Heading: The Management Science Approach to Problem Solving

Keywords: model

AACSB: Analytical thinking

47) Which of the following is an equation or an inequality that expresses a resource restriction in a mathematical model?

- A) a decision variable
- B) an objective function
- C) a constraint
- D) a parameter

Answer: C

Diff: 2 Page Ref: 24

Section Heading: The Management Science Approach to Problem Solving

Keywords: model, constraint

AACSB: Analytical thinking

48) There is considerable overlap in the scientific method and management science techniques. Which of the following steps is shared between them?

- A) observation
- B) problem definition
- C) model construction
- D) implementation

Answer: C

Diff: 2 Page Ref: 23

Section Heading: The Management Science Approach to Problem Solving

Keywords: scientific approach

AACSB: Analytical thinking

49) Which of the following is *incorrect* with respect to the use of models in decision making?

- A) They improve understanding of the problem.
- B) They promote subjectivity in decision making.
- C) They are generally easy to use.
- D) They provide a systematic approach to problem solving.

Answer: B

Diff: 3 Page Ref: 23

Section Heading: The Management Science Approach to Problem Solving

Keywords: model, problem solving

AACSB: Analytical thinking

50) The field of management science:

- A) approaches decision making irrationally with techniques based on the scientific method.
- B) is another name for management or human resources management.
- C) concentrates on the use of quantitative methods to assist managers in decision making.
- D) is completely separate and distinct from all other disciplines.

Answer: C

Diff: 1 Page Ref: 22

Section Heading: The Management Science Approach to Problem Solving

Keywords: management science, operations research

AACSB: Analytical thinking

- 51) The processes of problem observation:
A) cannot be done until alternatives are proposed.
B) requires consideration of multiple criteria.
C) is the first step of decision making.
D) is the final step of problem solving.

Answer: C

Diff: 1 Page Ref: 22

Section Heading: The Management Science Approach to Problem Solving

Keywords: observation, problem observation, management science process

AACSB: Analytical thinking

- 52) The limits of the problem and the degree to which it pervades other units in the organization must be included during the _____ step of the management science process.

- A) observation
B) definition
C) solution
D) implementation

Answer: B

Diff: 1 Page Ref: 22

Section Heading: The Management Science Approach to Problem Solving

Keywords: management science process

AACSB: Analytical thinking

- 53) _____ involves determining the functional relationship between variables, parameters, and equations.

- A) Problem observation
B) Problem definition
C) Model construction
D) Model solution

Answer: C

Diff: 1 Page Ref: 23

Section Heading: The Management Science Approach to Problem Solving

Keywords: management science process, model construction

AACSB: Analytical thinking

- 54) Which steps of the management science process can either be a recommended decision or information that helps a manager make a decision?

- A) model implementation
B) problem definition
C) model solution
D) problem formulation

Answer: C

Diff: 2 Page Ref: 23

Section Heading: The Management Science Approach to Problem Solving

Keywords: management science process, model solution

AACSB: Analytical thinking

55) The result of an effective decision-making process should be monitored in order to:

- A) reveal the break-even point.
- B) reveal errors in the implementation.
- C) keep fixed and variable costs distinct.
- D) change the scientific method.

Answer: B

Diff: 2 Page Ref: 27

Section Heading: The Management Science Approach to Problem Solving

Keywords: decision making process

AACSB: Analytical thinking

56) Which of these disciplines typically *does not* fall under the umbrella of analytics?

- A) information systems
- B) statistics
- C) management science
- D) operations management

Answer: D

Diff: 2 Page Ref: 27

Section Heading: Management Science and Business Analytics

Keywords: big data, analytics

AACSB: Application of knowledge

57) The indicator that results in total revenues being equal to total cost is called the:

- A) marginal cost.
- B) marginal volume.
- C) break-even point.
- D) profit mix.

Answer: C

Diff: 1 Page Ref: 30

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

58) Variable cost:

- A) depends on the number of units produced.
- B) plus marginal cost equals fixed cost.
- C) is equal to total cost in deterministic models.
- D) is the same as average cost.

Answer: A

Diff: 2 Page Ref: 29

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

59) The components of break-even analysis are:

- A) cost and profit.
- B) volume and cost.
- C) volume, cost and profit.
- D) volume and profit.

Answer: C

Diff: 1 Page Ref: 29

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

60) _____ are generally independent of the volume of units produced and sold.

- A) Fixed costs
- B) Variable costs
- C) Profits
- D) Average cost

Answer: A

Diff: 1 Page Ref: 29

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

61) The purpose of break-even analysis is to determine the number of units of a product to sell that will:

- A) appeal to the consumer.
- B) result in a profit.
- C) result in a loss.
- D) result in zero profit.

Answer: D

Diff: 2 Page Ref: 29

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

62) Variable cost *does not* include:

- A) raw materials and resources.
- B) staff and management salaries.
- C) material handling and freight.
- D) direct labor and packaging.

Answer: B

Diff: 2 Page Ref: 29

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

63) Which variable is *not* a component of break-even analysis?

- A) fixed costs
- B) variable costs
- C) number of employees
- D) number of customers

Answer: C

Diff: 1 Page Ref: 29

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

64) At the break-even point:

- A) total revenue equals total cost.
- B) profit is maximized.
- C) revenue is maximized.
- D) costs are minimized.

Answer: A

Diff: 1 Page Ref: 30

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

65) If the price increases, but fixed and variable costs do not change, the break-even point:

- A) decreases.
- B) increases.
- C) remains the same.
- D) may increase or decrease, depending on sales.

Answer: A

Diff: 2 Page Ref: 32

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

66) If the price decreases, but fixed and variable costs do not change, the break-even point:

- A) decreases.
- B) increases.
- C) remains the same.
- D) may increase or decrease, depending on sales.

Answer: B

Diff: 2 Page Ref: 32

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

67) The term _____ refers to testing how a problem solution reacts to changes in one or more of the model parameters.

- A) graphical solution
- B) decision analysis
- C) sensitivity analysis
- D) break-even analysis

Answer: C

Diff: 2 Page Ref: 32

Section Heading: Model Building: Break-Even Analysis

Keywords: sensitivity analysis, modeling process

AACSB: Analytical thinking

68) If fixed costs decrease, but variable cost and price remain the same, the break-even point:

- A) decreases.
- B) increases.
- C) remains the same.
- D) may increase or decrease depending on sales.

Answer: A

Diff: 2 Page Ref: 33

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

69) If fixed costs increase, but variable cost and price remain the same, the break-even point:

- A) decreases.
- B) increases.
- C) remains the same.
- D) may increase or decrease depending on sales.

Answer: B

Diff: 2 Page Ref: 33

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

70) Administrators at a university will charge students \$175 to attend freshman orientation. It costs \$10,000 to reserve a room, hire extra security, and bring in a moonwalk. Assume it costs \$15 per student for the administrators to provide the course materials. How many students would have to register for orientation for the university to break even?

- A) 54.25
- B) 58
- C) 56
- D) 62.5

Answer: D

Diff: 2 Page Ref: 30

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

71) A university is planning a seminar. It costs \$3000 to reserve a room, hire an instructor, and bring in the equipment. Assume it costs \$25 per student for the administrators to provide the course materials. If we know that 20 people will attend, what price should be charged per person to break even?

- A) \$120
- B) \$150
- C) \$175
- D) \$200

Answer: C

Diff: 2 Page Ref: 30

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

72) A university is planning an online seminar. It costs \$30 to live stream an instructor from Elbonia. Assume it costs \$25 per student for the administrators to provide the course materials. If we know that 20 people will attend, what price should be charged per person to break even?

- A) \$55
- B) \$15
- C) \$26.50
- D) \$75.75

Answer: C

Diff: 2 Page Ref: 30

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

73) It costs \$50,000 to start a production process. Variable cost is \$25 per unit and revenue is \$45 per unit. What is the break-even point?

- A) 1000 units
- B) 1111 units
- C) 2000 units
- D) 2500 units

Answer: D

Diff: 1 Page Ref: 30

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

74) It costs \$6,000 to start a production process. Variable cost is \$2 per unit and revenue is \$5 per unit. What is the break-even point?

- A) 1000 units
- B) 1111 units
- C) 2000 units
- D) 2500 units

Answer: C

Diff: 1 Page Ref: 30

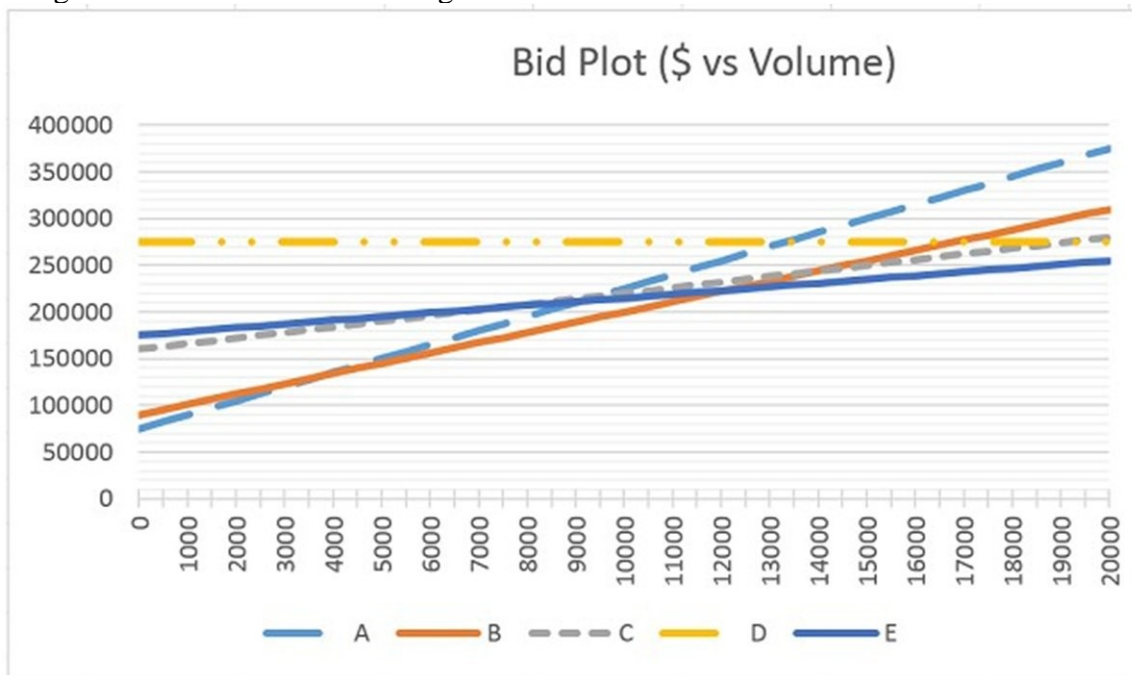
Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

Yowzah Bids

Yowzah receives bids from four companies we'll call A, B, C, and D to supply product for the coming year. René Descartes, the Yowzah VP of Plotting takes the bids and creates this graph to bring to the next executive meeting.



75) The company with the lowest variable cost is:

- A) A.
- B) B.
- C) C.
- D) D.

Answer: D

Diff: 2 Page Ref: 30

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

76) The company with the highest variable cost is:

- A) A.
- B) B.
- C) C.
- D) D.

Answer: A

Diff: 2 Page Ref: 30

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

77) Over the range of demand shown by this graph, which action would completely remove one of the potential suppliers from consideration?

- A) lowering A's fixed cost by 10%
- B) raising B's variable cost by 10%
- C) raising C's variable and fixed costs by 10%
- D) lowering D's fixed cost by 25%

Answer: C

Diff: 2 Page Ref: 30

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

78) Which of these changes would have no effect on which supplier is chosen in the output range of 0 units to 20,000 units?

- A) Variable costs fall 10% for all bidders.
- B) Fixed costs rise 10% for all bidders.
- C) Companies A and B swap their figures for fixed costs.
- D) Companies C and D swap their figures for fixed costs.

Answer: B

Diff: 2 Page Ref: 30

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

79) Which level of anticipated demand is least sensitive to variations in fixed and variable cost estimates?

- A) 5,000
- B) 10,000
- C) 15,000
- D) 20,000

Answer: B

Diff: 2 Page Ref: 30

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

80) Company A has a fixed cost of 75,000 and a variable cost of 15. Company B's fixed cost is 90,000 and variable cost is 11. At what point is Yowzah indifferent between the two bidders?

- A) 3,250
- B) 3,500
- C) 3,750
- D) 4,000

Answer: C

Diff: 2 Page Ref: 30

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

81) Yowzah receives a frantic call from company C. Evidently the fixed cost they quoted was in rupees rather than dollars. If the current exchange rate is 60 rupees to the dollar, what is the net effect of an updated analysis?

- A) Company C is the bidder of choice throughout the range depicted in the graph.
- B) Company C has the highest total cost throughout the range depicted in the graph.
- C) Company C has the highest fixed cost of all four companies.
- D) Even beyond the range depicted in the graph, company C would be the bidder of choice.

Answer: A

Diff: 1 Page Ref: 30

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

82) Which of the following statements is *false*?

- A) Decision models selectively describe the managerial situation.
- B) Decision models consider all factors from the real world.
- C) Decision models designate performance measures that reflect objectives.
- D) Decision models designate decision variables.

Answer: B

Diff: 2 Page Ref: 23

Section Heading: The Management Science Approach to Problem Solving

Keywords: models, decision models, modeling techniques

AACSB: Analytical thinking

83) Decision support systems and sensitivity analysis are useful management science tools for answering the question:

- A) by when?
- B) who else?
- C) how much?
- D) what if?

Answer: D

Diff: 2 Page Ref: 42

Section Heading: Management Science Models in Decision Support Systems

Keywords: decision support systems

AACSB: Analytical thinking

84) A difficult aspect of using spreadsheets to solve management science problems is:

- A) obtaining the solution to standard management science problems.
- B) data entry.
- C) performing sensitivity analysis.
- D) setting up a spreadsheet with complex models and formulas.

Answer: D

Diff: 2 Page Ref: 34

Section Heading: Computer Solution

Keywords: computer solution, spreadsheets

AACSB: Analytical thinking

85) A technique that assumes certainty in its solution is referred to as:

- A) stochastic.
- B) probabilistic.
- C) deterministic.
- D) parametric.

Answer: C

Diff: 2 Page Ref: 38

Section Heading: Management Science Modeling Techniques

Keywords: modeling, models, modeling techniques

AACSB: Analytical thinking

86) Classification of management science techniques *does not* recognize:

- A) linear mathematical programming.
- B) probabilistic techniques.
- C) network techniques.
- D) computer programming.

Answer: D

Diff: 1 Page Ref: 37

Section Heading: Management Science Modeling Techniques

Keywords: management science techniques, classification of techniques

AACSB: Analytical thinking

87) Linear mathematical programming techniques assume that all parameters in the models are:

- A) known with certainty.
- B) unknown.
- C) predictable.
- D) unpredictable.

Answer: A

Diff: 2 Page Ref: 37

Section Heading: Management Science Modeling Techniques

Keywords: management science techniques

AACSB: Analytical thinking

88) Decision analysis is a _____ technique.

- A) linear mathematical programming
- B) probabilistic
- C) network
- D) non-linear programming technique

Answer: B

Diff: 1 Page Ref: 38

Section Heading: Management Science Modeling Techniques

Keywords: management science techniques

AACSB: Analytical thinking

89) Which one of the following techniques is *not* a mathematical programming technique?

- A) linear programming models
- B) transportation models
- C) analytical hierarchy process
- D) integer linear programming technique

Answer: C

Diff: 2 Page Ref: 39

Section Heading: Management Science Modeling Techniques

Keywords: management science techniques

AACSB: Analytical thinking

90) The analytical hierarchy process is used to:

- A) convert qualitative problems into quantitative problems
- B) minimize the number of levels in an organization
- C) choose among several alternatives
- D) determine the optimal route between two points

Answer: C

Diff: 2 Page Ref: 39

Section Heading: Management Science Modeling Techniques

Keywords: AHP, analytical hierarchy process

AACSB: Analytical thinking

91) Which of these techniques is typically considered part of the operations realm rather than the management science realm?

- A) forecasting
- B) queuing
- C) networks
- D) routing

Answer: A

Diff: 2 Page Ref: 39

Section Heading: Management Science Modeling Techniques

Keywords: AHP, analytical hierarchy process

AACSB: Analytical thinking

92) Which one of the following management science methods is *not* a probabilistic technique?

- A) assignment models
- B) decision analysis
- C) queuing analysis
- D) statistical analysis

Answer: A

Diff: 2 Page Ref: 39

Section Heading: Management Science Modeling Techniques

Keywords: management science techniques

AACSB: Analytical thinking

93) A baker uses organic flour from a local farmer in all of his baked goods. For each batch of bread (x_1), he uses 4 pounds of flour. For a batch of cookies (x_2), he uses 3 pounds, and for a batch of muffins (x_3) he uses 2 pounds. The local farmer can supply him with no more than 24 pounds per week. The constraint that represents this condition is:

- A) $x_1 \leq 8, x_2 \leq 8, x_3 \leq 8$.
- B) $x_1 + x_2 + x_3 \geq 24$.
- C) $x_1 + x_2 + x_3 \leq 24$.
- D) $4x_1 + 3x_2 + 2x_3 \leq 24$.

Answer: D

Diff: 3 Page Ref: 24

Section Heading: The Management Science Approach to Problem Solving

Keywords: constraints

AACSB: Analytical thinking

94) A baker uses organic flour from a local farmer in all of his baked goods. For each batch of bread (x_1), he uses 4 pounds of flour. For a batch of cookies (x_2), he uses 3 pounds, and for a batch of muffins (x_3) he uses 2 pounds. The local farmer can supply him with no more than 24 pounds per week. At most, the baker could make:

- A) 4 batches of bread.
- B) 2 pounds of muffins.
- C) 8 batches of cookies.
- D) 24 pounds of flour.

Answer: C

Diff: 2 Page Ref: 24

Section Heading: The Management Science Approach to Problem Solving

Keywords: constraints

AACSB: Analytical thinking

95) A baker uses organic flour from a local farmer in all of his baked goods. For each batch of bread (x_1), he uses 4 pounds of flour. For a batch of cookies (x_2), he uses 3 pounds, and for a batch of muffins (x_3) he uses 2 pounds. The local farmer can supply him with no more than 24 pounds per week. Which of these combinations can be made with the available flour?

- A) 3 batches of bread, 3 batches of cookies, and 3 batches of muffins
- B) 2 batches of bread, 4 batches of cookies, and 2 batches of muffins
- C) 3 batches of bread, 4 batches of cookies, and 2 batches of muffins
- D) 2 batches of bread, 1 batches of cookies, and 1 batches of muffins

Answer: B

Diff: 2 Page Ref: 24

Section Heading: The Management Science Approach to Problem Solving

Keywords: constraints

AACSB: Analytical thinking

96) An objective function:

- A) shows where the break-even point is.
- B) describes how much of a resource can be used.
- C) can represent costs or profits.
- D) describes something to be maximized.

Answer: C

Diff: 2 Page Ref: 37

Section Heading: Management Science Modeling Techniques

Keywords: objective function, model construction

AACSB: Analytical thinking

97) Larry's Fish Market buys salmon (S) for \$5 per pound and a local whitefish (W) for \$3.50 per pound. Larry wants to minimize his cost, but he cannot spend more than \$160. The objective function that minimizes these costs for Larry is:

- A) $5S + 3.5W \leq 160$.
- B) $\text{Min } 5S + 3.5W$.
- C) $\text{Max } 5S + 3.5W$.
- D) $\text{Min } 5S + 3.5W \geq 160$.

Answer: B

Diff: 3 Page Ref: 23

Section Heading: The Management Science Approach to Problem Solving

Keywords: objective function, model construction

AACSB: Analytical thinking

98) It's time to buy pet food again and Lisa heads to the grocery store with \$40 in her purse, leaving her seven hungry cats and four hungry dogs at home. Dog food costs \$1 per can and cat food costs \$0.50 per can. Dogs eat two full cans of food each day but cats eat only one can. Lisa would like to buy enough food to last through her three-day weekend. What is an appropriate objective function for this scenario?

- A) $\text{Min } Z = 1D + 0.5C$
- B) $\text{Min } Z = 2D + 1C$
- C) $\text{Min } Z = D + C \leq 40$
- D) $\text{Min } Z = D + C \geq 3$

Answer: A

Diff: 3 Page Ref: 24

Section Heading: The Management Science Approach to Problem Solving

Keywords: objective function

AACSB: Analytical thinking

99) It's time to buy pet food again and Lisa heads to the grocery store with \$40 in her purse, leaving her seven hungry cats and four hungry dogs at home. Dog food costs \$1 per can and cat food costs \$0.50 per can. Dogs eat two full cans of food each day but cats eat only one can. Lisa would like to buy enough food to last through her three-day weekend. What is one appropriate constraint for this scenario?

- A) $7C + 4D \geq 3$
- B) $1C + 2D \leq 40$
- C) $.5C + 1D \leq 40$
- D) $7C + 4D \geq 1.5$

Answer: C

Diff: 3 Page Ref: 24

Section Heading: The Management Science Approach to Problem Solving

Keywords: constraints

AACSB: Analytical thinking

100) Marriott used which of the following management science techniques to help improve profit by \$120 million over two years?

- A) optimization, decision analysis, and forecasting
- B) forecasting, queuing theory, and inventory analysis
- C) queuing theory, optimization, and inventory analysis
- D) forecasting, simulation, and optimization

Answer: D

Diff: 3 Page Ref: 26

Section Heading: The Management Science Approach to Problem Solving

Keywords: management science, management scientist

AACSB: Analytical thinking

101) Which of these is a typical attribute of a decision support system?

- A) interactive
- B) intranet
- C) integrated
- D) insubordinate

Answer: A

Diff: 1 Page Ref: 41

Section Heading: Management Science Models in Decision Support Systems

Keywords: decision support systems

AACSB: Analytical thinking

102) Instantaneous information about business transactions is achievable through the use of:

- A) point of sale systems and CPM
- B) point of sale systems and EDI
- C) decision support systems and EDI
- D) decision support systems and CPM

Answer: B

Diff: 2 Page Ref: 42

Section Heading: Management Science Models in Decision Support Systems

Keywords: decision support systems

AACSB: Analytical thinking

103) Which of these decision support systems is the most comprehensive with respect to an entire organization?

- A) an Excel spreadsheet
- B) an ERP
- C) QM for Windows
- D) OLAP

Answer: B

Diff: 2 Page Ref: 42

Section Heading: Management Science Models in Decision Support Systems

Keywords: decision support systems

AACSB: Analytical thinking

104) The relationship $d = 5000 - 25p$ describes what happens to demand (d) as price (p) varies. Price can vary between \$10 and \$50. How many units can be sold when the price is \$10?

Answer: 4750

Diff: 2 Page Ref: 24

Section Heading: The Management Science Approach to Problem Solving

Keywords: break-even analysis

AACSB: Analytical thinking

105) A production process requires a fixed cost of \$50,000 and the variable cost per unit is \$25. The revenue per unit was projected to be \$45, but a recent marketing study shows that because of an emerging competitor, the revenue will be about 12% lower. How does this affect the break-even point?

Answer: The break-even point will be higher, at 3424 units, which is a 37% increase.

Diff: 3 Page Ref: 32

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

106) Administrators at a university are planning to offer a summer seminar. It costs \$3000 to reserve a room, hire an instructor, and bring in the equipment. Assume it costs \$25 per student for the administrators to provide the course materials. If we know that 20 people will attend, what price should be charged per person to break even?

Answer: \$175

Diff: 2 Page Ref: 30

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

107) A newly opened bed-and-breakfast projects the following:

Monthly fixed costs	\$8000
Variable cost per occupied room per night	\$40
Revenue per occupied room per night	\$165

Write the expression for total cost per month.

Answer: $C(x) = 8000 + 40x$

Diff: 2 Page Ref: 28

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

108) A newly opened bed-and-breakfast projects the following:

Monthly fixed costs	\$8000
Variable cost per occupied room per night	\$40
Revenue per occupied room per night	\$165

Write the expression for total revenue per month.

Answer: $R(x) = 165x$

Diff: 2 Page Ref: 29

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

109) A newly opened bed-and-breakfast projects the following:

Monthly fixed costs	\$8000
Variable cost per occupied room per night	\$40
Revenue per occupied room per night	\$165

How many rooms would have to be occupied per month in order to break even?

Answer: 64 rooms

Diff: 2 Page Ref: 30

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

110) Aaron decides to rent out a spare bedroom on a part time basis for weary business travelers coming to his fair city. Aaron's bed-and-breakfast projects the following:

Monthly fixed costs	\$2000
Variable cost per occupied room per night	\$10
Revenue per occupied room per night	\$165

How many nights would the room have to be occupied per month in order to break even?

Answer: 12.90 nights

Diff: 2 Page Ref: 30

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

111) A script writer has received an advance against royalties of \$10,000. The royalty rate is \$2 for every performance in the United States, and \$3 for every performance outside the United States. Define variables for this problem.

Answer: x = # of performances in the United States

y = # of performances outside the United States

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Section Heading: The Management Science Approach to Problem Solving

Keywords: break-even analysis

AACSB: Analytical thinking

112) A business analyst describes his company's profit function as $3x^2 + 6x - 200$. If x is the output volume, what statements can you make about the price, fixed cost, and variable cost?

Answer: The fixed cost is \$200, but we can't determine exactly what the price and variable cost are.

Diff: 3 Page Ref: 29

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis, variable definition

AACSB: Analytical thinking

113) A script writer has received an advance against royalties of \$10,000. The royalty rate is \$2 for every performance in the United States, and \$3 for every performance outside the United States. Write an expression that could be used to compute the number of performances in order to cover the advance.

Answer: $10000 = 2x + 3y$

Diff: 3 Page Ref: 25

Section Heading: The Management Science Approach to Problem Solving

Keywords: break-even analysis

AACSB: Analytical thinking

114) Students are organizing a "Battle of the Bands" contest. They know that at least 100 people will attend. The rental fee for the hall is \$150 and the winning band will receive \$500. In order to guarantee that they break even, how much should they charge for each ticket?

Answer: \$6.50

Diff: 2 Page Ref: 30

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

115) A popular performer is scheduled to appear at a major city. The promoter is deciding between two venues, the larger of which costs \$20,000 to rent and the smaller of which costs \$12,000 to rent. Ticket prices for the smaller venue are \$20, but the promoter is unsure what to charge per ticket for the larger venue. If exactly 1000 customers arrive, what percentage change in ticket prices would make the profit at the large venue identical to that of the smaller venue?

Answer: Increase 40%

Diff: 3 Page Ref: 30

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

116) Administrators at a university will charge students \$250 to attend freshman orientation. It costs \$8,000 to reserve their grand ballroom, hire extra security, and bring in a moonwalk. Assume it costs \$10 per student for the administrators to provide the course materials. How many students would have to register for orientation for the university to break even?

Answer: 33.3

Diff: 2 Page Ref: 30

Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

117) A manufacturer buys peas for vegetable pies from two cooperatives. The price per unit is \$6 from cooperative A and \$5.50 per unit from cooperative B. Define variables that would tell how many units to purchase from each source.

Answer: X_1 = # of units from cooperative A

X_2 = # of units from cooperative B

Diff: 3 Page Ref: 24

Section Heading: The Management Science Approach to Problem Solving

Keywords: break-even analysis, variable definition

AACSB: Analytical thinking

118) A manufacturer buys peas for vegetable pies from two cooperatives. The price per unit is \$6 from cooperative A and \$5.50 per unit from cooperative B. Develop an objective function that would minimize the total cost.

Answer: $\text{Min } 6x_1 + 5.5x_2$

Diff: 3 Page Ref: 24

Section Heading: The Management Science Approach to Problem Solving

Keywords: objective function, break-even analysis, model development

AACSB: Analytical thinking

119) A manufacturer buys peas for vegetable pies from two cooperatives. The price per unit is \$6 from cooperative A and \$5.50 per unit from cooperative B. The manufacturer needs at least 12,000 units of peas. Cooperative A can supply up to 8000 units, and cooperative B can supply at least 6000 units. Develop constraints for these conditions.

Answer: $X_A + X_B \geq 12000$

$X_A \leq 8000$

$X_B \geq 6000$

Diff: 3 Page Ref: 24

Section Heading: The Management Science Approach to Problem Solving

Keywords: constraints, model development

AACSB: Analytical thinking

120) A group of professors struggles to craft a set of assessment questions for their operations management intro class. They want to cover four topic areas with at least four questions each and have no more than twenty questions total for the assessment. What would a set of constraints look like if they chose an optimization approach to the assessment?

Answer: $X_1 \geq 4$

$X_2 \geq 4$

$X_3 \geq 4$

$X_4 \geq 4$

$X_1 + X_2 + X_3 + X_4 \leq 20$

Diff: 3 Page Ref: 25

Section Heading: The Management Science Approach to Problem Solving

Keywords: constraints

AACSB: Analytical thinking

121) What are some different types of decision support systems?

Answer: A DSS can be small and singular, such as an Excel spreadsheet set up for a single user to solve a specific type of problem. A DSS can also be large and complex, linking many users and databases. The DSS can be a data-oriented system or a model-oriented system. Some decision support systems (ERP systems) help managers make decisions about all facets of a company's operations.

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Section Heading: Management Science Models in Decision Support Systems

Keywords: decision support systems

AACSB: Analytical thinking

122) A manager of the cereal bar at the college campus has determined that the profit made for each bowl of Morning Buzz cereal sold, x , is equal to: $Z = \$4x - 0.5x$. Each bowl of Morning Buzz weighs 6 ounces, and the manager has 12 lbs (192 ounces) of cereal available each day, which can be written as the constraint, $6x \leq 192$. What maximum profit will be made from Morning Buzz if it is all sold in one day?

Answer: \$112

Diff: 2 Page Ref: 24

Section Heading: The Management Science Approach to Problem Solving

Keywords: model development

AACSB: Analytical thinking

123) The College Coffee Cafe buys tea from three suppliers. The price per pound is \$15.00 from supplier A, \$17.50 from supplier B, and \$21.00 from supplier C. They have budgeted \$175 to purchase the tea. The cafe needs at least 12 pounds of tea, and supplier C can supply no more than 4 pounds. Develop constraints for these conditions.

Answer: $15.00 X_A + 17.50 X_B + 21 X_C \leq 175$

$X_A + X_B + X_C \geq 12$

$X_C \leq 4$

Diff: 3 Page Ref: 24

Section Heading: The Management Science Approach to Problem Solving

Keywords: constraints, model development

AACSB: Analytical thinking

124) The College Coffee Cafe receives a profit of \$1.25 for each cup of house tea that they sell, \$1.40 for each cup of the premium brand, and \$1.50 for each cup of their special blend. Develop an objective that maximizes profit.

Answer: $\text{Max } 1.25x_1 + 1.40x_2 + 1.50x_3$

Diff: 2 Page Ref: 24

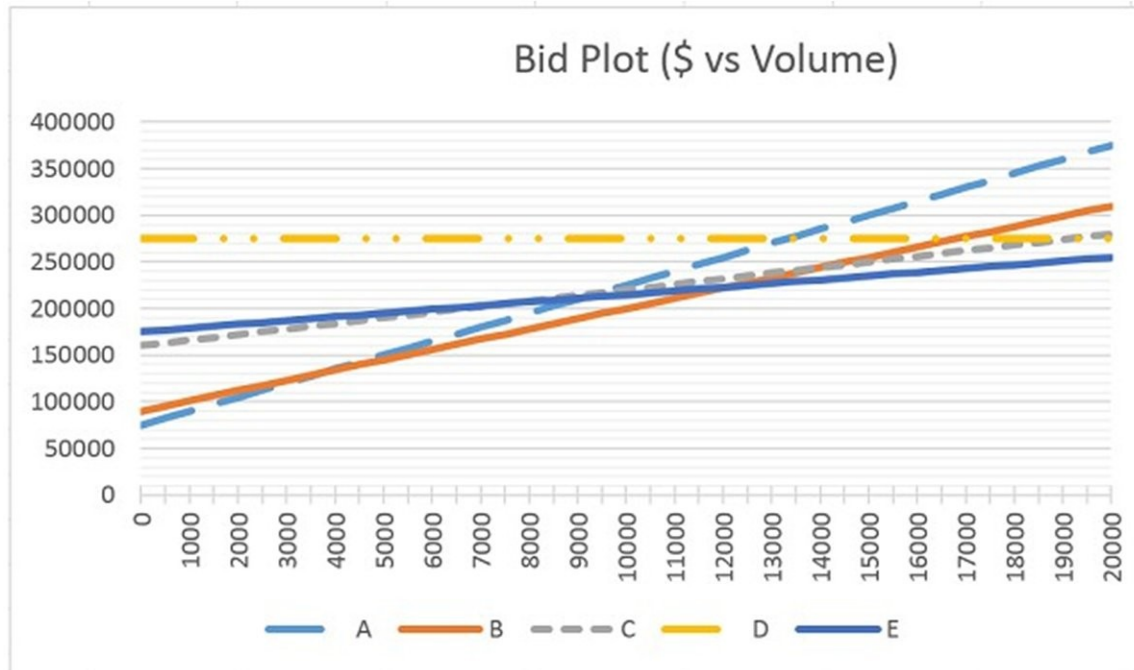
Section Heading: The Management Science Approach to Problem Solving

Keywords: objective function, model development

AACSB: Analytical thinking

Yowzah Bids

Yowzah receives bids from four companies we'll call A, B, C, and D to supply product for the coming year. René Descartes, the Yowzah VP of Plotting takes the bids and creates this graph to bring to the next executive meeting.



125) Describe a general approach for determining the variable cost of any of the companies in this plot.

Answer: The variable cost is reflected by the slope, so a rise over run formulation can be used. The leftmost edge of the graph represents $x = 0$ and the rightmost is a value of 20,000, which is a difference of 20,000. By subtracting the leftmost y-coordinate from each line from the rightmost, the rise can be computed. Then dividing the rise, or Δy , by the run, Δx , to determine the variable cost.

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Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

126) Which of the companies has the greatest variable cost?

Answer: The variable cost is reflected by the slope, and the line representing company A starts lower than the others on the left side of the graph and ends higher than all others, thus it must have the greatest slope and therefore highest variable cost.

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Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking

127) What is the point of indifference between company A and company C? How does this point of indifference affect Yowzah's decision?

Answer: Company A appears to have a fixed cost of 75,000 and company C appears to have a fixed cost of 160,000. The variable cost (slope) for company A is $(375,000 - 75,000)/20,000 = 15$. The variable cost (slope) for company C is $(280,000 - 160,000)/20,000 = 6$.

The point of indifference can be found by setting the two lines equal to each other, so $75,000 + 15x = 160,000 + 6x$; $9x = 85,000$; $x = 9444.4$

The point of indifference doesn't affect Yowzah's decision in this range as both companies have higher costs than their fierce rival company B around this range of output.

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Section Heading: Model Building: Break-Even Analysis

Keywords: break-even analysis

AACSB: Analytical thinking