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Chapter 2:
Quality Management

True/False

1. Six Sigma quality uses a statistical measure with a goal that equates to only 3.4 defects per million.
Ans: True
Difficulty: Moderate

Learning Objective: LO 5

2. With Six Sigma, the project team leader is known as a Black Belt.
Ans: True
Difficulty: Moderate

Learning Objective: LO 5

3. With Six Sigma, a teacher and mentor is known as a Green Belt.
Ans: False
Difficulty: Moderate

Learning Objective: LO 5

4. Quality levels in the United States were generally measured in defects per hundred before Six Sigma.
Ans: True
Difficulty: Moderate

Learning Objective: LO 5

5. Six Sigma is a recognized quality program based strictly on statistical process control.
Ans: False
Difficulty: Easy

Learning Objective: LO 5

6. Companies that have adopted Six Sigma view it as a short-term strategy for incremental quality improvement.
Ans: False

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Difficulty: Easy

Learning Objective: LO 5

7. The fundamental objective of Six Sigma is to focus on improvement by reducing process variation.
Ans: True
Difficulty: Moderate

Learning Objective: LO 5

8. To satisfy a customer's quality requirements companies often require the commitment to quality of their suppliers.
Ans: True
Difficulty: Moderate

Learning Objective: LO 4

9. Most members of a supply chain understand the importance of high quality because they are both customers and suppliers.
Ans: True
Difficulty: Moderate

Learning Objective: LO 4

10. Some companies enter into long-term relationships with suppliers who in return commit to meet delivery deadlines but not quality targets.
Ans: False
Difficulty: Easy

Learning Objective: LO 4

11. Globalization and foreign competition began to change consumers' attitudes toward quality in the 1950s.
Ans: False
Difficulty: Easy

Learning Objective: LO 4

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12. Deming advocated continuous process improvement to reduce variability and achieve conformance to design specifications.
Ans: True
Difficulty: Moderate

Learning Objective: LO 3

13. Deming emphasized final product inspection as a way to improve process quality.
Ans: False
Difficulty: Easy

Learning Objective: LO 3

14. Deming emphasized the use of statistical quality control techniques to reduce variability in the output of a process.
Ans: True
Difficulty: Easy

Learning Objective: LO 3

15. Deming believed that only suppliers are responsible for improving quality.

Ans: False
Difficulty: Easy

Learning Objective: LO 3

16. The Deming Wheel is also known as the plan-do-check-act (PDCA) cycle.
Ans: True
Difficulty: Easy

Learning Objective: LO 3

17. From the producer's perspective, quality is determined by what the consumer wants and is willing to pay for.
Ans: False
Difficulty: Moderate

Learning Objective: LO 3

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18. How well the product or service does what it is intended to do is known as quality of reliability.
Ans: False
Difficulty: Easy

Learning Objective: LO 1

19. The degree to which quality characteristics are designed into the product is known as quality of design.
Ans: True
Difficulty: Easy

Learning Objective: LO 1

20. Quality of performance relates to the basic operating characteristics of a product.
Ans: True
Difficulty: Easy

Learning Objective: LO 1

21. The degree to which a product meets pre-established standards is known as quality of conformance.
Ans: True
Difficulty: Easy

Learning Objective: LO 1

22. The courtesy and competence of the repair person can be one aspect of maintainability.
Ans: False
Difficulty: Easy

Learning Objective: LO 1

23. The probability that a product will operate properly within an expected time frame is known as quality of performance.
Ans: False
Difficulty: Moderate

Learning Objective: LO 1

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24. The dimension of quality related to the lifespan of a product before replacement is known as durability.
Ans: True
Difficulty: Moderate

Learning Objective: LO 1

25. In a general sense the supplier makes the final judgment regarding quality.
Ans: False
Difficulty: Easy

Learning Objective: LO 1

26. The cost of measuring, testing, and analyzing are collectively known as appraisal costs.
Ans: True
Difficulty Hard
Learning Objective: LO 2

27. Customer complaint costs are an example of external failure costs.
Ans: True
Difficulty: Moderate
Learning Objective: LO 2

28. ISO 9000 certification is a major consideration for doing business within the United States Europe Union.
Ans: True
Difficulty: Moderate

Learning Objective: LO 6

29. Statistical process control monitors and controls quality for both qualitative and quantitative variables.
Ans: True
Difficulty: Hard

Learning Objective: LO 3

30. Today, total quality management has been displaced by quality management systems.

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Ans: True
Difficulty: Hard

Learning Objective: LO 3

31. Total quality management represents a set of management principles that focus on quality improvement in all the functional areas within a company.

Ans: True
Difficulty: Easy

Learning Objective: LO 3

32. Employees' role in quality management is becoming less important due to the implementation of supplier partnerships.
Ans: False
Difficulty: Moderate

Learning Objective: LO 4

33. The training and education of all employees on quality improvement is a basic principle of total quality management.
Ans: True
Difficulty: Easy

Learning Objective: LO 4

34. One principle of total quality management (TQM) is that upper management is solely responsible for providing the leadership for quality.
Ans: False
Difficulty: Moderate

Learning Objective: LO 4

35. Two team approaches to quality improvement are quality circles and process improvement teams.
Ans: True
Difficulty: Moderate

Learning Objective: LO 4

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36. Benchmarking involves comparing a company's quality to the best level of quality achieved by another company in the same industry.
Ans: True
Difficulty: Moderate

Learning Objective: LO 4

37. Service quality is more directly related to the interaction between customer and employee than is manufacturing quality.
Ans: True
Difficulty: Moderate

Learning Objective: LO 4

38. McDonald's has a reputation for high-quality service resulting from the application of quality management principles.
Ans: True
Difficulty: Moderate

Learning Objective: LO 4

39 Quality management principles often do not apply to services because the customer has lower quality expectations.
Ans: False
Difficulty: Moderate

Learning Objective: LO 4

Multiple Choice

40. All of the following are parts of DMAIC **except**
a) define.
b) measure.
c) analyze.
d) improvise.
Ans: D.
Difficulty: Moderate

Learning Objective: LO 5

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41. Which of the following is not a dimension of quality for a manufactured good?
    a. performance
    b. reliability
    c. courtesy
    d. durability
Ans: C
Difficulty: Easy

Learning Objective: LO 1

42. All of the following are dimensions of quality for manufactured products, **except**
a. conformance.
b. reliability.
c. durability.
d. feasibility.
Ans: D
Difficulty: Moderate

Learning Objective: LO 1

43. The probability that a product will operate properly within an expected timeframe is the dimension of quality known as
    a. durability.
    b. reliability.
    c. performance.
    d. serviceability.
Ans: B
Difficulty: Easy

Learning Objective: LO 1

44. The degree to which a product meets pre-established standards is known as
    a. conformance.
    b. performance.
    c. reliability.
    d. None of these answer choices is correct.
Ans: A
Difficulty: Easy

Learning Objective: LO 1

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45. Making sure that the product meets the design specifications during production is referred to as
    a. quality of design.
    b. process capability.
    c. fitness for use.
    d. quality of conformance.

Ans: D
Difficulty: Easy

Learning Objective: LO 1

46. _____ advocated continuous improvement to the production process to achieve conformance to specifications and reduce variability.
    a. W. Edwards Deming
    b. Philip Crosby
    c. Kaoru Ishikawa
    d. Frederick Taylor

Ans: A
Difficulty: Moderate

Learning Objective: LO 3

47. W. Edwards Deming believed that primary responsibility for quality improvement rested with
    a. the firm's employees only.
    b. the firm's management only.
    c. research engineers and consulting statisticians only.
    d. both the employees and management of the firm.

Ans: D
Difficulty: Moderate

Learning Objective: LO 3

48. W. Edwards Deming's overall philosophy for achieving quality is embodied in
    a. his 14 points.
    b. his statement of purpose.
    c. his use of statistical control.
    d. None of these answer choices is correct.

Ans: A
Difficulty: Easy

Learning Objective: LO 3

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49. A relationship between a firm and its supplier where the supplier agrees to meet the firms' quality standards and the firm enters into a long-term purchasing agreement with the supplier is known as
    a. Outsourcing.
    b. vertical integration.
    c. partnering.
    d. conformance.

Ans: C
Difficulty: Moderate

Learning Objective: LO 4

50. Directly involving employees in the quality management process is referred to as
    a. partnering.
    b. a quality circle.
    c. Six Sigma.
    d. participative problem solving.

Ans: d
Difficulty: Easy

Learning Objective: LO 4

51. A production process consists of the following four stages with the average percentage of good quality at each stage as shown.

Stage	Average Percentage of Good Quality
1	0.92
2	0.95
3	0.96
4	0.93

What is the daily production yield for the company if daily input is 200 units?
    a. 192 units
    b. 188 units
    c. 184 units
    d. 156 units

Ans: D
Difficulty: Hard

Learning Objective: LO 2
Solution: Yield = 0.92 × 0.95 × 0.96 × 0.93 × 200 = 156 units.

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52. A production process consists of the following four stages with the average percentage of good quality at each stage as shown

Stage	Average Percentage of Good Quality
1	0.98
2	0.97
3	0.96
4	0.92

How many units must the company put into production each day to achieve a daily yield of 100 good units?

a. approximately 119 units
b. approximately 108 units
c. approximately 106 units
d. approximately 104 units

Ans: A
Difficulty: Hard
Learning Objective: LO 2

Solution: Input = 100/(0.98 × 0.97 × 0.96 × 0.92) = 119 units

53. A production process consists of the following four stages with the average percentage of good quality at each stage as shown.

Stage	Average Percentage of Good Quality
1	0.95
2	0.95
3	0.93
4	0.97

What is the daily production yield for the company if daily input is 500 units?

a. 485 units
b. 465 units
c. 407 units
d. 400 units

Ans: C
Difficulty: Hard
Learning Objective: LO 2

Solution: Yield = 500 × (0.95 × 0.95 × 0.93 × 0.97) = 407 units

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54. A production process consists of the following four stages with the average percentage of good quality at each stage as shown.

Stage	Average Percentage of Good Quality
1	0.95
2	0.95
3	0.93
4	0.97

How many units must the company put into production each day to achieve a daily yield of 350 good units?

a. approximately 430 units
b. approximately 415 units
c. approximately 468 units
d. approximately 361 units

Ans: A
Difficulty: Hard

Learning Objective: LO 2
Solution: Input = 350/(0.95 × 0.95 × 0.93 × 097) = 430 units

55. The costs associated with developing a quality management system are known as
a) training costs.
b) design costs.
c) quality planning costs.
d) information costs.
Ans: C
Difficulty: Hard

Learning Objective: LO 2

56. _____ failure costs include scrap, rework, and downtime.
a) External
b) Internal
c) Process
d) System
Ans: B
Difficulty: Moderate

Learning Objective: LO 2

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57. Which of the following quality tools display major causes of poor quality on a graph?
a. Process flow chart
b. Fishbone diagram
c. Histogram
d. Scatter diagram
Ans: B
Difficulty: Moderate

Learning Objective: LO 3

58. Which of the following quality tools displays the frequency of data related to a quality problem?
a. Fishbone diagram
b. Histogram
c. Scatter diagram
d. Process flow chart
Ans: B
Difficulty: Moderate

Learning Objective: LO 3

59. Which of the following quality tools displays the relationship between two variables on a graph?
a. Process flow chart
b. Fishbone diagram
c. Histogram
d. Scatter diagram
Ans: D
Difficulty: Moderate

Learning Objective: LO 3

60. Which of the following quality tools displays the steps in a process on a graph?
a. Process flow chart
b. Fishbone diagram
c. Histogram
d. Scatter diagram
Ans: A
Difficulty: Moderate

Learning Objective: LO 3

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61. Modern Inc. manufactures low-cost tables at a processing cost of $80 per table. The company produces 100 units per day and averages 90% good quality resulting in 10% defective items. Fifty percent of the defective units are reworked prior to shipment to Modern's distribution center.

What is the product yield?
a. 80
b. 85
c. 90
d. 95
Ans: D
Difficulty: Moderate

Learning Objective: LO 2
Solution: Yield = 100 × 0.90 + 10 × 0.50 = 95

62. Modern Inc. manufactures low-cost tables at a processing cost of $80 per table. The company produces 100 units per day and averages 90% good quality resulting in 10% defective items. Fifty percent of the defective units are reworked prior to shipment to Modern's distribution center. The rework cost is $10 per unit.

The quality productivity ratio (QPR) is
a. approximately 1.00.
b. approximately 1.10.
c. approximately 1.20.
d. approximately 1.30.
Ans: C
Difficulty: Moderate

Learning Objective: LO 2
Solution: QPR = 95/($8000 + $50) × 100 = 1.18

63. Modern Inc. manufactures low-cost tables at a processing cost of $80 per table. The company produces 100 units per day and averages 90% good quality resulting in 10% defective items. Fifty percent of the defective units are reworked prior to shipment to Modern's distribution center. The rework cost is $10 per unit.

If production is increased to 200 units per day, the quality productivity ratio (QPR) is
a. approximately 1.00.
b. approximately 1.10.
c. approximately 1.20.
d. approximately 1.30.
Ans: C
Difficulty: Moderate

Learning Objective: LO 2
Solution: QPR = 190/($16000 + $100) × 100 = 1.18

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64. Modern Inc. manufactures low-cost tables at a processing cost of $80 per table. The company produces 100 units per day and averages 90% good quality resulting in 10% defective items. Fifty percent of the defective units are reworked prior to shipment to Modern's distribution center. The rework cost is $10 per unit.

If the percent good quality increases from 90% to 95%, the quality productivity ratio (QPR) is
a. approximately 1.20.
b. approximately 1.40.
c. approximately 1.60.
d. approximately 180.
Ans: A
Difficulty: Moderate

Learning Objective: LO 2
Solution: QPR = 97.5/($8000 + $25) × 100 = 1.21

65. Modern Inc. manufactures low-cost tables at a processing cost of $80 per table. The company produces 100 units per day and averages 90% good quality resulting in 10% defective items. Fifty percent of the defective units are reworked prior to shipment to Modern's distribution center. The rework cost is $10 per unit.

If the rework cost is increased to $50 the quality productivity ratio (QPR) is
a. approximately 1.10.
b. approximately 1.15.
c. approximately 1.20.
d. approximately 125.
Ans: B
Difficulty: Moderate

Learning Objective: LO 2
Solution: QPR = 95/($8000 + $250) × 100 = 1.15

66. Modern Inc. manufactures low-cost tables at a processing cost of $80 per table. The company produces 100 units per day and averages 90% good quality resulting in 10% defective items. Fifty percent of the defective units are reworked prior to shipment to Modern's distribution center. The rework cost is $10 per unit.

If the production cost is decreased to $70 the quality productivity ratio (QPR) is
a. approximately 1.15.
b. approximately 1.25.
c. approximately 1.35.
d. approximately 1.45.
Ans: C
Difficulty: Moderate

Learning Objective: LO 2
Solution: QPR = 95/($7000 + $50) × 100 = 1.35

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67. Total quality management (TQM) was originated in the 1980s as a _____ management approach to improve quality.
    a. Korean
    b. American
    c. Japanese
    d. European
    Ans: C
    Difficulty: Moderate

    Learning Objective; LO 3

68. Which of the following is **not** a basic principle of total quality management (TQM)?
    a. Quality must be measured.
    b. The quality standard is no defects.
    c. Quality can and must be managed.
    d. The producer defines quality.
    Ans: D
    Difficulty: Moderate

    Learning Objective: LO 3

69. A _____ is a system that achieves customer satisfaction and complements other company systems.
    a. quality management system
    b. total quality system
    c. quality productivity system
    d. None of these answer choices is correct.
    Ans: A
    Difficulty: Moderate

Learning Objective: LO 3

70. Research has shown that companies achieving high customer satisfaction ratings
    a. attract new suppliers.
    b. retain existing customers.
    c. attract new employees.
    d. None of these answer choices is correct.
    Ans: B
    Difficulty: Moderate

Learning Objective: LO 4

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71. A relationship between a company and a supplier based on mutual quality standards is called
    a. sourcing.
    b. partnering.
    c. sourcing and partnering
    d. None of these answer choices is correct.
    Ans: B
    Difficulty: Moderate

Learning Objective: LO 4

72. The primary means for gathering information from customers and measuring customer satisfaction is
    a. a sampling program.
    b. a phone interview.
    c. feedback from competitors.
    d. a survey.
    Ans: D
    Difficulty: Moderate

Learning Objective: LO 4

73. ACSI measures _____ the goods and services of seven economic sectors.
    a. product quality of
    b. customer satisfaction with
    c. product demand for
    d. market share for
    Ans: B
    Difficulty: Moderate

Learning Objective: LO 4

74. The customer of _____ firm(s) interacts directly with the production process.
    a. a service
    b. a manufacturing
    c. both service and manufacturing
    d. None of these answer choices is correct.
    Ans: A
    Difficulty: Moderate

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Learning Objective: LO 4

75. A(n) _____ is the best level of quality achievement in one company that others seek to match or exceed.
    a. attribute
    b. target value
    c. benchmark
    d. variable
    Ans: C
    Difficulty: Moderate

Learning Objective: LO 4

76. _____ is an important measure of service quality that is not difficult to measure.
    a. Timeliness
    b. Benchmarking
    c. Kaizen
    d. Participative problem solving
    Ans: A
    Difficulty: Moderate

Learning Objective: LO 4

77. The Six Sigma quality goal is 3.4 defects per _____ opportunities.
    a. hundred
    b. thousand
    c. million
    d. billion
    Ans: C
    Difficulty: Easy

Learning Objective: LO 5

78. At the heart of Six Sigma is the _____ strategy, a five-step process applied to improvement projects.
    a. continuous improvement
    b. breakthrough
    c. champion
    d. None of these answer choices is correct.
    Ans: B
    Difficulty: Moderate

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Learning Objective: LO 5

79. Quality costs include the cost of _____.
    a. achieving good quality
    b. poor quality
    c. both achieving good quality and generating poor quality
    d. None of these answer choices is correct.
    Ans: C
    Difficulty: Moderate

Learning Objective: LO 2

80. The cost of achieving good quality includes
    a. prevention costs.
    b. internal failure costs.
    c. external failure costs.
    d. None of these answer choices is correct.
    Ans: A
    Difficulty: Moderate

Learning Objective: LO 2

81. The cost of achieving poor quality includes
    a. prevention costs.
    b. appraisal costs.
    c. internal failure costs.
    d. All of these answer choices are correct.
    Ans: B
    Difficulty: Moderate

    Learning Objective: LO 2

82. The Baldridge Award was created in 1987 to _____ in the U.S.
    a. stimulate growth of quality management
    b. stimulate economic growth
    c. recognize the best quality gurus
    d. None of these answer choices is correct.
    Ans: A
    Difficulty: Moderate

    Learning Objective: LO 6

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83. ISO in ISO 9000 is
    a. not an acronym for International Organization for Standardization.
    b. a word derived from a Greek word meaning equal.
    c. both a word derived from a Greek word meaning equal and not an acronym for International Organization for Standardization.
    d. None of these answer choices is correct.
    Ans: C
    Difficulty: Moderate

Learning Objective: LO 5

Short Answer

84. Briefly discuss four dimensions of quality a consumer looks for in manufactured products.

    Student answers will vary depending of the dimensions they select. Among the dimensions that could be discussed are:
    a. Performance: the basic operating characteristics of a product.
    b. Features: the extra items added to the basic features
    c. Reliability: the probability that a product will operate properly within an expected time frame.
    d. Conformance: the degree to which a product meets pre-established standards.
    e. Durability: how long the product lasts before it must be replaced.
    f. Serviceability: the ease, speed, and facility of the repair process.
    g. Aesthetics: how the product looks, feels, smells, sounds, or tastes.
    h. Safety: assurance that the customer will not suffer injury or harm from a product.
    i. Other: subjective perceptions based on brand name, advertising, etc.

Learning Objective: LO 4
Level of Difficulty: Medium

85. What is quality of conformance from the producer's perspective and how can it be achieved?

    Once the product design has been determined, the producer perceives quality to be how effectively the production process is able to conform to the specifications required by the design. This is referred to as quality of conformance. What this means is that quality during production focuses on making sure that the product meets the specifications required by the design. From the producer's perspective, good-quality products conform to specifications—they are well-made. Achieving quality of conformance depends on a number of factors, including the design of the production process (distinct from product design), the performance level of

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machinery, equipment and technology, the materials used, the training and supervision of employees and the degree to which statistical quality control techniques are used.
Learning Objective: LO 3
Level of Difficulty: Medium

86. Briefly discuss the principles associated with total quality management (TQM).

Total quality management represents a set of management principles that focus on quality improvement as the driving force in all functional areas and at all levels in a company. These principles are

a. the customer defines quality and customer satisfaction as the top priority,
b. top management must provide the leadership for quality,
c. quality is a strategic issues and requires a strategic plan,
d. quality is the responsibility of all employees in the organization,
e. all functions of the company must focus on continuous quality improvement to achieve strategic goals,
f. quality problems are solved through cooperation among employees and management,
g. problem solving and continuous quality improvement use statistical quality control methods, and
h. training and education of all employees are the basis for continuous quality improvement.

Learning Objective: LO 3
Level of Difficulty: Medium

87. What is Kaizen and what role do employees play in Kaizen?

Kaizen is the Japanese word for continuous improvement, not only in the workplace but also in one's personal life. In the workplace kaizen means involving everyone in a process of gradual, organized, and continuous improvement. Every employee in the organization should be involved in working together to make improvements. If an improvement is not a part of a continuous, ongoing process it is not considered kaizen. Employees are most directly involved in kaizen when they are determining solutions to their own problems. Employees are the real experts in their immediate workspace. In its most basic form kaizen is a system in which employees identify many small improvements on a continual basis and implement these improvements themselves. Every employee is encouraged to be involved in the improvement process so that all employees feel that they are participating in quality improvements and remain excited about their jobs. All Six Sigma and TQM programs need this level of involvement to be successful.
Learning Objective: LO 4

88. What is a Six Sigma quality program?

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A Six Sigma program is fundamentally a very organized and detailed process for improving quality. There is little doubt that Six Sigma is a direct descendant of the philosophy and principles of TQM. In its simplest form Six Sigma is based on Deming's PDCA cycle and Juran's assertion that "all quality improvement occurs on a project-by-project basis. Six Sigma is a process for developing and delivering near perfect products and services. The main idea is that if the number of defects in a process can be measured then it can be systematically determined how to eliminate them and get as close to zero defects as possible. In Six Sigma "as close to zero as possible" translates into a statistically-based numerical goal of 3.4 defects per million opportunities (DPMO), which means defects have been nearly eliminated. Through the reduction of variation of all processes, the overall performance of the company will be improved and significant cost savings will be realized.
Learning Objective: LO 5
Level of Difficulty: Medium

89. Briefly discuss the costs that are associated with achieving good quality.

The costs of a quality management program are prevention costs and appraisal costs. Prevention costs are the costs of trying to prevent poor-quality products from reaching the customer. Prevention reflects the quality philosophy of "do it right the first time, the goal of a quality management program. Examples of prevention costs include quality planning costs, product design costs, process costs, training costs, and information costs. Appraisal costs are the costs of measuring, testing, and analyzing materials, parts, products, and the production process to ensure that product quality specifications are being met. Examples of appraisal costs include inspection and testing, test equipment costs, and operator costs.
Learning Objective: LO 2
Level of Difficulty: Medium

90. Briefly discuss the cost of poor quality.

Costs associated with poor quality are also referred to as the cost of nonconformance, or failure costs. The cost of poor quality can be categorized as internal failure costs or external failure costs. Internal failure costs are incurred when poor-quality products are discovered before they are delivered to the customer. Examples of internal failure costs include scrap costs, rework costs, process failure costs, process downtime costs, price-downgrading costs. External failure costs are incurred after the customer has received a poor-quality product and are primarily related to customer service. Examples of external failure costs include customer complaint costs, product return costs, warranty claims costs, product liability costs, and lost sales costs.
Level of Difficulty: Medium
Learning Objective: LO 2

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91. Briefly describe various Six Sigma tools and give an example of the use of each.

QFD, Cause and Effect Matrix, FMEA, SPC, t-Tests, and DOE should all be discussed and related to quality management in particular and as a critical part of contemporary operations and supply chain management

Learning Objective: LO 5
Level of Difficulty: Medium

91. Kaizen is _____.
    a. another name for a lean system
    b. the Japanese term for continuous improvement
    c. the Japanese term for reengineering
    d. another name for a quality circle

    Ans: A
    Difficulty: Moderate

    Learning Objective: LO 4

92. Quality circles _____.
    a. were used in the 1970s but have been superseded by Six Sigma
    b. are small, mandatory groups of employees and their supervisor(s)
    c. follow an established procedure for identifying, analyzing, and solving quality-related or other problems
    d. have no moderators to allow the spontaneous and free interaction of its members

    Ans: C
    Difficulty: Moderate

    Learning Objective: LO 4

93. A *t*-test is _____.
    a. a statistical technique used in Six Sigma to collect, analyze, and interpret data
    b. a method to monitor a process over time to determine whether any variation in the process is the result of a cause or problem
    c. a statistical technique for analyzing potential reliability problems and weaknesses in a product or process
    d. a statistical measure to determine whether there is a statistical, not random, difference in the means of two groups of data

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Ans: C
Difficulty: Moderate

Learning Objective: LO 4

94. Designs of experiments (DOE) is _____.
    a. a statistical technique used in Six Sigma to collect, analyze, and interpret data
    b. a tool for analyzing potential reliability problems and weaknesses in a product or process
    c. a statistical measure used to determine whether there is a statistical, not random, difference in the means of two groups of data
    d. a structured, organized method for determining whether there is a statistical correlation between two variables

    Ans: A
    Difficulty: Moderate

    Learning Objective: LO 4

95. External failure costs include the following costs except _____ costs.
    a. price-downgrading
    b. product-return
    c. warranty claims
    d. lost sales

    Ans: A
    Difficulty: Moderate

    Learning Objective: LO 4

96. A factory has a yield-to-input (Y/I) ratio of 0.94 and the percentage of poor-quality products that can be reworked (R) is 89.1%. If the percentage of good products produced each day (G) is doubled but the yield-to-input ratio remains unchanged, then the percentage of poor-quality products that can be reworked must have _____.
    a. decreased to 44.6%
    b. decreased to 40%
    c. decreased to 37.81%
    d. There is not enough information to determine R.

    Ans: B
    Difficulty: Hard

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Learning Objective: LO 4

97. A factory has a yield-to-input (Y/I) ratio of 0.94 and the percentage of poor-quality products that can be reworked (R) is 89.1%. A new production process will increase the percentage of good products produced each day (G) to 80%. What is the minimum value of R that must be achieved to improve the yield-to-input ratio to 0.95?
    a. 85%
    b. 79%
    c. 77.8%
    d. 75%

    Ans: D
    Difficulty: Medium

    Learning Objective: LO 4

98. The quality-productivity ratio increases if
    a. the production capacity is increased
    b. the rework cost increases
    c. the percentage of good products increases
    d. the production capacity is decreased

    Ans: C
    Difficulty: Medium

    Learning Objective: LO 4

99. A production process has a percentage of good products produced each day (G) of 75% and a percentage of poor-quality products that can be reworked of 50%. The unit processing cost and the rework cost are both $1 per unit. Its quality-productivity ratio, QPR, is _____.
    a. 79.78
    b. 77.78
    c. 75.79
    d. 73.79

    Ans: B
    Difficulty: Medium

    Learning Objective: LO 4

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100. A production process has a percentage of good products produced each day (G) of 75%. What is the range of possible values for its quality-productivity ratio, QPR?
   a. 75 to 80
   b. 70 to 80
   c. 70 to 75
   d. There is not enough information to find out

   Ans: A
   Difficulty: Medium

   Learning Objective: LO 4

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