

CQE Sample Test #1

1. What are the major disadvantages of having an improvement team that is too large ?
- I . Difficulty in having constructive input from the entire group.
 - II . Difficulty in arriving at consensus.
 - III . Difficulty in finding large meeting facilities.
 - IV . Difficulty, on the part of the recorder, in keeping up with more paperwork.
- A. I only B. I and II only C. I, II and III only D. I, II , III and IV
2. Which of the following is NOT considered a prevention cost ?
- A. Writing operating procedures.
 - B. Training.
 - C. Data acquisition and analysis.
 - D. Calibrating test equipment.
3. An improvement in quality costs is MOST clearly indicated when :
- A. Appraisal and failure costs drop.
 - B. Prevention costs increase.
 - C. Total quality costs fall below 15% of total sales.
 - D. Management objectives are met.
4. During the building phase of improvement team development, which of the following properly describes team activities ?
- I . The team leader is usually directive.
 - II . The team leader often delegates tasks.
 - III . Team members prioritize and perform duties.
 - IV . Team members are uncertain of their duties.
- A. II and III only B. I, II and III only C. I and IV only D. II, III and IV only

5. Benchmarking might be defined as any of the following EXCEPT:
- A. A process for rigorously measuring your performance versus the best-in-class companies.
 - B. A standard of excellence or achievement against which other similar things must be measured or judged.
 - C. Comparing the performance of one company to a set of standards and then to another's performance.
 - D. The search for best industry practices that lead to superior performance.
6. Which of the following is the BEST method to developing materials for a training program on the gaps in performance ?
- A. Secure a workshop trainer.
 - B. Review a record of activities.
 - C. Set up a one shot case study.
 - D. Allocate employees for training.
7. In most cases, an improvement team facilitator will NOT normally :
- A. Be familiar with problem solving techniques.
 - B. Provide feedback to the group.
 - C. Function as the group leader.
 - D. Summarize key ideas generated by the group.
8. The ideal results of a quality training effort would NOT include which of the following ?
- A. Increased cost-of-quality results.
 - B. Improved working methods and morale.
 - C. Increased productivity and job satisfaction.
 - D. Reduced defects and employee turn-over.
9. Information that is received by upper management, is often distorted. Which of the following actions is effective in countering this problem ?
- I . Stop killing the messenger.
 - II . Establishing an open door policy.
 - III . Practice management by walking around.
- A. I only B. I and II only C. I and III only D. I, II and III

10. Which of the following quality gurus was very critical of merit-pay and individual bonuses ? He discouraged management by objectives and the ranking of employees by performance.

- A. Dr. Juran B. Dr. Deming C. Dr. Taguchi D. Dr. Feigenbaum

11. In order to implement a continuous improvement strategy, a company may institute a steering committee or improvement council. Which of the following would generally NOT be a task performed by this council ?

- A. The development of a quality vision for the company.
B. The combined development and implementation of the company improvement strategy.
C. The definition of certain quality objectives for sections of the company.
D. The development of quality education and communication modules for the organization.

12. A company is planning to completely change its employee performance, appraisal and reward system. Which of the following is NOT viable for consideration in the new system ?

- A. Integrating subordinate, peer, customer, and self-evaluations with supervisory ratings.
B. Using continuous improvement, quality and customer satisfaction as key criteria.
C. Requiring work team or group evaluations that are equal in emphasis to individual evaluations.
D. Requiring less frequent performance reviews, but utilizing many rating categories.

13. Any group, designing a quality information system (QIS) to collect product data, must consider which of the following items ?

- I . How the results will be used.
II . The frequency that results must be reported.
III . The allowable data error variation.

- A. II only B. I and II only C. II and III only D. I, II and III

14. Which of the following are likely to be positive actions in obtaining a supplier's commitment to quality improvement ?

- I . Involving the supplier early in the product development stage.
- II . Partially reimbursing the supplier, when the product is rejected.
- III . Establishing a firm schedule of required product quantities and dates.
- IV . Providing meaningful and timely quality performance feedback.

A. I and IV only B. I, II and IV only C. I, III and IV only D. I, II, III and IV

15. A pre-award evaluation of a supplier's quality system capability should NOT include consideration of

- A. The supplier's product-quality history.
- B. The supplier's geographical location.
- C. The supplier's implementation of quality manual procedures.
- D. The supplier's skills in quality control techniques.

16. For TQM success, what structure sequence should be followed ?

- I . Develop a quality policy.
- II . Establish a quality council.
- III . Establish strategic quality goals.
- IV . Train for internal audits.

A. II, III, I, IV B. II, I, III, IV C. III, II, I, IV D. I, II, III, IV

17. What is the highest form of partnering with employees ?

- A. Employee involvement.
- B. Task teams.
- C. Cost reduction projects.
- D. Stock option plans.

18. A product failure in the customer's hands is bad for the company. Why do only 4% of the customers normally file a complaint ?

- A. The product guarantee takes care of the product.
- B. A warranty is in place on the product.
- C. It is a minor inconvenience.
- D. They don't think it will do any good.

19. The Malcolm Baldrige award is open for competition among which of the following ?

- I. Large manufacturing businesses.
- II. Large and small manufacturing businesses.
- III. Service organizations.
- IV. Large service companies.

- A. I only B. I and III only C. II and III only D. II and IV only

20. Which of the following is NOT a method for customer service data collection ?

- A. Customer surveys.
- B. Internal surveys.
- C. Customer visits.
- D. Complaint analysis.

21. What is the key ranking difference between the Deming philosophy and the Malcolm Baldrige award criteria ?

- A. Deming prescribes "all or nothing" propositions but MBNQA ranks categories with different weights.
- B. The MBNQA ranks "business results" and "customer focus", but Deming does not consider these items.
- C. The MBNQA has seven categories compared to Deming's 14 points.
- D. There is no recognized rating system for the MBNQA.

22. A vendor may be audited both before and during the execution of a contract. During such a vendor audit, the focus may be directed at the management and resource management of the company. Which of the following areas would be EXCLUDED during such an audit ?

- A. Use and planning of time, manpower and training.
- B. Defined quality responsibilities.
- C. Company philosophy and organizational charts.
- D. Design and process capabilities.

23. In obtaining Total Customer Satisfaction, management should NOT undertake which of the following activities ?

- A. Use employee involvement and teamwork.
- B. Encourage team competition.
- C. Encourage sacrificing for the team.
- D. Coordinate efforts of the departments.

24. Normally, complaint data for both a product or service organization should provide

- A. An indication of the organizational areas creating the most problems.
- B. The degree or extent of customers dissatisfaction.
- C. The appropriate corrective action to take.
- D. The total quality costs for the organization.

25. The existence of a quality control manual at your key supplier means

- A. That a quality system has been developed.
- B. That a quality system has been implemented.
- C. That the firm is quality conscious.
- D. That the firm is a certified supplier.

26. A quality control program is considered to be

- A. A collection of quality control procedures and guidelines.
- B. A step by step listing of all quality control check points.
- C. A summary of company quality control policies.
- D. A system of activities to provide quality of products and service.

27. An audit will be viewed as a constructive service to the function which is audited when it
- A. Is conducted by nontechnical auditors.
 - B. Proposes corrective action for each item uncovered.
 - C. Furnishes enough detailed facts so the necessary action can be determined.
 - D. Is general enough to permit managerial intervention.
28. The term "quality audit" can refer to the appraisal of the quality system of
- I. An entire plant or company.
 - II. One product.
 - III. One major quality activity.
- A. I only B. I, II and III C. II and III only D. I and III only
29. Which of the following items is the MOST important consideration when selecting an audit team member ?
- A. Being familiar with the organization that will be audited.
 - B. Being competent in auditing techniques.
 - C. Being competent in many quality control techniques.
 - D. Having technical knowledge of the area being audited.
30. You are requested by top management to establish an audit program of the quality systems in each branch plant of your firm. Which of the following schemes would you use in selecting the audit team to optimize continuity, direction, availability, and technology transfer ?
- A. A full time audit staff.
 - B. All volunteer audit staff.
 - C. Hybrid audit staff (a proportion of answers a and b above).
 - D. An outside consulting firm.

31. Which of the following would be considered the WEAKEST reason to initiate an audit ?
- A. To compare actual practice to a defined standard.
 - B. Follow-up on corrective action.
 - C. Identify the root cause of a recent problem.
 - D. Verify that a quality system continues to meet requirements.
32. Findings and observations are audit terms. The best relationship between these terms is which of the following ?
- A. Observations are broader in scope than findings.
 - B. Observations are seen; findings are discovered.
 - C. Observations generally support findings.
 - D. Findings are reported in writing, observations are reported verbally.
33. Quality audits do NOT provide
- A. Answers to quality system deficiencies.
 - B. Highlighting of faulty company operations.
 - C. An index of quality needs.
 - D. An anticipated indication of customer acceptance of the product.
34. The sample size for a product quality audit should be
- A. Based on ANSI/ASQ Z1.4.
 - B. Based on the lot size.
 - C. A stated percentage of production.
 - D. A very small quantity of product.
35. Which of the following parties, traditionally initiates an audit ?
- A. The client.
 - B. The plant manager.
 - C. The lead auditor.
 - D. The auditee.

36. During the performance of an audit, which of the following are key considerations ?
- I . What sampling plans may be necessary ?
 - II . Is the audit schedule progressing as planned ?
 - III . Is there a need for a technical specialist ?
 - IV . Is the level of compliance satisfactory ?
- A. I, II and III only B. II and IV only C. I and IV only D. I, II, III and IV
37. When asked to make recommendations on how to correct any deficiencies noted in the exit report, the auditor(s) should
- A. Make the best recommendation possible.
 - B. Confer with the client first.
 - C. Avoid a recommendation in writing but help the auditee if possible.
 - D. Offer no specific advice and few suggestions.
38. The example of a supplier's quality management effort to meet your existing contractual requirements is MOST like
- I . A product audit.
 - II . A process audit.
 - III . A system audit.
- A. II only B. III only C. I and II only D. I, II and III
39. The audit team normally advises the auditee immediately upon the discovery of a finding during an audit. Which of the following items is (are) valid reasons for taking this action ?
- I . If corrected immediately, the findings may be eliminated from the audit report.
 - II . If corrected immediately, it shows genuine auditee interest in the objectives of the audit.
 - III . If corrected immediately, it demonstrates the strength of an ongoing audit program.
- A. I only B. III only C. II and III only D. I, II and III

40. A purchase order for subassemblies classified as critical must include a review by
- I . Quality engineering.
 - II . The procurement department.
 - III . Design engineering.
- A. III only B. I and III only C. II and III only D. I, II and III
41. Which of the following are the MOST logical reasons for providing source inspection ?
- I . The supplier has consistently shown poor out-going quality.
 - II . The key inspection points are hidden after assembly at the suppliers' plant.
 - III . The supplier requests the inspection to save them potential shipping expenses.
 - IV . The criticality of the product warrants it.
- A. I, II and IV only B. II and IV only C. II, III and IV only D. I, II, III and IV
42. Inspection operations typically
- A. Help in assuring satisfactory quality.
 - B. Reduce the usability of the product or service involved.
 - C. Require precise equipment in most instances.
 - D. Occur between all manufacturing operators.
43. Consider the following statement
- "A defect which might affect the appearance or general function of essential parts"
- This definition describes a seriousness classification described as
- A. Incidental. B. Critical. C. Minor. D. Major.
44. Which of the following quality system provisions is of the greatest concern when preparing an audit checklist for a vendor qualification system audit ?
- A. Drawing and print control. B. Makeup of the MRB
 - C. Training level of inspectors. D. Calibration of test equipment.

45. In the planning of a new major manufacturing program, the greatest quality effort should be put logically in

- A. Inspection of product.
- B. Nondestructive testing equipment.
- C. Nonconformance to specifications.
- D. Prevention of occurrence of substandard quality.

46. The first and most important step, in establishing a good corporate quality plan is

- A. Determining customer requirements.
- B. Determining manufacturing process capabilities.
- C. Evaluation vendor quality systems.
- D. Ensuring quality participation in design review.

47. When planning quality control functions, which one of the following is MOST directly related to production of a quality product ?

- A. Process control and process capability.
- B. Suitable blueprints.
- C. Dimensional tolerancing.
- D. Product audits.

48. Which of the following would be the MOST important considerations when establishing inspection points within a production operation ?

- I. Inspection to prevent defects from entering the system.
- II. Inspection after all operations (both manual and automated).
- III. Inspection prior to a painting or masking operation.

- A. I only
- B. I and II only
- C. I and III only
- D. I, II and III

49. The primary reason that nonconforming material should be identified and segregated is

- A. So that the cause of nonconformity can be determined.
- B. So it cannot be used in production without proper authorization.
- C. To obtain samples of poor workmanship for use in the company's training program.
- D. So that responsibility can be determined and disciplinary action taken.

50. Of the services listed below, which one performed by design engineering is of particular interest to QA personnel ?

- A. Audit reports. B. Cost reports. C. Change action. D. Rework criteria.

51. Four ingredients are blended to make a final product. Using the data below, what is the expected weight and variation of the final product ?

- Ingredient A 70 ± 3.00 grams
- Ingredient B 20 ± 1.73 grams
- Ingredient C 15 ± 1.73 grams
- Ingredient D 10 ± 1.00 grams

- A. 115 ± 7.46 grams b. 115 ± 5.73 grams c. 115 ± 4.00 grams d. 115 ± 3.61 grams

52. Corrective action requests are primarily

- A. Issued to correct supplier deficiencies.
- B. Generated to correct auditing deficiencies.
- C. Formal requests for corrective and preventive action.
- D. A result of nonconformances detected in the internal inspection process.

53. Reliability prediction is

- I. The process of performance estimation.
- II. The process of estimating the probability that a product will perform its intended function for a stated time.
- III. The process of telling "how you can get there from here".

- A. I only B. II only C. II and III only D. I, II and III

54. Maintainability is

- A. The probability of a system being restored to functional operation within a given period of time.
- B. Performing adequate maintenance on a system.
- C. Probability of survival of a system for a given period of time.
- D. Maintaining a machine in satisfactory working condition.

55. Analysis of data on all product returns is important because

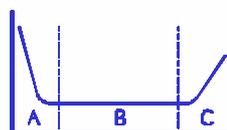
- I. Failure rates change with length of product usage.
- II. Changes in design and in customer use are often well reflected.
- III. Immediate feedback and analysis of product performance becomes available.

- A. I only
- B. I and III only
- C. II and III only
- D. I, II and III

56. When requesting "worst case" design analysis, you expect the reliability group to

- A. Analyze the worst rejects.
- B. Analyze only those products failing to meet specification requirements.
- C. Determine whether product requirements can be met with subassemblies assumed at their worst combination of tolerances.
- D. Assume all subassembly tolerances at their maximum limit.

57. In the failure rate model shown below, which one of the sections represents the period when catastrophic failures are likely to occur ?

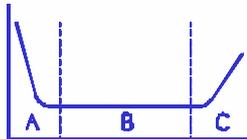


- A. A
- B. B
- C. C
- D. All sections can experience catastrophic failure.

58. Failure mode, effect, and criticality analysis, (FMECA) is primarily for the purpose of
- A. Learning as much about the item as possible after qualification test.
 - B. Determining the way an item will most likely fail to help obtain design and procedural safeguards against such failures.
 - C. Determining, by extensive analysis, the reliability of an item.
 - D. Determining the cause of a failure, by dissecting the item, to help obtain corrective action.

59. A system was designed with 3 capacitors. When the system is first activated all capacitors are operating. The system continues to operate as long as at least 1 capacitor is operating. This is an example of
- A. Redundancy.
 - B. A series system.
 - C. An active parallel system.
 - D. A standby parallel system.

60. The failure rate model above is used to show a typical relationship of many parts between their failure rate and the time in service. The reliability function for period "B" is BEST represented by



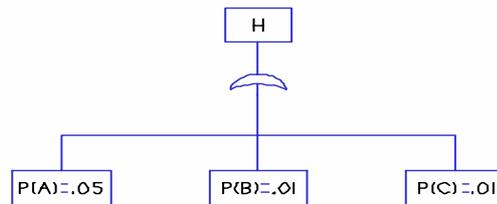
- A. $R(t) = \lambda t$
- B. $R(t) = \lambda$
- C. $R(t) = \lambda e^{-\lambda t}$
- D. $R(t) = e^{-\lambda t}$

61. What is the probability of an item failing in less than 5 hours if it has a constant failure rate of 1/ hour ?
- A. 0.00674
 - B. 0.99127
 - C. 0.99326
 - D. 0.99642

62. The design function which assigns probability of failures between components or subsystems is called
- A. Apportionment.
 - B. Significance
 - C. Confidence.
 - D. Qualification.

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63. The probability of an accident for the head event "H" given below is:



- A. 0.0700 B. 0.1125 C. 0.0689 D. 0.1100

64. Which of the following quantitative methods does NOT apply to the assessment of actual system/component reliability ?

- A. Statistical analysis of field test and failure data.
- B. Statistical allocation of reliability goals.
- C. Evaluation of laboratory test data.
- D. Analysis of results of reliability demonstration tests.

65. When trying to find all possible causes of a problem, which of the following tools would be useful ?

- I. Systematic troubleshooting and brainstorming.
- II. Fishbone diagrams and histograms.
- III. Checklists and scatter diagrams.
- IV. Control charts and graphs.

- A. I and IV only B. I, II and IV only C. II, III and IV only D. I, II, III and IV

66. Typically Pareto diagrams are used for which of the following reasons ?

- I. To display the significant few categories.
- II. To compliment attribute data charting.
- III. To eliminate insignificant categories.
- IV. To focus attention in priority order.

- A. I and III only B. I, II and III only C. II, III and IV only D. I, II, III and IV

67. As a commonly used problem solving technique, which of the following would be the BEST application of a Pareto chart ?

- I . To determine when to make proactive adjustments to a process.
- II. To differentiate between major and minor problem areas.
- III. To gather data and to design experimental controlled changes.
- IV. To evaluate the results of other problem solving techniques upon the product or service.

A. I and II only B. II and III only C. II and IV only d. I, II, III and IV

68. A comprehensive corrective action program is initiated at a large company. Input for CARs are received from customers, internal and external audits, material review reports and other sources. Which two of the following groups would usually administer and control the CAR process ?

- I . Management review team.
- II. Quality department.
- III. Corrective Action Board.
- IV. Material Review Board.

A. I and II only B. I and III only C. II and III only d. III and IV only

69. Which of the following statements BEST describes a bimodal distribution ?

- A. This distribution shows stratified data and two distinct peaks.
- B. This distribution shows a single mode and bell shaped distribution.
- C. This distribution is truncated.
- D. This distribution has several distribution peaks.

70. Two advantages of process mapping are the ability to

- I . Visualize the process being described.
- II. Discover manufacturing problems only.
- III. Discover quality problems only.
- IV. Check current processes for duplication or redundancy.

A. I and IV only B. II and III only C. I and III only D. II and IV only

71. Writing and establishing process control procedures is
- A. Disposition. B. Notification. C. Preventive action. D. Corrective action.
72. Which of the following problem-solving tools is a column graph which displays a static picture of the process ?
- A. Pareto chart. B. Control chart. C. Histogram. D. Cause and effect diagram.
73. A cause and effect diagram is also called which of the following ?
- A. Pareto diagram. B. Fishbone diagram. C. Boxplot. D. Histogram.
74. A graph of a data set, composed of a series of rectangles, each proportional in width to the range of values in a class and proportional in height to the number of items or fraction of items falling in these classes, is called which of the following ?
- A. Histogram. B. Raw data. C. Ogive. D. Venn diagram.
75. Which of the following statements describes discrete data ?
- A. It takes 3 hours 48 minutes to fly from LA to New York.
B. Of 225 people on the airplane, 85 had connecting flights.
C. The flight arrived at 9:08 PM.
D. There were 5,923 gallons of fuel consumed on the flight.
76. Which of the following tools can provide a ranking of things to be done ?
- A. Measles charts. B. Cause & effect diagram. C. Scatter diagram. D. Checklist.
77. Which of the following is NOT a statistical level of measurement ?
- A. Ordinal. B. Nominal. C. Numerical. D. Ratio.

78. What does a corrective action do to prevent an existing nonconformity, defect or undesirable situation from recurring ?

- A. Minimizes it.
- B. Takes repercussions against those responsible.
- C. Takes action against it.
- D. Eliminates it.

79. The Shewhart or Deming cycle is often referred to as

- A. The cause and effect diagram.
- B. The affinity diagram.
- C. Plan-do-check-act.
- D. Problem solving flow chart.

80. A normal (Gaussian) distribution curve is

- A. Bell shaped.
- B. Dome shaped.
- C. Pear shaped.
- D. Positively skewed.

81. Which of the following actions or techniques is MOST useful in determining the original fundamental cause of a product or process nonconformance ?

- A. Continuous improvement.
- B. Pareto analysis.
- C. Root cause analysis.
- D. Preventive action.

82. What order do the following corrective action steps normally take for nonconforming product ?

- I . Analyze the problem.
- II . Assign responsibility.
- III . Take preventive action.
- IV . Evaluate potential importance.
- V . Investigate possible causes.

- A. I, II, V, IV, III
- B. II, IV, V, I, III
- C. V, II, IV, I, III
- D. II, I, IV, V, III

88. Which of the following distributions have the set of all real numbers as their domain ?
A. Lognormal B. Exponential C. Weibull D. None of the above.
89. Determine the coefficient of variation for the last 500 pilot plant test runs of high temperature film having a mean of 900 Kelvin with a standard deviation of 54.
A. 6% B. 16.7% C. 6% D. 31%
90. According to Tchebysheff's theorem what % of measurements must lie within 2.5 standard deviations of the mean ?
A. 3/4 B. 8/9 C. 0.840 D. 0.625
91. The hypergeometric distribution should be used instead of the binomial distribution when
A. There are more than 2 outcomes on a single trial.
B. Each trial is independent.
C. Sampling does not involve replacement.
D. There is a fixed number of trials.
92. The distribution of a characteristic is negatively skewed. The sampling distribution of the mean for large samples is:
A. Negatively skewed. B. Approximately normal. C. Positively skewed. D. Lognormal.
93. If a distribution is skewed to the right
A. The mode is between the median and the mean.
B. The mean is between the mode and the median.
C. The mode is greater than the median.
D. None of the above.

94. If the probability of a success on a single trial is 0.2 and 3 trials are performed, what is the probability of at least one success ?

- A. 0.008 B. 0.384 C. 0.488 D. 0.600

95. A process is turning out end items that have defects of type A or type B or both. If the probability of type A defect is 0.1 and of a type B is 0.2, the probability that an end item will have no defect is

- A. 0.7 B. 0.30 C. 0.72 D. 0.68

96. What is the standard deviation of the following data ?

3.2, 3.1, 3.3, 3.3, 3.1

- A. 3.2 B. 0.0894 C. 0.1 D. 0.0498

97. Periodically, a sample of 20 items are randomly selected from a population that is normally distributed, the average is computed, and plotted. Which of the following statements is correct ?

- I . The average of the logarithms of the values is lognormally distributed.
- II . The standard deviation of the averages is equal to the standard deviation of the individuals divided by the square root of 20.
- III . The variance of the averages is equal to the variance of the individuals divided by the square root of 20.

- A. I only B. II only C. I and II only D. I and III only

98. If a distribution is skewed to the left, the median will always be

- A. Less than the mean. B. Between the mean and the mode.
C. Greater than the mode. D. An average of the mean and the mode.

99. The expression below is which of the following ?

$$F(x) = {}_n C_x p^x q^{n-x}$$

- A. General term for the Poisson distribution.
- B. General term for the Pascal distribution.
- C. General term for the binomial distribution.
- D. General term for the hypergeometric distribution.

100. Which of the following distributions models events that have 2 possibilities on each trial ?

- A. Normal.
- B. Poisson.
- C. Binomial
- D. gamma.

101. The equation below represents the:

$$f(x) = \frac{1}{x\sqrt{2\pi}} \exp\left[-\frac{1}{2}\left(\frac{\ln x - \mu}{\sigma}\right)^2\right]$$

- A. Lognormal probability density function.
- B. Normal probability density function.
- C. Exponential probability density function.
- D. None of the above.

102. The weight of paint cans is considered

- A. Discrete data.
- B. Continuous data.
- C. Random data.
- D. Probability data.

103. A bin contains 40 pills with a weight of 3.1 gm. each, 30 pills weighing 3.2 gms each and 10 pills weighing 3.3 gms each. The weight of an average pill is found from

A. $\frac{3.1 + 3.2 + 3.3}{3}$

B. $\frac{(3.1)(40) + 3.2(30) + 3.3(10)}{3}$

C. $\frac{(3.1 + 3.2 + 3.3)(10 + 30 + 40)}{80}$

D. $\frac{(3.1)(40) + 3.2(30) + 3.3(10)}{80}$

104. The following measurements for a sample with dimension X are representative of a process known to be in statistical control

42, 52, 64, 45, 53, 56, 70, 57, 49, 62

Which of the following values BEST approximates the upper and lower control limits of the process capability.

A. 81 and 29

B. 59 and 51

C. 64 and 46

D. 70 and 42

105. An X-bar and R chart with n=5 has been plotted for some time and has demonstrated random variation. Upon review of the last 30 plot points, the expected number of runs around the centerline on the X-bar chart is expected to be approximately which of the following ?

A. 4

B. 9

C. 12

D. 16

106. What is the lower control limit for proportion defective if the average daily production is 5000 units and the average fraction defective is 0.02 ?

A. 0.016

B. 0.014

C. 0

D. 0.010

107. A single sampling plan calls for a sample size of 80 with an acceptance number of five and a rejection number of six. If the quality of the submitted lots is 10 percent defective, then the percent of lots expected to be accepted in the long run is approximately.

A. 6%

B. 10%

C. 20%

D. 30%

108. You have been asked to sample a lot of 500 units from vendor whose past quality has been about 2% defective. A sample of 40 pieces is drawn from the lot and you have been told to reject the lot if you find two or more parts defective. What is the probability of finding two or more parts defective ?

- A. 0.953 B. 0.809 C. 0.191 D. 0.047

109. When using a control chart, a point plotting within the limits on the chart is

- A. The equivalent of type I error.
B. The equivalent of type II error.
C. The equivalent of accepting the hypothesis that the process is in control.
D. The equivalent of not rejecting the hypothesis that the process is in control.

110. An X-bar and R chart was prepared for an operation using twenty samples with five pieces in each sample; X-bar was found to be 33.6 and R-bar was 6.20. During production, a sample of five was taken and the pieces measured 36, 43, 37, 25, and 38. At the time, this sample was taken:

- A. Both the average and range were within control limits.
B. Neither the average nor range were within control limits.
C. Only the average was outside control limits.
D. Only the range was outside control limits.

111. Select the incorrect statement from among the following. The IDs of a certain piece of tubing are normally distributed with mean 1.00". The proportion of tubing with IDs less than 0.90 is

- A. Less than the proportion of IDs greater than 0.90
B. Less than 50 percent.
C. Less than the proportion with IDs greater than 1.10
D. Less than the proportion with IDs greater than 1.00

112. Compute the upper control limit for an s chart, based on a sample size of 10, if the process is in control with a mean of 40 and a sample standard deviation of 7.

- A. 11.7 B. 13.3 C. 15.7 D. 21

113. A "p" chart

- A. Can be used for only one type of defect per chart.
- B. Plots the number of defects in a sample.
- C. Plots either the fraction or percent defective in order of time.
- D. Plots variations in dimensions.

114. What percentage of the area under the standard normal curve is included within (+/-) 1.5 standard deviations from 0 ?

- A. 0.8664
- B. 0.7500
- C. 0.6680
- D. 0.9332

115. Which of the following control charts are more efficient than an X-bar chart at detecting small shifts in the mean ?

- I . CUSUM.
- II . EWQR.
- III. EWMA.

- A. I only
- B. II only
- C. III only
- D. I and III only

116. A process has been experiencing problems lately. The operators charting the process have identified the cause to be due to a change in incoming materials. This problem is

- A. Attributed to purchasing.
- B. A special cause.
- C. A common cause.
- D. A normal event.

117. A process is normally distributed with a mean of 200 and a variance of 25. One item is randomly selected, what is the probability of this item having a value greater than 210 ?

- A. 0.3446
- B. 0.0228
- C. 0.0012
- D. 0.0375

118. When used together for variables data, which of the following pair is the MOST useful in preparing control charts ?

- A. AQL, p-bar B. p, n C. X-bar and R D. R, sigma

119. An X-bar chart has shown control for a long time. You see that points for the last 50 samples are all very near the center line on the chart. In fact, they are all within one sigma of the center line. This probably indicates that

- A. It is a desirable situation.
 B. It is an undesirable situation.
 C. The process standard deviation has decreased during the time the last 50 samples were taken.
 D. The control charts are incorrectly computed.

120. An electronics firm was experiencing high rejections in their multiple connector manufacturing departments. "p" charts were introduced as part of a program to reduce defectives. Control limits were based on prior history, using the formula:

$$P' \pm 3\sqrt{\frac{P'(100 - P')}{N}}$$

P' is the historical value of percent defective and n is the number of pieces inspected each week. After six weeks, the following record was accumulated

dept.	P ⁰	w1	w2	w3	w4	w5	w6
104	9	8	11	6	13	12	10
105	16	13	19	20	12	15	17
106	15	18	19	16	11	13	16

1,000 pieces were inspected each week in each department. Which department(s) exhibited a point or points out of control during this period (round off calculations to nearest tenth of a percentage point) ?

- A. Department 104. B. Department 105.
 C. Department 106. D. All of the department.

121. A typical use for the optical comparator would be to measure
A. Surface finish. B. Contours. C. Depth of holes. D. Diameters of internal grooves.
122. The Dodge-Romig tables are designed to minimize which of the following parameters ?
A. AOQL A. AQL C. ATI D. AOQ
123. The MOST essential value of a surface plate in precision measurement application is which of the following ?
A. It provides a flat working surface.
B. It provides a surface free of minor vibration.
C. It provides an accurate reference surface.
D. It provides a chemically resistant work surface.
124. Which of the following are TRUE statements regarding the use of visual inspection ?
I . Reference standards can be used.
II . It provides consistency between inspectors.
III . It is relatively expensive.
IV . It can be quickly performed.
A. I and IV only B. I, II and IV only C. II and IV only D. I, II, III and IV
125. Which of the following is the BEST statement to make regarding the relationship between product precision and product production ?
A. With too little precision, production costs increase.
B. With too much precision, production costs increase.
C. Precision costs and performance are related.
D. With little precision, performance will improve.

126. The maximum allowable percent defective for the process average is the

- A. AOQL B. LPTD C. AQL D. RQL

127. Applications for surface plate includes which of the following ?

- I . Referencing plane for length measurements.
- II . Referencing plane for parallelism measurements.
- III. Establishing a datum plane for dimensional layout.
- IV. Waiting place for delicate parts.
- V . Keeping extra gages when not in use.

- A. I and II only B. I and IV only C. I, II and III only D. III and V only

128. A process is in control with a defect rate of 0.2%. A sampling plans calls for 30 items to be selected at random, and for the process to be shut down and corrected if any defects are found. How often will the process be shut down without a change in the defect rate ?

- A. 1.22% of the time B. 5.83% of the time C. 3.91% of the time D. None of the above

129. Which of the following nondestructive testing methods can be used to evaluate sub-surface discontinuities in aluminum bar stock ?

- I . Microwave.
- II . Magnetic particle.
- III. Pulse echo.
- IV. Eddy current.

- A. I, II and IV only B. I and III only C. III and IV only D. I and IV only

130. The use of 100% inspection normally means

- A. That the final customers will not experience defective product.
- B. That selected characteristics have been evaluated against specified standards.
- C. That there will be an opportunity to rework any product deemed to be outside of specifications.
- D. That the lowest over-all quality costs have been considered.

131. The probability of accepting a lot of unacceptable quality is known as
A. Alpha risk. B. 1-beta. C. Producer's risk. d. Beta risk.
132. Which of the following list of basic NDT techniques are X ray types ?
A. Electromagnetic / Thermal. B. Radiation / Image generation.
C. Ultrasonic / Optical. D. Thermal / Radiation.
133. The steeper the OC-curve, the
A. Less protection for both producer and consumer.
B. More protection for both producer and consumer.
C. The lower the AQL.
D. The smaller the sample size.
134. The AQL for a given sampling plan is 1% this means that
A. The producer takes a small risk of rejecting product which is 1% defective or better.
B. All accepted lots are 1% defective or better.
C. All lots are 1% defective or better.
D. The average quality level of the plan is 1%.
135. What distribution is used to determine the OC curve for an attributes sampling plan ?
A. Normal. B. Binomial. C. Exponential. D. The binomial or the hypergeometric distribution.
136. Measurement gaging is preferable to go, no-go gaging of a quality characteristic because
A. It is more scientific.
B. It provides the most information per piece inspected.
C. It requires greater skills.
D. It requires a larger sample than go, no-go gaging does.

137. The basic elements of an ultrasonic test systems do NOT include which of the following ?

- A. A transducer.
- B. A test object.
- C. A laser beam.
- D. An electronic system.

138. A lot is known to be 1.2% defective. Five units are randomly selected from the lot, and the lot is accepted if 1 or fewer defects are found. What is the probability of the lot being rejected ?

- A. 0.9985
- B. 0.01
- C. 0.00173
- D. 0.00223

139. Given the following probabilities

- 1 or more defects = .70
- 2 or more defects = .35
- 3 or more defects = .15
- 4 or more defects = .03

What is the probability of 2 or fewer defects ?

- A. 0.20
- B. 0.35
- C. 0.65
- D. 0.85

140. An operation requires shipments from your vendor of small lots of fixed size. The attribute sampling plan used for receiving inspection should have its OC curve developed using

- A. The binomial distribution.
- B. The Gaussian (normal) distribution.
- C. The Poisson distribution.
- D. The hypergeometric distribution.

141. As the scatter of points about a regression line becomes less, r^2 will

- A. Be unaffected.
- B. Become smaller.
- C. Become larger.
- D. Approach a value of 1.

142. The critical value of the t-distribution is
- A. Always greater than the critical value of the normal distribution.
 - B. Always less than the critical value of the normal distribution.
 - C. Not related to the critical value of the normal distribution.
 - D. Approaches the critical value of the normal distribution as the degrees of freedom increase.
143. To be effective, a corrective and preventive action system must have
- A. A material review board.
 - B. Approved of the QC department.
 - C. Top management support.
 - D. A method for identifying nonconformities.
144. The power of efficiency in designed experiments lies in the
- A. Random order of performance.
 - B. The sequential and cyclical procedure of conjecture to design to analysis and back to conjecture.
 - C. Hidden replication.
 - D. The large number of possible combinations of factors.
145. Which table should be used to determine a confidence interval on the mean when standard deviation is NOT known and the sample size is 10 ?
- A. z
 - B. t
 - C. F
 - D. Chi-Square
146. Given that the population standard deviation is 6.8, what sample size is required to be 90% confident that the estimated mean has an error less than 0.02 ?
- A. 312,761
 - B. 189,859
 - C. 175,987
 - D. 152,083

147. Given the data below is normally distributed, and the population standard deviation is 3.1, what is the 90% confidence interval for the mean ?

22, 23, 19, 17, 29, 25

- A. 20.88 - 24.12 B. 20.42 - 24.59 C. 21.65 - 23.35 D. 17.4 - 27.6

148. If a sample size of 16 yields an average of 12 and standard deviation of 3, estimate the 95% confidence interval for the population (assume a normal distribution).

- A. $10.40 \leq \mu \leq 13.60$
B. $10.45 \leq \mu \leq 13.55$
C. $10.53 \leq \mu \leq 13.47$
D. $10.77 \leq \mu \leq 13.23$

149. Which of the following statements is CORRECT ?

- A. The higher the correlation, the better the regression estimate.
B. Regression estimates are better made with positive correlation than with negative correlation.
C. The lower the correlation, the greater the likelihood that homoscedasticity exists with respect to the predicted variable.
D. The better the regression estimate, the greater the likelihood that homoscedasticity exists with the respect to the predicted variable.

150. How many outcomes are possible when performing a single trial of a binomial experiment ?

- A. 1 B. 2 C. 3 D. 4

151. Which of the following is a valid null hypothesis ?

- A. $p > 1/8$
B. $\mu < 98$
C. The mean of population A is not equal to the mean of population B
D. $\mu = 110$

152. A two-way analysis of variance has r levels for one variable and c levels for the second variable with 2 observations per cell. The degree of freedom for interaction is

- A. $2(r)(c)$ B. $(r-1)(c-1)$ C. $rc-1$ D. $2(r-1)(c-1)$

153. One-way analysis of variance is MOST similar in its objectives to

- A. A test of a population mean. B. A test for equality of two sample proportions.
C. A test for equality of two population means. D. A chi-square test for independence.

154. The difference between setting alpha equal to 0.05 and alpha equal to 0.01 in hypothesis testing is

- A. With alpha equal to 0.05, we are more willing to risk a type I error.
B. With alpha equal to 0.05, we are more willing to risk a type II error.
C. Alpha equal to 0.05 is a more "conservative" test of the null hypothesis.
D. With alpha equal to 0.05, we are less willing to risk a type I error.

155. In nonparametric statistics:

- I. No assumptions are made concerning the distribution from which the samples are taken.
II. The parameters of the distribution do not relate to the parameters of the sample.
III. The sample and the distribution must have no parameters in common.

- A. I only B. II only C. III only D. II and III only

156. The value for t , when making a two-tailed paired t test, with samples of 13 and $\alpha = 0.05$, is

- A. 1.782 B. 2.179 C. 2.064 D. 1.711

157. The "least squares method" is used in

- A. The central limit theorem B. Calculating σ^2
C. Calculating σ^2 and s^2 D. Calculating a best fit regression line.

158. The primary advantage of the Latin square design, compared to the factorial design, is that
- A. In most circumstances, it requires less data.
 - B. It eliminates the need for interaction analysis.
 - C. It allows higher significance levels.
 - D. It does not require homogeneity of variance.
159. An experiment with two factors, in which all levels of one variable are run at each level of the second variable, is called a
- A. One-way experiment.
 - B. Latin square experiment.
 - C. Factorial experiment.
 - D. Fractional factorial experiment.
160. Given the data below, what is the 90% confidence interval for the variance ?
- 22, 23, 19, 17, 29, 25
- A. 4.21 - 99.07
 - B. 15.32 - 28.66
 - C. 8.27 - 79.88
 - D. 16.87 - 56.52

Solution #1

1	B	16	B	31	C	46	A	61	C	76	D	91	C	106	B	121	B	136	B	151	D
2	D	17	A	32	C	47	A	62	A	77	C	92	B	107	C	122	C	137	C	152	B
3	D	18	D	33	A	48	C	63	C	78	D	93	D	108	C	123	C	138	C	153	C
4	C	19	C	34	D	49	B	64	B	79	C	94	C	109	D	124	A	139	D	154	A
5	C	20	B	35	A	50	C	65	D	80	A	95	C	110	D	125	C	140	D	155	A
6	B	21	A	36	B	51	C	66	D	81	C	96	B	111	C	126	C	141	D	156	B
7	C	22	D	37	D	52	C	67	C	82	B	97	B	112	A	127	C	142	D	157	D
8	A	23	B	38	B	53	B	68	B	83	B	98	B	113	C	128	B	143	D	158	A
9	D	24	B	39	C	54	A	69	A	84	B	99	C	114	A	129	C	144	C	159	C
10	B	25	A	40	D	55	D	70	A	85	C	100	C	115	D	130	B	145	B	160	C
11	A	26	D	41	B	56	C	71	C	86	A	101	D	116	B	131	D	146	A		
12	D	27	C	42	A	57	D	72	C	87	C	102	B	117	B	132	B	147	B		
13	D	28	B	43	D	58	B	73	B	88	D	103	D	118	C	133	B	148	A		
14	C	29	B	44	D	59	C	74	A	89	A	104	A	119	C	134	A	149	A		
15	B	30	C	45	D	60	D	75	B	90	C	105	D	120	D	135	D	150	B		