CQE EXAM

CQE Exam Practice Exam

32 Questions to Help You Prepare For the **CQE Exam**

ANDY ROBERTSON

1. You're working through an PFMEA for a new process and you're meeting with the R&D team to discuss the impact that your potential failure modes have on the end user. What risk management activity are you engaged in?

   - Risk Evaluation
   - Risk Analysis
   - Risk Identification
   - Risk Control

2. If the probability of event A is P(A) = 0.70 and the probability of event B is P(B) = .40 and the intersection of A&B is P(A & B) = 0.10. If B had already occurred, what is the probability of A now that B has occurred?

   - 25%
   - 33%
   - 40%
   - 60%

3. What is the UCL for a p-chart when the average daily inspection quantity is 60, and the historical percentage of defectives is 0.10?

   - 0.22
   - 0.29
   - 0.14
   - 0.17

4. A team of engineers is analyzing their automated production process where they believe that a bimodal distribution is occurring for the height of their final product. Which tool can use used to confirm this hypothesis?

   - Pareto Chart
   - Check Sheet
   - Prioritization Matrix
   - Histogram

5. You're working on a team and in your meetings, you notice that the other members feel overwhelmed and seem to be suggesting ideas that benefit themselves but not the team. Which stage of team development is the team currently in?

   - Forming
   - Storming
   - Norming
   - Performing

6. A measurement system experienced a calibration failure that resulted in non-conforming material being falsely accepted. This went undetected until the non-conforming material was received by the customer. The return and rework of that material is considered:
   - Preventative Cost
   - Appraisal Cost
   - Internal Failure Cost
   - External Failure Cost

7. Which of the situations represents a potential conflict of interest:
   - You used to own stock in a publicly traded company for which you're now auditing
   - Your kids go to school with a co-worker who you're currently auditing
   - You went to high school with the auditing manager of the internal department your auditing
   - You're performing a supplier audit when you find out the suppliers Quality Manager is your cousin

8. A system is in its useful life period & has been shown to have a MTBF of 5,000 Hours. What is the Reliability of the system at 2000 Hours?
   - 79%
   - 75%
   - 71%
   - 67%

9. An air-compressor manufacturer has identified a non-conformance with a pressure relief valve, whereby if the valve were to stick, the tank might over-pressurize and explode. How would the company classify this non-conformance?
   - Critical
   - Major
   - Minor
   - Incidental

10. A team of engineers at an Electronics Manufacturer wants to improve the way material moves through the production process. At the start of the improvement process the team needs to align on the current state of the process. Which tool will best help the team align on the existing process?
    - Cause & Effect Diagram
    - Check Sheet
    - Flow Chart
    - Activity Network Diagram

11. **During and after an audit, all audit information and findings should be kept confidential. Ensuring this is the responsibility of which individual in the audit:**
- The Lead Auditor
- The Support Auditor
- The Auditee
- The Client.

12. **According to Juran, Quality Control is described as:**
- A continuous method whereby Top Management is strategically planning for improved Quality
- The on-going monitoring process to detect & correct any Quality issues
- A drive for breakthrough results to resolve chronic issues
- A drive for daily, small improvements that's focused on reducing waste

13. **Top Leaders in an organization are responsible for cascading goals and objectives throughout the organization, this is called:**
- Project Management
- Kaizen
- Quality Function Deployment
- Hoshin Kanri

14. **You're creating a linear regression model for your data and you've calculated the following values:**
$$S_{yy} = 721, S_{xy} = 654, S_{xx} = 336$$
What is the slope coefficient for your regression model?
- 0.51
- 0.90
- 1.95
- 2.14

15. **Identify all of the statements below regarding dimensions & tolerances which are true:**
   - A. Dimensions and tolerances shall be complete so there is a full understanding of the characteristics of each feature
   - B. Each necessary dimension shall be shown
   - C. Parts dimensions shall be selected and arranged to suit the manufacturing operation
   - D. Dimensions and tolerance apply at all drawing levels where the component is utilized

- A, B
- A, C
- B, C
- A, D

16. **What tool is most useful in determining if a supplier's process is able to produce product that conforms to your specifications:**
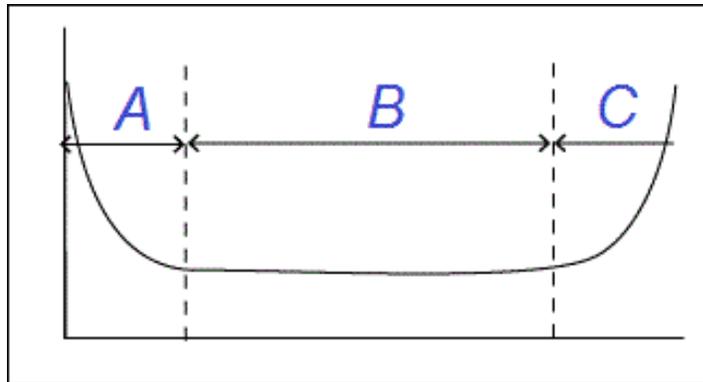   - Supplier Audit
    - A Quality Agreement
    - Receiving Inspection
    - A Process Capability Study

17. **This concept is the act of performing a designed experiment all over again.**
    - Blocking
    - Randomization
    - Replication
    - Robustness

18. **Here is a picture of the bathtub curve, what is region A called?**
    - Early Life Period
    - Useful Life Period
    - Wear Out Period
    - The Normal Region

19. **Which QMS Document summarizes your organizations intentions & views with respect to the importance of quality as it relates to the organization's customers, employees and the business objectives.**
    - The Quality Policy
    - The Quality Objectives
    - The Quality Scorecard
    - The Quality Plan

20. **Put the following Quality System Documentation in order from Top to Bottom**
    - Policy, Procedures, Work Instructions, and Records
    - Policy, Work Instructions, Procedures, and Records
    - Procedures, Policy, Work Instructions and Records
    - Procedures, Policy, Records and Work Instructions

21. You're preparing for an upcoming production run where the likelihood (Probability) of defect A is known to be 7%, and the likelihood of defect B is 4%; and an overlapping 3% had both defect A & defect B. If you randomly sampled 1 piece from a lot of 100, what is the likelihood of picking a defect?
    - 6%
    - 8%
    - 11%
    - 14%

22. You're inspecting a recent pipe installation and you need a quick, portable non-destructive test method to inspect a fillet weld of two aluminum components where you want to identify surface defects such as cracks or undercuts. Which method would be most appropriate?
    - Magnetic Particle Testing
    - Dye Penetrant Testing
    - Radiographic Testing
    - Ultrasonic Testing

23. A dish washer that automatically shuts off when the door is opened is an example of which quality principle:
    - Design for Six Sigma
    - Quality By Design
    - Poke-Yoke
    - Design Validation

24. For a Single Sampling Plan at an AQL of 0.40 at a normal, general inspection level II per ANSI/ASQ Z1.4, find the Accept Number for a total lot size of 9,000 units:
    - 1
    - 2
    - 3
    - 4

25. Which Audit Documents typically contain the scope & purpose of the audit, the standards against which the audit will be or was conducted, the auditor team conducting the audit, and the time, date & location of the audit
    - The Audit Plan
    - The Audit Checklist
    - The Audit Report
    - The Audit Flowchart

26. **Your control plan has identified a non-conformance, and your team is working through the reaction strategy. You're working to identify and set aside all potentially affected product, which phase of the reaction plan are you in?**
    - Containment
    - Diagnosis
    - Verification
    - Disposition

27. **These are the technical reflection of your customers' needs and they represent your customers' requirements for the final product relating to safety, performance, functionality, quality, reliability, and the intended use of your product.**
    - Design Outputs
    - Engineering Drawings
    - Design Inputs
    - Design Requirements

28. **You're designing a new product that is similar to an existing product and you know that you only have a few top-level events that need to be analyzed for their risk, which risk management tool is most appropriate?**
    - The FMECA
    - The PFMEA
    - The DFMEA
    - The FTA

29. **You're manufacturing a widget and using an X-bar and R chart with 5 samples per sub-group to control the critical feature of the product. Your normal process has the following attributes:** $\overline{\overline{X}} = 37,\ \overline{R} = 2.5$
    Identify the upper control limits for the X-bar chart:
    - 37.82
    - 38.44
    - 39.50
    - 41.33

30. **Calculate Cpk for the following Parameters: (USL = 145, LSL = 85, σ = 6, μ = 115)**
    - 1.0
    - 1.33
    - 1.67
    - 2.00

31. **You've experienced a new, never before seen non-conformance within your production process and you're performing functional testing to understand how this failure mode would impact your customer. What aspect of risk management does this fall under?**
    - Risk Identification
    - Risk Analysis
    - Risk Evaluation
    - Risk Reduction

32. **A team of engineers is varying a process parameter and measuring a critical output to determine if the two are potentially related. Which tool can be used to assess this relationship:**
    - Pareto Chart
    - Interrelationship Digraphs
    - Scatter Diagram
    - Control Charts

Solutions for Practice Exam

1. **You're working through an PFMEA for a new process and you're meeting with the R&D team to discuss the impact that your potential failure modes have on the end user. What risk management activity are you engaged in?**
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   - **25%**
   - 33%
   - 40%
   - 60%

   $$P(A|B) = P(A \& B) / P(B) = 0.10 / 0.40 = 1/3 = 25\%.$$

3. **What is the UCL for a p-chart when the average daily inspection quantity is 60, and the historical percentage of defectives is 0.10?**
   - **0.22**
   - 0.29
   - 0.14
   - 0.17

   The **upper control limit** for **a P-chart** can be calculated using the following equation: $UCL_{\bar{p}} = \bar{p} + 3\sqrt{\frac{\bar{p}(1-\bar{p})}{\bar{n}}}$

   $$UCL_{\bar{p}} = \bar{p} + 3\sqrt{\frac{\bar{p}(1-\bar{p})}{\bar{n}}} = 0.10 + 3\sqrt{\frac{0.10(1-0.10)}{60}} = 0.10 + 3\sqrt{0.0015} = 0.22$$

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    - **Your performing a supplier audit when you find out the suppliers Quality Manager is your Cousin**

8. **A system is in its useful life period & has been shown to have a MTBF of 5,000 Hours. What is the Reliability of the system at 2000 Hours?**
    - 79%
    - 75%
    - 71%
    - **67%**

    The first step in solving this problem is understanding that because the system is in its useful life period, we must use the Exponential Distribution to calculate reliability, see below:

    $$R(t) = e^{-\lambda t} \text{ where } \lambda = \frac{1}{MTBF}$$

    $$R(t) = e^{-\lambda t} = e^{\frac{-t}{\theta}} = e^{\frac{-2,000}{5,000}} = 67.03\%$$

9. An air-compressor manufacturer has identified a non-conformance with a pressure relief valve, whereby if the valve were to stick, the tank might over-pressurize and explode. How would the company classify this non-conformance?
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What is the slope coefficient for your regression model?

- 0.51
- 0.90
- **1.95**
- 2.14

The slope of the linear regression model, $\beta_1 = S_{xy} / S_{xx} = 654 / 336 = 1.95$

15. Identify all of the statements below regarding dimensions & tolerances which are true:
    A. **Dimensions and tolerances shall be complete so there is a full understanding of the characteristics of each feature (True)**
    B. **Each necessary dimension shall be shown (True)**
    C. Parts dimensions shall be selected and arranged to suit the ~~manufacturing operation~~ **(function and mating relationship of the part) (False)**
    D. Dimensions and tolerance apply ~~at all drawing levels where the component is utilized~~ **(only at the drawing level where they are specified) (False)**

- **A, B are the only two correct statements**
- A, C
- B, C
- A, D

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- Supplier Audit
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- Receiving Inspection
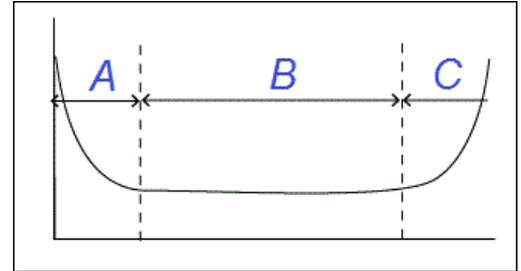- **A Process Capability Study**

A **Process Capability Study** is the statistical analysis of the supplier's operation to ensure their process is capable of producing product that conforms to specifications.

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- Blocking
- Randomization
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- Robustness

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   - 6%
   - **8%**
   - 11%
   - 14%

   In this situation the following information is true: $P(A) = 7\%$ $P(B) = 4\%$ $P(A \cap B) = 3\%$

   Therefore, the probability of picking one of the two defect types can be calculated using the addition rule:
$$P(A \cup B) = P(A) + P(B) - P(A \cap B) = 7\% + 4\% - 3\% = 8\%$$

22. **You're inspecting a recent pipe installation and you need a quick, portable non-destructive test method to inspect a fillet weld of two aluminum components where you want to identify surface defects such as cracks or undercuts. Which method would be most appropriate?**
    - Magnetic Particle Testing
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    Magnetic particle testing will not work as this material is aluminum (nonferrous), and cannot be magnetized. Also, the awkward geometry of a fillet weld can make ultrasonic testing difficult. Radiographic testing could work, but the defects of interested are all surface defects (cracks and undercuts) making Dye Penetrant testing the best choice.

23. **A dish washer that automatically shuts off when the door is opened is an example of which quality principle:**
    - Design for Six Sigma
    - Quality By Design
    - **Poke-Yoke**
    - Design Validation

    Poke-Yoke, or error proofing, is a concept that means to prevent an error (in this example a safety issue) by design.

24. **For a Single Sampling Plan at an AQL of 0.40 at a normal, general inspection level II per ANSI/ASQ Z1.4, find the Accept Number for a total lot size of 9,000 units:**
    - 1
    - **2**
    - 3
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    First, we start with the sample size code letter table where we find the intersection of general inspection level II, and a lot size of 9,000 units to be the sample size code letter of L.

    Then, we can go to the single normal inspection table and look for the intersection of Code Letter L and AQL 0.45, which indicates that we **accept on 2 or fewer non-conformances**, and reject on 3 or more non-conformances.

25. **Which Audit Documents typically contain the scope & purpose of the audit, the standards against which the audit will be or was conducted, the auditor team conducting the audit, and the time, date & location of the audit**
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    - The Audit Flowchart

    These details are normally contained in both the Audit Plan.

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    The FTA is the best risk management tool if you have only a few top-level events that you want to analyze.

29. **You're manufacturing a widget and using an X-bar and R chart with 5 samples per sub-group to control the critical feature of the product. Your normal process has the following attributes:** $\overline{\overline{X}} = 37, \ \overline{R} = 2.5$
Identify the upper control limits for the X-bar chart:
- 37.82
- **38.44**
- 39.50
- 41.33

$$Upper \ Control \ Limit: LCL_{\overline{X}} = \overline{\overline{X}} + A_2\overline{R}$$

Now we must look up the A₂ constant using the sample size (n=5), and we find A₂ = 0.577

$$LCL_{\overline{X}} = 37 + 0.577 * 2.5 = 38.44$$

30. **Calculate Cpk for the following Parameters: (USL = 145, LSL = 85, σ = 6, μ = 115)**
- 1.0
- 1.33
- **1.67**
- 2.00

$$C_{pk} = Min\left(C_{p,Lower}, C_{p,Upper}\right) = Min\left(\frac{USL - \mu}{3s}, \frac{\mu - LSL}{3s}\right) = Min\left(\frac{145 - 115}{3 * 6}, \frac{115 - 85}{3 * 6}\right) = Min\left(\frac{30}{18}, \frac{30}{18}\right)$$

$$C_{pk} = Min(1.66, 1.66) = 1.66$$

31. **You've experienced a new, never before seen non-conformance within your production process and you're performing functional testing to understand how this failure mode would impact your customer. What aspect of risk management does this fall under?**
- Risk Identification
- **Risk Analysis**
- Risk Evaluation
- Risk Reduction

Working to understand the effect that a failure mode has on your customer is considered **risk analysis** because you're working to quantify the severity of the failure mode.

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- Interrelationship Digraphs
- **Scatter Diagram**
- Control Charts