
**THE
QUALITY ENGINEER
SOLUTIONS TEXT**

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A Note to Fellow Quality Professionals

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The Solutions Text follows the content and questions in the Tenth Edition of the *CQE Primer* (May, 2015).

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WITH A LITTLE HELP FROM MY FRIENDS.

JOHN LENNON/PAUL McCARTNEY

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We would appreciate any comments regarding improvement and errata. It is our concern to be accurate.

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Bill has instructed over 9000 individuals in quality fundamentals including certification training in the engineering, auditing, management and technician bodies of knowledge. Mr. Wortman has authored, co-authored or edited some 42 quality related books or software products, most prominently among these is the QCI Primer series.

Preface

This Solutions Text addresses all questions in the *CQE Primer*, 10th edition (2015). Some question replacements have been made to reflect recent changes to a number of ASQ BOK elements.

The author feels that approximately 95% of the 400 questions can be answered with the *CQE Primer* and ANSI/ASQ Z1.4. Other references are noted, particularly *Juran's Quality Handbook*, 5th ed., Grant and Leavenworth's *Statistical Quality Control*, 5th ed., and the *Quality Dictionary* by Tracy Omdahl.

The author strongly advises CQE students to test their knowledge of quality concepts since the CQE Body of Knowledge and question bank are subject to change.

If the student feels that additional questions would be of benefit, QCI offers a CD with 600 additional questions. These questions can be taken as a simulated test or in a variety of different formats. The tests are timed and are summarized by category upon completion. An explanation of the correct answer is provided.

SECTION II

MANAGEMENT & LEADERSHIP -- TEST QUESTIONS

- 2.1. A thorough review of the works of the major quality gurus would indicate which of the following to be the most effective way to create quality?
- Effective problem solving
 - Benchmarking the best competition
 - Continuous process improvement
 - Modern statistical control techniques

Solution: This question requires a general familiarity with the teachings of major quality gurus and an answer review. Dr. Juran refers to quality improvement as part of his quality trilogy. Dr. Deming's point 5 (The 14 obligations of top management) discusses the need for constant improvement to the process of planning, production and service. Philip Crosby's 14 step approach lists quality improvement teams (2) and "do it all over again"(14) which indicate continuous improvement.

Answers **a**, **b**, and **d** could be viewed as subsets of answer **c**, which is the best choice.

Answer c is correct.

Reference: *CQE Primer*, Section II - 2/12 (and logic).

- 2.2. A method of improving the performance in any functional area of a company, including product or service quality, would be:
- Utilizing FMEA or FMECA techniques
 - Applying the benchmarking process
 - Instituting an improved design review
 - Reading the Baldrige application guidelines

Solution: FMECA and design review procedures are utilized in product driven companies. Thus, answers **a** and **c** can be eliminated. Baldrige criteria is an excellent guideline for systems improvement. However, a specific functional area would be more directly served by using the benchmarking process.

Answer b is correct.

Reference: *CQE Primer*, Sections II - 37/39, III - 31/32, IV - 7/10 and 77/81 (and logic).

- 2.3. The project management performance measure known as time lines is also known as:
- A PERT chart because tasks and durations are shown as circles and lines
 - A Gantt chart which shows task starting and ending dates along a common time axis
 - PTTF (project time to finish) schedule because it shows project milestones
 - A CPM chart with bars proportional in length to task durations

Solution: Gantt charts are widely used in project planning to display time lines. They are also known as bar charts because bars are used to show the amount of time necessary to perform an activity. The CPM, PERT, and PTTF charts do not show bars or time lines.

Answer b is correct.

Reference: *CQE Primer*, Section II - 43/50.

SECTION II

MANAGEMENT & LEADERSHIP -- TEST QUESTIONS

- 2.4. The best way to disseminate information about a new quality program is to:
- Send an e-mail to all employees
 - Post the announcement on the company bulletin board
 - Send a memo to all department heads
 - Use a combination of media

Solution: People receive communications by various media in different ways. Everyone does not read the bulletin board. Some department heads do not pass on information received in memos. Using e-mail is a convenient way to send messages, but the message may not be read, or may be read at a later date than when the information is useful. To reach all relevant employees with the information about a new quality program, a combination of media is needed, including e-mail, bulletin boards, memos, meetings, newsletters, etc.

Answer d is correct.

Reference: *CQE Primer*, Section II - 76/80.

- 2.5. The most important step in vendor certification is to:
- Obtain copies of the vendor's quality manual
 - Familiarize the vendor with quality requirements
 - Analyze the vendor's first shipment
 - Visit the vendor's plant

Solution: The key question phrase is "most important step." One of the fundamental steps in dealing with a vendor is to familiarize them with the basic requirements. If the requirements are not understood, then quality manuals, plant visits and incoming inspection will be futile.

Answer b is correct.

References: *CQE Primer* Section II - 97/98. This question has been modified from an old published CQE exam.

- 2.6. Which of the following concepts is mostly associated with Taiichi Ohno?
- SPC
 - TOC
 - CTQ
 - TPS

Solution: Taiichi Ohno is the main contributor to the Toyota Production System (TPS).

Answer d is correct.

Reference: *CQE Primer*, Section II - 15 and 19.

SECTION II

MANAGEMENT & LEADERSHIP -- TEST QUESTIONS

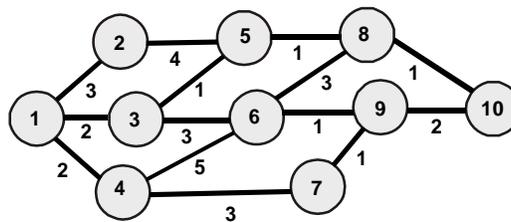
- 2.7. For employee involvement efforts to succeed, what may be needed?
- Increased employee incentives
 - Increased basic training companywide
 - Employee understanding of how they can make a difference
 - The initiation of pilot projects

Solution: Increasing employee incentives indicates that one believes that incentives are a way to guarantee success (answer **a**). It is a very specific solution and may not be correct. Increased training is a good choice (answer **b**), but not the best choice. Answer **c**, having employees understand how they can make a difference, is a basic step toward success. Answer **d**, is another specific and somewhat restrictive solution. The best answer is **c**.

Answer c is correct.

Reference: *CQE Primer*, Section II - 57/60.

- 2.8. Consider the following network, with events marked within the circles and durations in weeks:



The critical path is:

- 1-3-6-8-10
- 1-3-6-9-10
- 1-4-6-8-10
- 1-4-6-9-10

Solution: The critical path is the task sequence which requires the longest expected time.

For the program evaluation and review technique (PERT) network given above, the following possible paths and times are:

ANSWER	PATH	WEEKS
a.	1-3-6-8-10	9
b.	1-3-6-9-10	8
c.	1-4-6-8-10	11
d.	1-4-6-9-10	10

OTHER PATHS	WEEKS
1-2-5-8-10	9
1-3-5-8-10	5
1-4-7-9-10	8

The critical path is 1-4-6-8-10. The other paths have slack times.

Answer c is correct.

Reference: *CQE Primer*, Section II - 45/48.

SECTION II

MANAGEMENT & LEADERSHIP -- TEST QUESTIONS

2.9. Strategic quality goals must be subdivided. Thus, they are:

- a. Delegated
- b. Distributed
- c. Accountable
- d. Deployed

Solution: Delegated means to be assigned goals (answer **a**). Distributed means to be given goals (answer **b**). Accountable means to be responsible for the goals (answer **c**). Deployed means to have the goals spread out into attainable portions. Answer **d** is the best choice.

Answer d is correct.

Reference: *CQE Primer*, Section II - 30/31.

2.10. In most cases, conflict within an organization:

- a. Has a negative effect on the employees
- b. Has a positive effect on creating alternate solutions
- c. Most often results in a win-win situation
- d. Promotes horizontal and vertical employee growth skills

Solution: Conflict within an organization often has a negative effect on employees. Conflict most often results in win-lose or lose-lose situations. Rarely will conflict result in a win-win situation or the creation of alternate solutions. Only a few exceptional personalities thrive in an environment of conflict.

Answer a is correct.

Reference: *CQE Primer*, Section II - 73/75 and 83.

2.11. In establishing a quality reporting and information feedback system, primary consideration must be given to:

- a. The number of inspection stations
- b. Timely feedback and corrective action
- c. Historical preservation of data
- d. A routing copy list

Solution: The key question phrase is "primary consideration." Answers **a** and **d** are limiting options. This question implies an immediate feedback system for timely corrective action. Historical preservation of data may or may not be desired.

Answer b is correct.

References: *CQE Primer*, Section II - 51/54. This question has been modified from an old published CQE exam.

SECTION II

MANAGEMENT & LEADERSHIP -- TEST QUESTIONS

2.12. Who created the initial problem solving framework that would later become DMAIC?

- a. Michel Harry
- b. Forrest Breyfogle, III
- c. Robert Galvin
- d. Michael George

Solution: Michel Harry along with Bill Smith developed a "MAIC" methodology (measure, analyze, improve, control) that evolved to become DMAIC (define, measure, analyze, improve, control). Initially, they felt that many company problems and opportunities were already well defined.

Answer a is correct.

Reference: CQE Primer, Section II - 13.

2.13. Which of the following techniques is especially beneficial for the generation of ideas when solving quality and productivity problems?

- a. Poka - yoke
- b. Storming
- c. NGT
- d. PERT

Solution: This question requires knowledge of team problem solving and project management techniques.

Poka - yoke is a technique for mistake proofing a process. Storming is a team development phase. PERT is a project management acronym meaning program evaluation and review technique. The nominal group technique (NGT), using silent brainstorming techniques, can be an effective tool for generating ideas.

Answer c is correct.

Reference: CQE Primer, Section II - 70.

2.14. In spite of the quality engineer's best efforts, situations may develop in which his/her decision is overruled. The most appropriate action would be to:

- a. Resign the position based upon his/her convictions
- b. Report his/her findings to an outside source such as a regulatory agency
- c. Document his/her findings, report them internally, and move on to the next task
- d. Discuss his/her findings with co-workers in order to gain support

Solution: Answer choice **a** is rather drastic. Without some indication that a federal or state environmental or safety statute has been violated, answer **b** is not a viable option. Answer **d** sounds like an insurrection.

A quality (or any other) professional should know that not all of his/her decisions will be supported.

Answer c is correct.

References: CQE Primer, Section II - 55/58 (and logic). This question has been modified from an old published CQE exam and CQE brochure.

SECTION II

MANAGEMENT & LEADERSHIP -- TEST QUESTIONS

2.15. The most desirable method of evaluating a supplier is:

- a. A history evaluation
- b. A survey evaluation
- c. A questionnaire
- d. Discussion with the quality manager

Solution: This question requires an answer review and logic. The key phrase is “most desirable.”

- a. An evaluation of a supplier’s quality history is the best answer. It reflects a supplier’s performance over a longer period of time in a number of areas (quality, reliability, responsiveness, etc.).
- b. A survey evaluation is a valid answer. However, it is a snapshot of the supplier at one point in time.
- c/d. These two answers are very weak. A supplier will present themselves in the best possible light in a questionnaire or over the phone.

Answer a is correct.

References: *CQE Primer*, Section II - 91. This question has been modified from an old published CQE exam and CQE brochure.

2.16. One of Dr. Deming’s 14 points for management states “Cease dependence upon inspection as a way to achieve quality.” The underlying tenet of this statement is which of the following?

- a. Many American companies employ too many inspectors
- b. Quality should be built into the product, not inspected in
- c. Workers should perform their own inspection and not rely on others
- d. Most manual inspection will miss 10%-20% of defects under typical conditions

Solution: Answers **a**, **c**, and **d** are true statements in many circumstances. They explain or expand on some of the weaknesses of product inspection. However, answer **b** explains the question best. If quality is built in to the product, it doesn’t matter if inspection misses a defect. The defect isn’t there. Inspection to improve quality is too late, ineffective, and costly. Harold F. Dodge said, “You cannot inspect quality into a product.”

Answer b is correct.

References: *CQE Primer*, Section II - 7. W. Edwards Deming, (1986). *Out of the Crisis*. Cambridge: MIT Press.

SECTION II

MANAGEMENT & LEADERSHIP -- TEST QUESTIONS

- 2.17. In consumer products, the complaint rate is most directly a measure of:
- Product quality
 - Customer satisfaction
 - Market value
 - Rejection rate

Solution: Customer satisfaction has always been a good choice on past ASQ exams. The complaint rate is most closely tied to customer satisfaction. A product may conform to specification, have typical quality and good market value, but receive complaints in other areas. Customer expectations, difficult assembly, the features of competing products may all play a role in the complaint rate (this is not an inclusive list). A complaint does not mean a rejection. Often, the customer wants to continue doing business with you, but they want you to improve.

Answer b is correct.

References: *CQE Primer*, Section II - 84/86. This question has been modified from an old published CQE exam.

- 2.18. Quality data, which are regularly obtained but never used, should be:
- Analyzed periodically by a statistician to glean as much information as possible
 - Discontinued to save time and money
 - Stored until such time as the need arises
 - Processed into summary reports and made available for interested parties

Solution: Any data collection which is not used should be stopped.

Answer b is correct.

References: *CQE Primer*, Section II - 54. This question has been modified from an old published CQE exam.

- 2.19. Which of the following would be a positive step for an organization intent on continuous improvement?
- Determine the total organizational impact of changes
 - Decrease skill based training expenditures
 - Discontinue detailed record keeping of improvement projects
 - Avoid expensive improvement projects

Solution: All or part of answers **b**, **c**, and **d** could prove to be counterproductive.

Answer a is correct.

Reference: *CQE Primer*, Section II - 104/105 (and logic).

SECTION II

MANAGEMENT & LEADERSHIP -- TEST QUESTIONS

- 2.20. What is a major distinction between the CPM and PERT methods in the evaluation of project performance?
- Only the PERT method can be displayed on a Gantt chart
 - The PERT technique allows for easier crashing of project time
 - The PERT technique permits network relationships but CPM does not
 - The PERT technique is event oriented, while CPM is activity centered

Solution: Answer **a** is false. Both PERT and CPM information can be displayed on a Gantt chart. Answers **b** and **c** are also false. Both CPM and PERT charts show network relationships and can be “crashed.”

Answer d is correct.

Reference: *CQE Primer*, Section II - 43/50.

- 2.21. One would say that, from an overall perspective, the activities of a company are tied together by:
- Customers
 - Stockholders
 - Suppliers
 - Process management

Solution: In the context of the question, almost any model or schematic of an organization has either a business process management or internal company process at its core.

Answer d is correct.

Reference: *CQE Primer*, Section II - 33.

- 2.22. As one works through a conflict situation with a customer:
- There is no conflict, the customer is always right
 - The process should not embarrass either party
 - The company should maintain its position
 - All steps and procedures are strictly followed

Solution: This question requires the completion of a statement. The first half of an idea is presented and the selected half must flow with the first half. What general principle seems to fit best with the situation provided?

There are companies that maintain that the customer is always right (answer **a**). This is a good principle, and it works for some companies. The process should not embarrass either party, (answer **b**), is an even better principle. Answer **c**, maintaining the company position, and answer **d**, strict steps, are both poorer choices. The best selection is **b**.

Answer b is correct.

Reference: *CQE Primer*, Section II - 83/86.

SECTION II

MANAGEMENT & LEADERSHIP -- TEST QUESTIONS

2.23. Which American figure is seen as the earliest advocate of waste reduction?

- a. Henry Ford
- b. Frederick W. Taylor
- c. W. Edwards Deming
- d. James Womack

Solution: Henry Ford's dramatic gains at his Highland Park and River Rouge plants could be seen as the earliest examples of waste reduction.

Answer a is correct.

Reference: *CQE Primer*, Section II - 15/17.

2.24. What is business continuity?

- a. To recover and move on after a disruption
- b. To change rapidly after a disruption
- c. To expect business disruptions
- d. To adapt to changing business conditions

Solution: Business continuity is about sustaining the organization's objectives during and after a disruption. Some of the other answer choices have good context but are not fully descriptive of business continuity.

Answer a is correct.

Reference: *CQE Primer*, Section II - 102/103.

2.25. A key characteristic of a business partnership is:

- a. Sharing of critical business information
- b. Limited access to human resources
- c. Special company audits are performed
- d. Only plant managers agree on agendas

Solution: A close reading of the answers shows that three of the answers offer a limited or slightly negative response "tone." For a partnership to work, there is joint cooperation and sharing of much information. Answers **b**, **c**, and **d** are restrictive in their wording. Answer **a** indicates a sharing of critical information, which is needed for successful partnerships. Thus, answer **a** is the best choice.

Answer a is correct.

Reference: *CQE Primer*, Section II - 96.

SECTION II

MANAGEMENT & LEADERSHIP -- TEST QUESTIONS

2.26. The effective supervisor:

- a. Sees his/her role primarily as one of making people happy
- b. Sometimes does a job himself because he/she can do it better than others
- c. Has objectives of growth and increased profit by working through other people
- d. Assumes the decision making function, but leaves personnel development to others

Solution: A good supervisor does not abdicate personnel development to others or see his/her role as one of making people "happy." Thus, answers **a** and **d** are incorrect.

Although answer **b** may be true in some cases, it is not a principal supervisory motivation.

Answer c is correct.

References: *CQE Primer*, Section II - 57/60. This question has been modified from an old published CQE exam.

2.27. Complaint indices should:

- a. Recognize the degree of dissatisfaction as viewed by the customer
- b. Provide a direct input to corrective action
- c. Not necessarily be based on field complaints, service calls, or value of claims
- d. Ignore life cycle costs

Solution: This question requires knowledge of customer feedback and an answer review. Answer **b** is incorrect. A complaint, in most cases, will not directly solve a problem. Answer **c** is incorrect (in part). Complaint indices can be based on field complaints, service calls, etc. Answer **d** is incorrect. During the wearout phase of certain products, both repair costs and complaint indices will increase.

Recognizing the degree of dissatisfaction as viewed by the customer is important.

Answer a is correct.

References: *CQE Primer*, Section II - 84/87. This question has been modified from an old published CQE exam.

2.28. Which of the following items describe well functioning improvement teams?

- a. Members listen to what others say in the meeting
- b. Members often act without interdependency
- c. Members often have covert agendas
- d. Members set unrealistic objectives

Solution: Answer **a** is a desirable team characteristic. Covert agendas are poor characteristics in any team or group. Team members must be able to act both independently and interdependently. Members need to set realistic objectives.

Answer a is correct.

Reference: *CQE Primer*, Section II - 65/68.

SECTION II

MANAGEMENT & LEADERSHIP -- TEST QUESTIONS

- 2.29. The "next process is your customer" refers to:
- "Do it right" for the next operation
 - Desire for better cooperation among departments
 - Providing "zero defects" for the next process
 - The importance of process efficiency

Solution: Dr. Kaoru Ishikawa originated the concept "next operation as customer" while working with a steel mill in 1950 in Japan. He was attempting to remove sectionalism and promote cooperation between departments.

Answer b is correct.

Reference: *CQE Primer*, Section II - 9.

- 2.30. In the preparation of a project, efforts should be made to identify and involve various parties affected by the planned changes. These other parties are known as:
- Process owners
 - Champions
 - Team leaders
 - Stakeholders

Solution: The champion and team leader are participants in the team. The process owner is required to be in the communications chain. Any party that may be affected by the results can be described as a stakeholder. This includes the process owner.

Answer d is correct.

Reference: *CQE Primer*, Section II - 35.

- 2.31. A disadvantage of using Gantt charts includes which of the following:
- They are more complex than CPM charts
 - They do not show interdependencies of activities
 - Most project managers prefer PERT charts over Gantt charts
 - Slack times cannot be indicated

Solution: Answer **a** is false. Gantt charts are generally easier to construct than PERT and CPM charts. Answer **c** might be true for complex projects, but this preference is not a disadvantage. Answer **d** is somewhat true. Slack time for an individual activity can be easily shown. What makes this item questionable is, since interdependencies of activities cannot be shown, the slack time for the individual activity may be adversely impacted by other activities. Answer **d** is not considered a disadvantage in the context of this question. Answer **b** is certainly a disadvantage.

Answer b is correct.

Reference: *CQE Primer*, Section II - 43/50.

SECTION II

MANAGEMENT & LEADERSHIP -- TEST QUESTIONS

2.32. No one likes complaints, but they can be good for a company. Why?

- a. They state the customer's needs
- b. They provide a second chance to improve
- c. They eliminate the need for inspection
- d. They can be ignored

Solution: There can be good news coming from a complaint. Ignoring the complaint, answer **d**, is definitely a bad choice. It is bad news if the customer does our inspection for us (answer **c**). The customer's needs should have been defined before product shipment (answer **a**). A complaint is a second chance for a company to improve their product or service.

Answer b is correct.

Reference: *CQE Primer*, Section II - 84/86.

2.33. Acceptable corporate quality goals are normally derived from:

- a. The quality department
- b. Identified competitive benchmarks
- c. Top management objectives
- d. The quality council

Solution: Top management objectives should be translated into corporate quality goals whenever possible. The quality department and quality council may have some input.

Answer c is correct.

Reference: *CQE Primer*, Section II - 26 and 30/32.

2.34. What association does the expression "house of quality" normally make?

- a. Our entire organization is quality minded
- b. Full quality functional deployment
- c. The organization listens to the voice of the customer
- d. Prompt service and product quality

Solution: Quality functional deployment provides a graphical method to express the relationship between the customers' wants and the design hows. This matrix has the appearance of a house.

Answer b is correct.

Reference: *CQE Primer*, Section II - 88/90.

SECTION II

MANAGEMENT & LEADERSHIP -- TEST QUESTIONS

2.35. The concept most closely associated with lean production is:

- a. Better quality
- b. Faster production
- c. Flexible production
- d. Elimination of waste

Solution: All answer choices have merit. A good lean implementation will result in better quality, and faster and more flexible production. However, the central concept in lean production is the elimination of waste.

Answer d is correct.

Reference: *CQE Primer*, Section II - 14/15.

2.36. How would an organization reduce their vulnerability to the lost of a critical material supplier?

- a. Have a dual source supplier available
- b. Have an abundant safety stock on hand
- c. Rapidly look for a substitute material
- d. Develop a materials allocation list

Solution: The best approach is to have another supplier available for a critical raw material.

Answer a is correct.

Reference: *CQE Primer*, Section II - 99/100.

2.37. The management approach most supportive of personnel effectiveness, is which of the following?

- a. Incorporate as many of the current motivational techniques as possible
- b. Enforce the philosophy that people are the only asset which can be developed
- c. Ensure that company objectives take precedent over individual objectives
- d. Make sure that employees leave work each day feeling good about themselves

Solution: Answers a is a weak choice. Answer c could well make people less effective. Answer d is a warm, fuzzy statement that does not necessarily ensure personnel effectiveness.

Answer b is correct.

Reference: *CQE Primer*, Section II - 57/60.

SECTION II

MANAGEMENT & LEADERSHIP -- TEST QUESTIONS

- 2.38. As a leader of a quality improvement project, which of the following is the most important consideration?
- Build team commitment and confidence
 - Minimize the impact of opinions outside the group
 - Reduce the opportunities for discussion
 - Encourage team members to defend their positions

Solution: Answers **c** and **d** are counterproductive actions. Answer **b** may or may not be an advisable consideration. Answer **a** is very important.

Answer a is correct.

Reference: *CQE Primer*, Section II - 63 and 66/68.

- 2.39. Which of the following quality leaders is associated with the definition of quality as "fitness for use?"
- Joseph M. Juran
 - Philip B. Crosby
 - W. Edwards Deming
 - Armand V. Feigenbaum

Solution: Philip Crosby defines quality as "conformance to requirement." Deming and Feigenbaum had longer quality definitions. Dr. Juran defines quality as "fitness for use."

Answer a is correct.

Reference: *CQE Primer*, Section II - 4/12 (partial coverage).

- 2.40. Which luminary is generally recognized as being the creator of the control chart?
- Deming
 - Shewhart
 - Harry
 - Ishikawa

Solution: The honor belongs to Dr. Walter Shewhart. In fact, some quality professionals still refer to them as Shewhart control charts.

Answer b is correct

Reference: *CQE Primer*, Section II - 4 and 11.