



# THE QUALITY ENGINEER PRIMER

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## CQE Solutions Question Contents

	<u>Primer Section</u>	Questions			
		%	Exam	Solutions	CD
II.	Management & Leadership	11.2%	18	45	112
III.	Quality Systems	10%	16	40	100
IV.	Product, Process, & Service Design	14.4%	23	58	144
V.	Product & Process Control	8%	13	32	80
VI.	Testing & Measurement	7.6%	12	30	76
VII.	Continuous Improvement	16.9%	27	68	169
VIII.	Quantitative Methods	7.5%	12	30	75
IX.	Statistical Tools	7%	11	28	70
X.	Statistical Applications	8%	13	32	80
XI.	Risk Management	9.4%	15	37	94
	<b>Total</b>	<b>100%</b>	<b>160</b>	<b>400</b>	<b>1000</b>

### Comparison B/T CQE Primer & ASQ BOK

Primer	II	III	IV	V	VI	VII	VIII	IX	X	XI
ASQ BOK	I A → I	II A → F	III A → E	IV A → C	IV D → F	V A → F	VI A → C	VI F & G	VI D,E,H	VII A → C





I. CERTIFICATION OVERVIEW

## Professionalizing Quality Education

**I KNOW OF NO MORE ENCOURAGING  
FACT THAN THE UNQUESTIONABLE  
ABILITY OF MAN TO ELEVATE HIS LIFE  
BY A CONSCIOUS ENDEAVOR.**

**HENRY DAVID THOREAU**



## I. CERTIFICATION OVERVIEW

### **Preface**

**This text is designed to be a Primer for those interested in taking the certification examination offered by the American Society for Quality. Practice test questions are provided in a Solutions Text, which is sold separately and contains 400 practice questions. A Practice Exam CD/DVD is sold separately, which contains 1,000 practice questions. Test questions and answers cannot be used during an ASQ certification examination.**



## I. CERTIFICATION OVERVIEW

# Certified Quality Engineer Exam

### Objective

To provide recognized quality engineer fundamental training and to prepare persons interested in taking the CQE examination.

### Certification

Certification is the independently verified prescribed level of knowledge as defined through a combination of experience, education and examination.

### The Certified Quality Engineer

Is a professional who can carry out in a responsible manner proven techniques which make up the body of knowledge recognized by those who are experts in quality technology.



## I. CERTIFICATION OVERVIEW

# CQE Exam (Continued)

### Eligibility

CQE participants must register with ASQ headquarters. Eligibility entails a combination of eight years work experience and/or higher education. Three years of this requirement must be in a decision making position.

### Cost

The national test fee is determined by ASQ and is detailed in the CQE brochure.

### Location

ASQ Certification exams are administered at Prometric Test Centers. There are over 8,000 Prometric test sites throughout the world.

### Duration

The written test lasts 5 hours and will begin at an individually scheduled exam site and time. The Prometric exam lasts 5.5 hours.



I. CERTIFICATION OVERVIEW

## CQE Exam (Continued)

### Other Details

Can be obtained by calling ASQ headquarters at (800) 248-1946 or (414) 272-8575. They will send a CQE brochure free of charge.

### Bibliography Sources

The reference sources recommended in the ASQ brochure are excellent. Four favorites are:

(1) *Juran's Quality Handbook*

(2) *Western Electric's Statistical Quality Control Handbook*

(3) *Gryna's Quality Planning and Analysis*

(4) *Grant & Leavenworth's Statistical Quality Control*

ANSI/ASQ Z1.4 should be reviewed and taken into the exam. Other sources are listed in the Primer.



## I. CERTIFICATION OVERVIEW

# CQE Exam (Continued)

### Study

The author recommends that this Primer be taught by a qualified CQE using classroom lecture, study assignments and a review of test questions. Training may vary from 27 hours to 48 hours. Additionally, the student should spend about 90 hours of individual study on the Primer, test questions, and other bibliography sources. If the student studies unaided, a minimum of 130 hours of preparation is suggested.

## Exam Hints

The CQE applicant should take into the exam:

- A calculator (capable of determining standard deviation and natural log). Verify acceptable calculators with ASQ or Prometric.
- The *CQE Primer* (without test questions)
- A recommended quality reference
- ANSI/ASQ Z1.4
- A good statistical reference (one the student knows)
- Scratch paper
- Loose leaf paper will not be allowed into the exam



I. CERTIFICATION OVERVIEW

## **Exam Hints (Continued)**

**Arrive early, get a good seat, organize your materials.**

**Answer all questions. There's no penalty for wrong answers.**

**Save difficult questions until the end.**

**Use good time management. If there are 160 questions on a written 5 hour exam, one must average 1.88 minutes/question. If there are 175 questions on a 5.5 hour Prometric exam, one must also average 1.88 minutes/question.**

**Some tests begin with difficult questions, avoid panic.**

**Bring any exam errata to your proctor's attention.**

**Mentally note weakness categories in case you have to take the exam again. ASQ will report only flagrant areas.**



**I. CERTIFICATION OVERVIEW**

## **ASQ CQE Body of Knowledge**

### **I. Management and Leadership (18 Questions)**

#### **A. Quality Philosophies and Foundations**

- 1. Evolution of Quality (Understand)**
- 2. Continuous improvement tools (Understand)**

#### **B. The Quality Management System (QMS)**

- 1. Strategic planning (Apply)**
- 2. Deployment techniques**
  - a. Benchmarking (Remember)**
  - b. Stakeholder(s) (Apply)**
  - c. Performance (Apply)**
  - d. Project management (Apply)**
- 3. Quality information system (QIS) (Understand)**

#### **C. ASQ Code of Ethics for Professional Conduct (Evaluate)**

#### **D. Leadership Principles and Techniques (Analyze)**





**I. CERTIFICATION OVERVIEW**

**ASQ CQE Body of Knowledge**

**E. Facilitation Principles and Techniques**

- 1. Roles and responsibilities (Understand)
- 2. Facilitation tools (Apply)

**F. Communication Skills (Analyze)**

**G. Customer Relations (Analyze)**

**H. Supplier Management**

- 1. Techniques (Apply)
- 2. Improvement (Analyze)
- 3. Risk (Understand)

**I. Barriers to Quality Improvement (Analyze)**

**II. The Quality System (16 Questions)**

**A. Elements of the Quality System**

- 1. Basic elements (Evaluate)
- 2. Design (Analyze)



**I. CERTIFICATION OVERVIEW**

**ASQ CQE BOK (Continued)**

**B. Documentation of the Quality System**

1. Document components (Understand)
2. Document control (Evaluate)

**C. Quality Standards and Other Guidelines (Apply)**

**D. Quality Audits**

1. Types of audits (Apply)
2. Roles and responsibilities (Understand)
3. Audit planning and implementation (Apply)
4. Audit reporting and follow-up (Apply)

**E. Cost of Quality (COQ) (Analyze)**

**F. Quality Training (Apply)**

**III. Product, Process, and Service Design (23 Questions)**

**A. Classification of Characteristics (Evaluate)**



**I. CERTIFICATION OVERVIEW**

**ASQ CQE BOK (Continued)**

**B. Design Inputs and Review**

1. Inputs (Analyze)
2. Review (Apply)

**C. Technical Drawings and Specifications (Evaluate)**

**D. Verification and Validation (Evaluate)**

**E. Reliability and Maintainability**

1. Predictive and preventive maintenance tools (Apply)
2. Reliability and maintainability indices (Analyze)
3. Reliability models (Apply)
4. Reliability / Safety / Hazard Assessment Tools (Evaluate)

**IV. Product and Process Control (25 Questions)**

**A. Methods (Analyze)**



I. CERTIFICATION OVERVIEW

## ASQ CQE BOK (Continued)

### B. Material Control

1. Material identification, status, and traceability (Analyze)
2. Material segregation (Evaluate)
3. Material classification (Evaluate)
4. Material review board (MRB) (Evaluate)

### C. Acceptance Sampling

1. Sampling concepts (Analyze)
2. Sampling standards and plans (Analyze)
3. Sample integrity (Apply)

### D. Measurement and Test

1. Measurement tools (Analyze)
2. Destructive and nondestructive tests (Apply)

### E. Metrology (Analyze)

### F. Measurement System Analysis (MSA) (Evaluate)



**I. CERTIFICATION OVERVIEW**

**ASQ CQE BOK (Continued)**

**V. Continuous Improvement (27 Questions)**

**A. Quality Control Tools (Analyze)**

1. Flowcharts
2. Pareto charts
3. Cause and effect diagrams
4. Control charts
5. Check sheets
6. Scatter diagrams
7. Histograms

**B. Quality Management and Planning Tools(Analyze)**

1. Affinity diagrams and force field analysis
2. Tree diagrams
3. Process decision program charts (PDPC)
4. Matrix diagrams
5. Interrelationship digraphs
6. Prioritization matrices
7. Activity network diagrams



**I. CERTIFICATION OVERVIEW**

**ASQ CQE BOK (Continued)**

**C. Continuous Improvement Methodologies (Evaluate)**

1. Total quality management (TQM)
2. Kaizen
3. Plan-do-check-act (PDCA)
4. Six sigma
5. Theory of constraints (TOC)

**D. Lean tools (Evaluate)**

1. 5S
2. Value-stream mapping
3. Kanban
4. Visual control
5. Waste (Muda)
6. Standardized work
7. Takt time
8. Single minute exchange of die (SMED)



**I. CERTIFICATION OVERVIEW**

**ASQ CQE BOK (Continued)**

**E. Corrective Action (Evaluate)**

**F. Preventive Action (Evaluate)**

**VI. Quantitative Methods and Tools (36 Questions)**

**A. Collecting and Summarizing Data**

1. Types of data (Apply)
2. Measurement scales (Understand)
3. Data collection methods (Apply)
4. Data accuracy and integrity (Apply)
5. Descriptive statistics (Evaluate)
6. Graphical methods for depicting relationships (Analyze)
7. Graphical methods for depicting distributions (Analyze)

**B. Quantitative Concepts**

1. Terminology (Analyze)
2. Drawing statistical conclusions (Evaluate)
3. Probability terms and concepts (Understand)



## I. CERTIFICATION OVERVIEW

# ASQ CQE BOK (Continued)

## C. Probability Distributions

1. Continuous distributions (Analyze)
2. Discrete distributions (Analyze)

## D. Statistical Decision-Making

1. Point estimates and confidence intervals (Evaluate)
2. Hypothesis testing (Evaluate)
3. Paired-comparison tests (Apply)
4. Goodness-of-fit tests (Understand)
5. Analysis of variance (ANOVA) (Analyze)
6. Contingency tables (Apply)

## E. Relationships Between Variables

1. Linear regression (Analyze)
2. Simple linear correlation (Analyze)
3. Time-series analysis (Apply)





I. CERTIFICATION OVERVIEW

## ASQ CQE BOK (Continued)

### F. Statistical Process Control (SPC)

1. Objectives and benefits (Understand)
2. Common and special causes (Analyze)
3. Selection of variable (Analyze)
4. Rational subgrouping (Apply)
5. Control charts (Analyze)
6. Control chart analysis (Evaluate)
7. Pre-control charts (Understand)
8. Short-run SPC (Understand)

### G. Process and Performance Capability

1. Process capability studies (Analyze)
2. Performance vs. specifications (Analyze)
3. Process capability indices (Evaluate)
4. Process performance indices (Evaluate)

### H. Design and Analysis of Experiments

1. Terminology (Understand)
2. Planning and organizing experiments (Analyze)
3. Design principles (Apply)
4. One-factor experiments (Analyze)
5. Full-factorial experiments (Analyze)
6. Two-level fractional factorial experiments (Analyze)



## I. CERTIFICATION OVERVIEW

### VII. Risk Management (15 Questions)

#### A. Risk Oversight

- |                           |              |
|---------------------------|--------------|
| 1. Planning and oversight | (Understand) |
| 2. Metrics                | (Apply)      |
| 3. Mitigation planning    | (Evaluate)   |

#### B. Risk Assessment (Analyze)

#### C. Risk Control

- |                                     |            |
|-------------------------------------|------------|
| 1. Identification and documentation | (Analyze)  |
| 2. Auditing and Testing             | (Evaluate) |



## I. CERTIFICATION OVERVIEW

# Levels of Cognition

### Remember

Recall or recognize terms, definitions, facts, ideas, materials, patterns, sequences, methods, principles, etc.

### Understand

Read and understand descriptions, communications, reports, tables, diagrams, directions, regulations, etc.

### Apply

Know when and how to use ideas, procedures, methods, formulas, principles, theories, etc.

### Analyze

Break down information into its constituent parts and recognize their relationship to one another and how they are organized

### Evaluate

Make judgments about the value of proposed ideas, solutions, etc., by comparing the proposal to specific criteria or standards.

### Create

Put parts or elements together in such a way as to reveal a pattern or structure not clearly there before; identify which data or information from a complex set is appropriate to examine further.



**II. MANAGEMENT & LEADERSHIP**

**I.**

**IF YOU DON'T KNOW WHERE  
YOU ARE GOING, YOU WILL  
PROBABLY END UP  
SOMEWHERE ELSE.**

**LAURENCE J. PETER**