

## Certified Quality Process Analyst Exam

### Objective

To provide recognized quality process analyst fundamental training and to prepare persons interested in taking the CQPA examination.

### Certification

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

### The Certified Quality Process Analyst

Is a paraprofessional who, in support of and under the direction of quality engineers or supervisors, analyses and solves quality problems and is involved in quality improvement projects. A CQPA may be a recent graduate or someone with work experience who wants to demonstrate his or her knowledge of quality tools and processes.

### Eligibility

CQPA participants must register with ASQ headquarters. Eligibility entails two years of work experience or an associate degree as a minimum.

The national test fee is determined by ASQ and is detailed in a CQPA Brochure

### and the ASQ website. Location

Exams are given at Prometric Test Centre's at dates and times scheduled by the test taker within the given exam dates, and at selected conferences and other locations.

### Duration

A written test lasts 4 hours and begins at an advised time. A Prometric exam lasts 4.5 hours. These multiple-choice exams are open book.

### Study

The authors recommend that this Primer be taught by a qualified CQPA using classroom lecture, study assignments, and a review of test questions. Training may vary from 20 - 40 hours. Additionally, the student should spend about 60 hours of individual study on the Primer, test questions, and other bibliography sources. If the student studies unaided, a minimum of 80 hours of preparation is suggested.

### Exam Hints

The CQPA applicant should take into the exam:

- Several No. 2 pencils
- A calculator (with basic scientific functions)
- The CQPA Primer (without test questions)

- Another recommended quality reference
- Scratch paper

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

Answer all questions. There is no penalty for wrong answers.

Use good time management. If there are 100 questions on a 4-hour written exam, one must average 2.4 minutes/question. If there are 110 questions on a 4.5-hour Prometric exam, one must average approximately 2.45 minutes/question.

Some tests begin with difficult questions, don't panic. Save difficult questions until the end.

Keep test question numbers and the answer sheet numbers aligned. Bring any exam errata to your proctor's attention.

Make a mental note of areas of weakness in the event you must retake the exam. ASQ will report only flagrant areas.

## ASQ CQPA Body of Knowledge

Included in this body of knowledge (BOK) are explanations (subtext) and cognitive levels for each topic or subtopic in the test. These details will be used by the Examination Development Committee as guidelines for writing test questions and are designed to help candidates prepare for the exam by identifying specific content within each topic that can be tested. Except where specified, the subtext is not intended to limit the subject or be all-inclusive of what might be covered in an exam but is intended to clarify how topics are related to the role of the CQPA.

### I. Quality Concepts and Tools (22 Questions)

#### A. Quality Concepts

##### 1. Quality planning (Understand)

Define a quality plan, describe its purpose for the organization as a whole, and know who has responsibility for contributing to its development.

##### 2. Quality standards, requirements, and specifications (Understand)

Define and distinguish between national or international standards, customer requirements, and product or process specifications.

##### 3. Cost of quality (COQ) (Understand)

Define and describe the four-basic cost of quality categories: prevention, appraisal, internal failure, external failure.

##### 4. Quality documentation (Understand)

Identify and describe common elements of various document control systems, including configuration management, and describe the relationship between quality manuals, procedures, and work instructions.

## B. Quality Audits

### 1. Audit types (Understand)

Define and distinguish between basic audit types, including internal and external audits, product, process, and systems audits, and first-, second-, and third-party audits.

### 2. Audit components (Understand)

Identify various elements of the audit process, including audit purpose and scope, the standard to audit against, audit planning (preparation) and performance, opening and closing meetings, final audit report, and verification of corrective actions.

### 3. Audit roles and responsibilities (Understand)

Identify and describe the roles and responsibilities of key audit participants: lead auditor, audit team member, client, and auditee.

## C. Quality Tools (Evaluate)

Select, construct, apply, and interpret the seven basic quality tools: 1) cause and effect diagrams, 2) flowcharts (process maps), 3) check sheets, 4) Pareto charts, 5) scatter diagrams, 6) control charts, and 7) histograms.

## D. Team Dynamics

### 1. Types of teams (analyse)

Distinguish between various types of teams: process improvement teams, workgroups/work cells, self-managed teams, temporary/ad hoc project teams, and cross-functional teams.

### 2. Team-building techniques (Apply)

Identify various elements in team-building such as inviting team members to share information about themselves during the initial meeting, using ice-breaker activities to enhance team membership, and developing a common vision and agreement on team objectives.

### 3. Team roles and responsibilities (Understand)

Describe the roles and responsibilities of various team stakeholders: sponsor, champion, facilitator, team leader, team member.

### 4. Team conflict (Understand)

Identify common group challenges, including members with hidden agendas, intentional distractions, and other disruptive behaviours. Describe ways of resolving these issues and keeping team members on task.

### 5. Training and evaluation (Understand)

Describe various elements of training, including linking the training to organizational goals, identifying training needs, adapting information to meet adult learning styles, and using coaching

and peer training methods. Use various tools to measure the effectiveness of the training, including post-training feedback, end-of-course tests, and individual and department performance improvements measures.

E. Professional Conduct and Ethics (Apply)

Identify and apply behaviours that are aligned with the ASQ Code of Ethics.

II. **Problem Solving and Improvement (22 Questions)**

A. Continuous Improvement Models (Apply)

Define and explain elements of Plan-Do-Check-Act (PDCA), kaizen, and incremental and breakthrough improvement.

B. Process Improvement Techniques

1. Six Sigma (Understand)

Identify key six sigma concepts and tools, including green belt and black belt roles and responsibilities, project types and processes used, and six sigma DMAIC phases, design, measure, analyse, improve, and sustaining control.

2. Lean (Apply)

Identify and apply lean tools and processes, including set-up reduction (SUR), pull (including just-in-time (JIT) and KanBan), 5S, continuous flow manufacturing (CFM), value stream, poka-yoke, and total preventive/predictive maintenance (TPM) to reduce waste in areas of cost, inventory, labor, and distance.

3. Benchmarking (Understand)

Define and describe this technique and how it can be used to support best practices.

C. Project and Quality Management Tools

1. Basic quality management tools (Apply)

Select and apply affinity diagrams, tree diagrams, process decision program charts, matrix diagrams, interrelationship digraphs, prioritization matrices, and activity network diagrams.

2. Project management tools (analyse)

Select and interpret scheduling and monitoring tools such as Gantt charts, program evaluation and review technique (PERT), and critical path method (CPM).

D. Taguchi Loss Function (Understand)

Identify and describe Taguchi concepts: signal-to-noise ratio, controllable and uncontrollable factors, and robustness.

### III. Data Analysis (33 Questions)

#### A. Terms and Definitions

##### 1. Basic statistics (Apply)

Define, calculate, and interpret measures of central tendency (mean, median, mode) and measures of dispersion (standard deviation, range, variance).

##### 2. Basic distributions (Understand)

Define and explain frequency distributions (normal, binomial, Poisson, and Weibull) and the characteristics of skewed and bimodal distributions.

##### 3. Probability concepts (Apply)

Describe and use probability concepts: independent and mutually exclusive events, combinations, permutations, additive and multiplicative rules, conditional probability. Perform basic probability calculations.

##### 4. Reliability concepts (Remember)

Define basic reliability concepts: mean time to failure (MTTF), mean time between failures (MTBF), mean time between maintenance actions (MTBMA), mean time to repair (MTTR). Identify elements of the bathtub curve model and how they are used to predict failure patterns.

##### 5. Measurement scales (Apply)

Define and use nominal, ordinal, interval, and ratio measurement scales.

#### B. Data Types and Data Collection Methods (Apply)

Identify, define, and classify in terms of continuous (variables) and discrete (attributes) data. Determine when it is appropriate to convert attributes data to variables measures. Distinguish between collecting data and generating useful information, and describe the planning and implementation steps that will support meaningful output.

#### C. Sampling

##### 1. Characteristics (Understand)

Identify and define sampling characteristics such as lot size, sample size, acceptance number, and operating characteristic (OC) curve.

##### 2. Sampling methods (Understand)

Define and distinguish between various sampling methods such as random, sequential, stratified, fixed sampling, and attributes and variables sampling.

##### 3. Rational subgroups (Understand)

Define and describe the principles of rational subgroups.

D. Measurement System Analysis (Understand)

Define and distinguish between accuracy, precision, repeatability and reproducibility (gauge R&R) studies, bias, and linearity.

E. Statistical Process Control (SPC)

1. Control limits and specification limits (Understand)

Identify and distinguish between control limits and specification limits.

2. Control charts for attributes data (analyse)

Identify, interpret, and select control charts (p, np, c, and u) for data that must be plotted in discrete units (dollars, hours, go/no-go and yes-no choices) and that measure only the presence or absence of a characteristic.

3. Control charts for variables data (Apply)

Identify, interpret, and select control charts (X-R, X-S, and X-R) for data that must be plotted on a continuous and infinite scale (distance, pressure, temperature).

4. Process capability measures (analyse)

Describe the conditions that must be met in order to measure capability. Calculate CP, CPK, PP' and Ppk measures and interpret their results.

5. Common and special cause variation (analyse)

Interpret various control chart patterns (runs, hugging, trends) to determine process control, and use SPC rules to distinguish between common cause and special cause variation.

6. Data graphics (Understand)

Identify the advantages and limitations of presenting data graphically instead of numerically.

F. Advanced Statistical Analysis

1. Regression and correlation models (Apply)

Describe how these models are used for estimation and prediction.

2. Hypothesis testing (analyse)

Calculate confidence intervals using t tests and the z statistic, and determine whether the result is significant.

3. Design of experiments (DOE) (Remember)

Define basic DOE terms: blocking, randomization, treatment, error, response, and factors.

4. Analysis of variance (ANOVA) (Understand)

Define key elements of ANOVAs and how the results can be used.

## IV. Customer-Supplier Relations (15 Questions)

### A. Internal and External Customers and Suppliers (Apply)

Define and distinguish between internal and external customers and suppliers. Describe their impact on products, services, and processes, and identify strategies for working with them to make improvements.

B. Customer Satisfaction Methods (Understand) Describe the different types of tools used to gather customer feedback: surveys, complaint forms, warranty analysis. Define key elements of quality function deployment (QFD).

C. Product and Process Approval Systems (Understand) Describe how validation and qualification methods, including beta testing, first-article, in-process, and final inspection, are used to approve new or updated products, processes, and services.

### D. Supplier Management (Understand)

Define and describe key supplier performance measures, including quality, price, delivery, and level of service, and commonly used metrics: defect rates, functional performance, timeliness, responsiveness, and technical support.

### E. Material Identification, Status, and Traceability (Apply)

Describe the importance of identifying material by lot, batch, source, and conformance status. Describe key requirements for preserving the identity of a product and its origin. Use various methods to segregate nonconforming material and process it according to procedures.

## V. Corrective and Preventive Action {CAPA} {8 Questions}

### A. Corrective Action (Apply)

Identify and use key elements of the corrective action process: identify the problem, contain the problem, determine the causes of the problem, propose solutions to eliminate them or prevent their recurrence, verify that the solutions are implemented, and confirm their effectiveness.

### B. Preventive Action (Apply)

Identify and use key elements of a preventive action process: track data trends and patterns, use failure mode and effects analysis (FMEA), review product and process monitoring reports, and study the process to identify potential failures, defects, or deficiencies; improve the process by developing error- or mistake-proofing methods and procedural changes, and verify that the changes are made and confirm their effectiveness.

## Six Levels of Cognition based on Bloom's Taxonomy {Revised}

In addition to content specifics, the subtext for each topic in this BOK also indicates the intended complexity level of the test questions for that topic. These levels are based on "Levels of Cognition" (from Bloom's Taxonomy- Revised, 2001) and are presented below in rank order, from least complex to most complex.

### 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.

### analyse

Break down information into its constituent parts and recognize their relationship to one another and how they are organized; identify sublevel factors or salient data from a complex scenario.

### 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 or from which supported conclusions can be drawn.