

## Certified Quality Engineer (CQE) Body of Knowledge Map 2015 – 2022

The Certified Quality Engineer (CQE) Body of Knowledge (BoK) has been updated to ensure that the most current state of Quality Engineering practice is being tested in the examination. If you would like more information on how a BoK is updated, see a description of the process on <https://asq.org/cert/exam-development>.

Part of the updating process is to conduct a job analysis survey to determine whether the topics in the 2015 BoK are still relevant to the job role of Quality Engineers and to identify any new topics that have emerged since that BoK was developed. The results of the CQE job analysis survey showed that most of the topics that were in the 2015 BoK are still relevant to the job roles of Quality Engineers. As indicated in Table 2, two 2015 BoK subtopics were combined into one subtopic (IV.A.6 & IV.A.7 into IV.A.7), eight new subtopics were added (III.B.2, VI.A.5, VII.A.1, VII.A.2, VII.B.1, VII.C.2, VII.C.3, VII.C.4), and several subtexts were revised.

The 2022 Certified Quality Engineer Body of Knowledge (CQE BoK) will be introduced at the **October 2022** administration. Both BoKs will be available online until December 1, 2022, at which time the 2015 BoK will be removed.

### **General comments about ASQ Body of Knowledge updates**

When the Body of Knowledge (BoK) is updated for an ASQ exam, most of the material covered in the BoK remains the same. There are very few programs that change significantly over a 5-7 year period. One of the points that we make to all the exam development committees is that ASQ Certification Exams need to reflect “the state of practice” not “the state of the art.” This helps to keep the programs grounded in what people currently do, rather than being driven by the latest hot-topic improvement idea or trend. Typically, the biggest change in any updated BoK is in how the content is organized. When a new BoK is announced and posted on the ASQ website, we also include a “BoK Map” that highlights the changes between the two Bodies of Knowledge: old and new. The BoK map also clearly identifies any new content that has been added to the exam, as well as any content that has been removed from the exam.

With regard to exam preparation materials, you should be able to use any of the reference books that are currently listed on the reference list for the exam program. These are the source materials that the exam development committees use to write questions and verify answers.

## Certified Quality Engineer (CQE) Body of Knowledge Map 2015 – 2022

### Specific comments about the 2022 CQE Body of Knowledge updates

The CQE Body of Knowledge mostly stayed the same with the 2022 update. The primary change was the additional topics included in the Risk Management section. There were changes to nine cognitive levels.

Table 1 below portrays the change in items allocated to each section of the Body of Knowledge. The section names have all remained the same. Table 2 presents the 2022 CQE BoK and maps the topics to the 2015 BoK. Details on changes between the two can be found in Table 2. Table 3 presents the 2015 CQE BoK and maps the topics to the 2022 BoK.

**Table 1. CQE BoK Section Item Allocation**

<b>BoK Section</b>	<b>2015 BoK</b>	<b>2022 BoK</b>	<b>Difference</b>
I. Management and Leadership	18	17	-1
II. The Quality System	16	18	+2
III. Product, Process, and Service Design	23	21	-2
IV. Product and Process Control	25	23	-2
V. Continuous Improvement	27	26	-1
VI. Quantitative Methods and Tools	36	34	-2
VII. Risk Management	15	21	+6

## Certified Quality Engineer (CQE) Body of Knowledge Map 2015 – 2022

**Table 2. 2022 CQE BoK mapped to 2015 CQE BoK**

2015 BoK	2022 BOK Details	Notes
<b>Section</b>	<b>I. Management and Leadership (17 Questions)</b>	<b>Number of questions changed from 18 to 17</b>
<b>I.A</b>	<b>A. Quality Philosophies and Foundations</b>	
	Describe continuous improvement tools, including lean, six sigma, statistical process control (SPC), and total quality management. Understand how modern quality has evolved from quality control through statistical process control (SPC) to total quality management and leadership principles (including Deming’s 14 points). (Understand)	Removed theory of constraints.
<b>I.B</b>	<b>B. The Quality Management System (QMS)</b>	
<b>I.B.1</b>	<b>1. Strategic planning</b> Identify and define top management’s responsibility for the QMS, including establishing policies and objectives, setting organization-wide goals, and supporting quality initiatives. (Apply)	
<b>I.B.2</b>	<b>2. Deployment techniques</b> Define, describe, and use various deployment tools in support of the QMS such as: a. Benchmarking Define the concept of benchmarking and why it may be used. (Remember) b. Stakeholder Define, describe and use stakeholder identification and analysis. (Apply) c. Performance Define, describe and use performance measurement tools such as cost-benefit. (Apply) d. Project management Define, describe and use project management tools, including Gantt charts, and the responsible, accountable, consulted and informed matrix (RACI). (Apply)	Added cost-benefit analysis to Performance. Removed PERT charts, critical path method (CPM) and replaced resources allocation with responsible, accountable, consulted and informed matrix (RACI) in Project management.

## Certified Quality Engineer (CQE) Body of Knowledge Map 2015 – 2022

2015 BoK	2022 BOK Details	Notes
I.B.3	<b>3. Quality information system (QIS)</b> Identify and describe the basic elements of a QIS, including who will contribute data, the kind of data to be managed, who will have access to the data, the level of flexibility for future information needs, and data analysis. (Understand)	
I.C	<b>C. ASQ Code of Ethics for Professional Conduct</b> Determine appropriate behavior in situations requiring ethical decisions. (Evaluate)	
I.D	<b>D. Leadership Principles and Techniques</b> Analyze various principles and techniques for developing and organizing teams and leading quality initiatives. (Analyze)	
I.E	<b>E. Facilitation Principles and Techniques</b>	
I.E.1	<b>1. Roles and responsibilities</b> Describe the facilitator's roles and responsibilities on a team. (Understand)	
I.E.2	<b>2. Facilitation tools</b> Apply various tools used with teams, including brainstorming, nominal group technique, conflict resolution, and force-field analysis. (Apply)	
I.F	<b>F. Communication Skills</b> Identify and distinguish between specific communication methods that are used for delivering information and messages in a variety of situations across all levels of the organization. (Analyze)	Revised subtext.
I.G	<b>G. Customer Relations</b> Define, apply, and analyze the results of customer relation tools such as customer satisfaction surveys. (Analyze)	Removed quality function deployment (QFD).
I.H	<b>H. Supplier Management</b>	
I.H.1	<b>1. Techniques</b> Apply various supplier management techniques, including supplier qualification, certification, and evaluation. (Apply)	
I.H.2	<b>2. Improvement</b> Analyze supplier ratings and performance improvement results. (Analyze)	

## Certified Quality Engineer (CQE) Body of Knowledge Map 2015 – 2022

2015 BoK	2022 BOK Details	Notes
I.H.3	<b>3. Risk</b> Understand business continuity, resiliency, and contingency planning. (Understand)	
I.I	<b>I. Barriers to Quality Improvement</b> Identify barriers to quality improvement, analyze their causes and impact, and implement methods for improvement. (Analyze)	
	<b>II. The Quality System (18 Questions)</b>	<b>Number of questions changed from 16 to 18</b>
II.A	<b>A. Elements of the Quality System</b>	
II.A.1	<b>1. Basic elements</b> Interpret the basic elements of a quality system, including planning, control, and improvement, from product and process design through quality cost systems and audit programs. (Evaluate)	
II.A.2	<b>2. Design</b> Analyze the design and alignment of interrelated processes to the strategic plan and core processes. (Analyze)	
II.B	<b>B. Documentation of the Quality System</b>	
II.B.1	<b>1. Document components</b> Identify and describe quality system documentation components, including quality policies and procedures to support the system. (Understand)	
II.B.2	<b>2. Document control</b> Evaluate configuration management, maintenance, and document control to manage work instructions and quality records. (Evaluate)	
II.C	<b>C. Quality Standards and Other Guidelines</b> Apply national and international standards and other requirements and guidelines, including the Malcolm Baldrige National Quality Award (MBNQA), and describe key points of the ISO 9000 series of standards. [Note: Industry-specific standards will not be tested.] (Apply)	
II.D	<b>D. Quality Audits</b>	

## Certified Quality Engineer (CQE) Body of Knowledge Map 2015 – 2022

2015 BoK	2022 BOK Details	Notes
II.D.1	<b>1. Types of audits</b> Describe and classify the various types of quality audits such as product, process, management (system), registration (certification), compliance (regulatory), first, second, and third party. (Apply)	Revised subtext.
II.D.2	<b>2. Roles and responsibilities in audits</b> Identify and define roles and responsibilities for audit participants such as audit team (leader and members), client, and auditee. (Understand)	
II.D.3	<b>3. Audit planning and implementation</b> Describe and apply the stages of a quality audit, from audit planning, including assessing risks through conducting an audit. (Apply)	Added assessing risks to subtext.
II.D.4	<b>4. Audit reporting and follow-up</b> Apply the steps of audit reporting and follow up, including the need to verify corrective action. (Apply)	
II.E	<b>E. Cost of Quality (COQ)</b> Identify and apply COQ concepts, including cost categorization, data collection, reporting, and interpreting results. (Analyze)	
II.F	<b>F. Quality Training</b> Identify and apply key elements of a training program, including conducting a needs analysis, preparing curricula and materials, and determining the program's effectiveness. (Apply)	Revised subtext.
	<b>III. Product, Process, and Service Design (21 Questions)</b>	<b>Number of questions changed from 23 to 21</b>
III.A	<b>A. Classification of Quality Characteristics</b> Define, interpret, assess, and classify quality characteristics for new and existing products, processes, and services. [Note: The classification of defects is covered in IV.B.3.] (Evaluate)	Revision to subtext, added 'assess'.
III.B	<b>B. Design Inputs, Techniques, and Review</b>	Added 'Techniques' to topic title.
III.B.1	<b>1. Inputs</b> Classify design inputs such as customer needs, regulatory requirements, critical to quality, and risk assessment into robust design using techniques such as failure mode and effects analysis (FMEA). (Analyze)	Added critical to quality (CTQ) to subtext and moved quality function deployment (QFD), Design for X (DFX), and Design for Six Sigma (DFSS) to new topic area III.B.2.

## Certified Quality Engineer (CQE) Body of Knowledge Map 2015 – 2022

2015 BoK	2022 BOK Details	Notes
New	<b>2. Techniques</b> Apply Design for X (DFX), Design for Six Sigma (DFSS), and requirements traceability. (Apply)	New subtopic
III.B.3	<b>3. Review</b> Identify and apply common elements of the design review process, including roles and responsibilities of participants. (Apply)	
III.C	<b>C. Technical Drawings and Specifications</b> Interpret specification requirements in relation to product and process characteristics and technical drawings, including characteristics such as views, title blocks, dimensioning and tolerancing, and geometric dimensioning and tolerance symbols GD&T. (Evaluate)	Revised subtext.
III.D	<b>D. Verification and Validation</b> Interpret the results of evaluations and tests used to verify and validate the design of products, processes and services, such as installation qualification (IQ), operational qualification (OQ), and process qualification (PQ). (Evaluate)	
III.E	<b>E. Reliability and Maintainability</b>	
III.E.1	<b>1. Predictive and preventive maintenance tools</b> Describe and apply the tools and techniques used to maintain and improve process and product reliability. (Apply)	
III.E.2	<b>2. Reliability and maintainability indices</b> Apply indices such as mean time to failure (MTTF), mean time between failure (MTBF), mean time to repair (MTTR), availability, and failure rate. (Apply)	Revised subtext and decreased cognitive level to Apply.
III.E.3	<b>3. Reliability models</b> Classify and apply the basic elements of reliability models such as exponential, Weibull, and bathtub curve. (Apply)	Revised subtext.
III.E.4	<b>4. Reliability / Safety / Hazard Assessment Tools</b> Define, construct, and interpret the results of failure modes and effects analysis (FMEA), design FMEA (dFMEA), process FMEA (pFMEA), use	Added dFMEA, pFMEA, uFMEA, changed fault tree analysis to hazard analysis, and decreased cognitive level to Analyze.

## Certified Quality Engineer (CQE) Body of Knowledge Map 2015 – 2022

2015 BoK	2022 BOK Details	Notes
	FMEA (uFMEA), failure mode, effects, and criticality analysis (FMECA), and hazard analysis. (Analyze)	
	<b>IV. Product and Process Control (23 Questions)</b>	<b>Number of questions changed from 25 to 23</b>
<b>IV.A</b>	<b>A. Methods</b> Implement product and process control methods such as control plan development, critical control point identification, and work instruction development and validation. (Analyze)	
<b>IV.B</b>	<b>B. Material Control</b>	
<b>IV.B.1</b>	<b>1. Material identification, status, and traceability</b> Define and distinguish between these concepts, and describe methods for applying them in various situations. (Analyze)	
<b>VI.B.2</b>	<b>2. Material segregation</b> Describe material segregation and its importance, and evaluate appropriate methods for applying it in various situations. (Evaluate)	
<b>VI.B.3</b>	<b>3. Material classification</b> Assess and classify product and process defects and non-conformities. (Evaluate)	Revised subtext.
<b>IV.B.4</b>	<b>4. Material review board (MRB)</b> Describe the purpose and function of an MRB, and evaluate nonconforming product or material to make a disposition decision in various situations. (Evaluate)	
<b>IV.C</b>	<b>C. Acceptance Sampling</b>	
<b>IV.C.1</b>	<b>1. Sampling concepts</b> Apply the concepts of producer and consumer risk and related terms, including operating characteristic (OC) curves, acceptable quality limit (AQL), and lot tolerance percent defective (LTPD). (Apply)	Revised subtext to remove average outgoing quality (AOQ) and average outgoing quality (AOLQL) and decreased cognitive level to Apply.
<b>IV.C.2</b>	<b>2. Sampling standards and plans</b> Identify, interpret, and apply ANSI/ASQ Z1.4 and Z1.9 standards for attributes and variables sampling. (Analyze)	Revised subtext to remove single, double, multiple, sequential and continuous sampling and Dodge-Romig sampling tables.
<b>IV.C.3</b>	<b>3. Sample integrity</b> Identify and apply techniques for establishing and maintaining sample integrity. (Apply)	

## Certified Quality Engineer (CQE) Body of Knowledge Map 2015 – 2022

2015 BoK	2022 BOK Details	Notes
<b>IV.D</b>	<b>D. Measurement and Test</b>	
<b>IV.D.1</b>	<b>1. Measurement tools</b> Select and describe appropriate uses of inspection tools such as gage blocks, calipers, micrometers, optical comparators and coordinate measuring machines (CMM). (Analyze)	Revised subtext to add coordinate measuring machines (CMM).
<b>IV.D.2</b>	<b>2. Destructive and nondestructive tests</b> Identify when destructive and nondestructive measurement test methods should be used and apply the methods appropriately. (Apply)	
<b>IV.E</b>	<b>E. Metrology</b> Apply metrology techniques such as calibration, traceability to calibration standards, measurement error and its sources, and control and maintenance of measurement standards and devices. (Apply)	Decreased cognitive level to Apply.
<b>IV.F</b>	<b>F. Measurement System Analysis (MSA)</b> Calculate, analyze, and interpret repeatability and reproducibility (Gage R&R) studies, measurement correlation, capability, bias, linearity, precision, stability and accuracy, using MSA quantitative and graphical methods. (Evaluate)	Revised subtext.
	<b>V. Continuous Improvement (26 Questions)</b>	<b>Number of questions changed from 27 to 26</b>
<b>V.A</b>	<b>A. Quality Control Tools</b> Select, construct, apply, and interpret the following quality control tools: 1. Flowcharts 2. Pareto charts 3. Cause and effect diagrams 4. Control charts 5. Check sheets 6. Scatter diagrams 7. Histograms (Analyze)	
<b>V.B</b>	<b>B. Quality Management and Planning Tools</b> Select, construct, apply, and interpret the following quality management and planning tools:	

## Certified Quality Engineer (CQE) Body of Knowledge Map 2015 – 2022

2015 BoK	2022 BOK Details	Notes
	<ol style="list-style-type: none"> <li>1. Affinity diagrams and force field analysis</li> <li>2. Tree diagrams</li> <li>3. Process decision program charts (PDPC)</li> <li>4. Matrix diagrams</li> <li>5. Interrelationship digraphs</li> <li>6. Prioritization matrices</li> <li>7. Activity network diagrams (Analyze)</li> </ol>	
<b>V.C</b>	<p><b>C. Continuous Improvement Methodologies</b> Define, describe, and apply the following continuous improvement methodologies:</p> <ol style="list-style-type: none"> <li>1. Total quality management (TQM)</li> <li>2. Kaizen</li> <li>3. Plan-do-check-act (PDCA)</li> <li>4. Six sigma (Analyze)</li> </ol>	Removed Theory of Constraints (TOC) and decreased cognitive level to Analyze.
<b>V.D</b>	<p><b>D. Lean tools</b> Define, describe, and apply the following lean tools:</p> <ol style="list-style-type: none"> <li>1. 5S</li> <li>2. Value-stream mapping</li> <li>3. Kanban</li> <li>4. Visual control</li> <li>5. 8 Wastes</li> <li>6. Standardized work</li> <li>7. Takt time</li> <li>8. Single minute exchange of die (SMED)</li> <li>9. Overall equipment effectiveness (OEE) (Evaluate)</li> </ol>	Revised Waste (Muda) to 8 Wastes and added OEE.
<b>V.E</b>	<p><b>E. Corrective Action</b> Identify, describe, and apply elements of the corrective action process, including problem identification, failure analysis, root cause analysis, 5 whys, problem correction, recurrence control, and verification of effectiveness. (Evaluate)</p>	Revised subtext to add 5 whys.

## Certified Quality Engineer (CQE) Body of Knowledge Map 2015 – 2022

2015 BoK	2022 BOK Details	Notes
V.F	<b>F. Preventive Action</b> Identify, describe and apply various preventive action tools such as error-proofing/poka-yoke, robust design and analyze their effectiveness. (Evaluate)	
	<b>VI. Quantitative Methods and Tools (34 Questions)</b>	<b>Number of questions changed from 36 to 34</b>
VI.A	<b>A. Collecting and Summarizing Data</b>	
VI.A.1	<b>1. Types of data</b> Define, classify, and compare discrete (attributes) and continuous (variables) data. (Apply)	
VI.A.2	<b>2. Measurement scales</b> Define and describe nominal, ordinal, interval, and ratio scales. (Understand)	
VI.A.3	<b>3. Data collection methods</b> Describe various methods for collecting data, including tally or check sheets, data coding, automatic gaging, data automation, database integration, and identify the strengths and weaknesses of the methods. (Apply)	Revised subtext to include data automation and data integration.
VI.A.4	<b>4. Data accuracy and integrity</b> Identify factors that can influence data accuracy such as source/resource issues, flexibility, versatility, inconsistency, inappropriate interpretation of data values, and redundancy to ensure data accuracy and integrity. (Apply)	Revised subtext.
New	<b>5. Data visualization techniques</b> Apply and interpret data visualization techniques using dashboards, and select the appropriate metrics for dashboards. (Apply)	
VI.A.5	<b>6. Descriptive statistics</b> Describe, calculate, and interpret measures of central tendency and dispersion, apply the central limit theorem, and construct and interpret frequency distributions, including simple, categorical, grouped, ungrouped, and cumulative. (Evaluate)	Revised subtext.
VI.A.6 & VI.A.7	<b>7. Graphical methods for depicting relationships</b>	Revised subtext.

## Certified Quality Engineer (CQE) Body of Knowledge Map 2015 – 2022

2015 BoK	2022 BOK Details	Notes
	Apply and interpret diagrams and charts such as probability plots for normal and other distributions. [Note: Scatter diagrams are covered in V.A.] (Analyze)	
<b>VI.B</b>	<b>B. Quantitative Concepts</b>	
<b>VI.B.1</b>	<b>1. Terminology</b> Define and apply quantitative terms, including population, parameter, sample, statistic, random sampling, and expected value. (Analyze)	
<b>VI.B.2</b>	<b>2. Drawing statistical conclusions</b> Distinguish between numeric and analytical studies. Assess the validity of statistical conclusions by analyzing the assumptions used and the robustness of the technique used. (Evaluate)	
<b>VI.B.3</b>	<b>3. Probability terms and concepts</b> Describe concepts such as independence, mutual exclusivity, multiplication rules, complementary probability, and joint occurrence of events. (Apply)	Revised subtext and increased the cognitive level to Apply.
<b>VI.C</b>	<b>C. Probability Distributions</b>	
<b>VI.C.1</b>	<b>1. Continuous distributions</b> Define and distinguish between these distributions such as normal, uniform, exponential, lognormal, Weibull, Student's t, and F. (Analyze)	Revised subtext to remove bivariate normal and chi square.
<b>VI.C.2</b>	<b>2. Discrete distributions</b> Define and distinguish between these distributions such as binomial, Poisson, hypergeometric, and multinomial. (Analyze)	
<b>VI.D</b>	<b>D. Statistical Decision-Making</b>	
<b>VI.D.1</b>	<b>1. Point estimates and confidence intervals</b> Define, describe, and assess the bias of estimators. Calculate and interpret standard error, tolerance intervals, and confidence intervals. (Evaluate)	
<b>VI.D.2</b>	<b>2. Hypothesis testing</b> Define, interpret, and apply hypothesis tests for means, variances, and proportions. Apply and interpret the concepts of significance level,	

## Certified Quality Engineer (CQE) Body of Knowledge Map 2015 – 2022

2015 BoK	2022 BOK Details	Notes
	power, type I and type II errors. Define and distinguish between statistical and practical significance. (Evaluate)	
VI.D.3	<b>3. Paired-comparison tests</b> Define and use paired-comparison (parametric) hypothesis tests, and interpret the results. (Apply)	
VI.D.4	<b>4. Goodness-of-fit tests</b> Define and use chi square and other goodness-of-fit tests, and understand the results. (Apply)	Revised subtext and increased cognitive level to Apply.
VI.D.5	<b>5. Analysis of variance (ANOVA)</b> Define, use, and explain ANOVAs and interpret the results. (Analyze)	Revised subtext.
VI.D.6	<b>6. Contingency tables</b> Define and use contingency tables to evaluate statistical significance. (Apply)	
<b>VI.E</b>	<b>E. Relationships Between Variables</b>	
VI.E.1	<b>1. Linear regression</b> Calculate simple linear regression models. Illustrate hypothesis tests for regression statistics. Use linear regression models for estimation and prediction. (Apply)	Revised subtext and decreased cognitive level to Apply.
VI.E.2	<b>2. Simple linear correlation</b> Calculate the correlation coefficient and its confidence interval, and illustrate a hypothesis for correlation statistics. (Apply)	Revised subtext and decreased cognitive level to Apply.
VI.E.3	<b>3. Time-series analysis</b> Define, describe, and use time-series analysis, including moving average to identify trends and seasonal or cyclical variation. (Apply)	
<b>VI.F</b>	<b>F. Statistical Process Control (SPC)</b>	
VI.F.1	<b>1. Objectives and benefits</b> Identify and explain the objectives and benefits of SPC. (Understand)	
VI.F.2	<b>2. Common and special causes</b> Describe, identify, and distinguish between these types of causes. (Analyze)	

## Certified Quality Engineer (CQE) Body of Knowledge Map 2015 – 2022

2015 BoK	2022 BOK Details	Notes
VI.F.3	<b>3. Selection of variable</b> Identify and select characteristics for monitoring by control chart. (Analyze)	
VI.F.4	<b>4. Rational subgrouping</b> Define and apply the principles of rational subgrouping. (Apply)	
VI.F.5	<b>5. Control charts</b> Identify, select, construct, and use various control charts, including $\bar{X}-R$ , $\bar{X}-s$ , individuals and moving range (ImR or XmR), moving average and moving range (MamR), p, np, c, and u. (Analyze)	
VI.F.6	<b>6. Control chart analysis</b> Read and interpret control charts and use rules for determining statistical control. (Evaluate)	
VI.F.8	<b>7. Short-run SPC</b> Identify and define short-run SPC rules. (Understand)	
<b>VI.G</b>	<b>G. Process and Performance Capability</b>	
VI.G.1	<b>1. Process capability studies</b> Define, describe, calculate, and use process capability studies, including identifying characteristics, specifications and tolerances, developing sampling plans for such studies, and establishing statistical control. (Analyze)	
VI.G.2	<b>2. Process performance vs. specifications</b> Distinguish between natural process limits and specification limits, and calculate percent defective, defects per million opportunities (DPMO), and parts per million (PPM). (Analyze)	
VI.G.3	<b>3. Process capability indices</b> Define, select, and calculate $C_p$ , $C_{pk}$ , $C_{pm}$ , and $C_{tr}$ , and evaluate process capability. (Evaluate)	
VI.G.4	<b>4. Process performance indices</b> Define, select, and calculate $P_p$ and $P_{pk}$ , and evaluate process performance. (Evaluate)	
<b>VI.H</b>	<b>H. Design and Analysis of Experiments</b>	

## Certified Quality Engineer (CQE) Body of Knowledge Map 2015 – 2022

2015 BoK	2022 BOK Details	Notes
VI.H.1	<b>1. Terminology</b> Define terms such as dependent and independent variables, factors, levels, response, treatment, error, and replication. (Understand)	
VI.H.2	<b>2. Planning and organizing experiments</b> Identify the basic elements of designed experiments, including determining the experiment objective, selecting factors, responses, and measurement methods, and choosing the appropriate design. (Analyze)	
VI.H.3	<b>3. Design principles</b> Define and apply the principles of power and sample size, balance, replication, order, efficiency, randomization, blocking, interaction, and confounding. (Apply)	
VI.H.5	<b>4. Full-factorial experiments</b> Construct full-factorial designs and use computational and graphical methods to analyze the significance of results. (Analyze)	
VI.H.6	<b>5. Two-level fractional factorial experiments</b> Construct two-level fractional factorial designs and apply computational and graphical methods to analyze the significance of results. (Analyze)	
	<b>VII. Risk Management (21 Questions)</b>	<b>Number of questions changed from 15 to 21</b>
VII.A	<b>A. Risk Fundamentals</b>	Revised topic title
New	<b>1. Risk terminology</b> Define, describe, and apply risk terminology such as risk, risk management, severity, occurrence, detection, and risk-based thinking. (Analyze)	New subtopic
New	<b>2. Types of risk management</b> Understand and apply various types of enterprise (strategic, software, business, regulatory, medical, audit), operational (supplier, supply chain, safety, project, manufacturing, operations, service, quality system), and product (design, process, use, safety) risk management. (Apply)	New subtopic
VII.B	<b>B. Risk Planning and Assessment</b>	Revised topic title

## Certified Quality Engineer (CQE) Body of Knowledge Map 2015 – 2022

2015 BoK	2022 BOK Details	Notes
New	<b>1. Risk management plan</b> Analyze and interpret a risk management plan and its components (objectives, risk criteria, stakeholder identification, and team member roles/responsibilities) to identify and prioritize risks. (Analyze)	New subtopic
VII.B	<b>2. Risk assessment</b> Apply categorization methods and evaluation tools to assess risk such as failure mode and effects analysis. Identify and apply evaluation metrics including the use of risk matrices, risk priority numbers, and acceptability criteria. (Analyze)	Revised subtext
VII.C	<b>C. Risk Treatment, Control, and Monitoring</b>	Revised topic title
VII.C.1	<b>1. Identification and documentation</b> Identify risks, gaps, and controls and document with tools such as a risk register. (Analyze)	Revised subtext
New	<b>2. Risk management system evaluation</b> Apply auditing techniques and testing of controls to evaluate a risk management system. (Apply)	New subtopic
New	<b>3. Risk treatment strategies</b> Understand and apply risk treatment strategies, such as avoid, mitigate, transfer, and accept. (Analyze)	New subtopic
New	<b>4. Risk monitoring</b> Apply risk monitoring techniques such as, complaint tracking, trending, and post-market surveillance. (Analyze)	New subtopic
New	<b>5. Mitigation planning</b> Apply and interpret risk mitigation plan. (Analyze)	New subtopic

## Certified Quality Engineer (CQE) Body of Knowledge Map 2015 – 2022

**Table 3. 2015 CQE BoK mapped to 2022 CQE BoK**

2015 BoK		2022 BoK		Notes
2015 BoK	Label	Code	Label	
I.A	Quality Philosophies and Foundations	I.A	Quality Philosophies and Foundations	
I.B.1	Strategic planning	I.B.1	Strategic planning	
I.B.2	Deployment techniques	I.B.2	Deployment techniques	
I.B.3	Quality information system (QIS)	I.B.3	Quality information system (QIS)	
I.C	ASQ Code of Ethics for Professional Conduct	I.C	ASQ Code of Ethics for Professional Conduct	
I.D	Leadership Principles and Techniques	I.D	Leadership Principles and Techniques	
I.E.1	Roles and responsibilities	I.E.1	Roles and responsibilities	
I.E.2	Facilitation tools	I.E.2	Facilitation tools	
I.F	Communication Skills	I.F	Communication Skills	
I.G	Customer Relations	I.G	Customer Relations	
I.H.1	Techniques	I.H.1	Techniques	
I.H.2	Improvement	I.H.2	Improvement	
I.H.3	Risk	I.H.3	Risk	
II	Barriers to Quality Improvement	II	Barriers to Quality Improvement	
II.A.1	Basic elements	II.A.1	Basic elements	
II.A.2	Design	II.A.2	Design	
II.B.1	Document components	II.B.1	Document components	
II.B.2	Document control	II.B.2	Document control	
II.C	Quality Standards and Other Guidelines	II.C	Quality Standards and Other Guidelines	
II.D.1	Types of audits	II.D.1	Types of audits	
II.D.2	Roles and responsibilities in audits	II.D.2	Roles and responsibilities in audits	

## Certified Quality Engineer (CQE) Body of Knowledge Map 2015 – 2022

2015 BoK		2022 BoK		Notes
2015 BoK	Label	Code	Label	
II.D.3	Audit planning and implementation	II.D.3	Audit planning and implementation	
II.D.4	Audit reporting and follow-up	II.D.4	Audit reporting and follow-up	
II.E	Cost of Quality (COQ)	II.E	Cost of Quality (COQ)	
II.F	Quality Training	II.F	Quality Training	
III.A	Classification of Quality Characteristics	III.A	Classification of Quality Characteristics	
III.B.1	Inputs	III.B.1	Inputs	
		III.B.2	Techniques	New
III.B.2	Review	III.B.3	Review	
III.C	Technical Drawings and Specifications	III.C	Technical Drawings and Specifications	
III.D	Verification and Validation	III.D	Verification and Validation	
III.E.1	Predictive and preventive maintenance tools	III.E.1	Predictive and preventive maintenance tools	
III.E.2	Reliability and maintainability indices	III.E.2	Reliability and maintainability indices	
III.E.3	Reliability models	III.E.3	Reliability models	
III.E.4	Reliability/Safety/Hazard Assessment Tools	III.E.4	Reliability/Safety/Hazard Assessment Tools	
IV.A	Methods	IV.A	Methods	
IV.B.1	Material identification, status, and traceability	IV.B.1	Material identification, status, and traceability	
IV.B.2	Material segregation	IV.B.2	Material segregation	
IV.B.3	Material classification	IV.B.3	Material classification	
IV.B.4	Material review board (MRB)	IV.B.4	Material review board (MRB)	
IV.C.1	Sampling concepts	IV.C.1	Sampling concepts	
IV.C.2	Sampling standards and plans	IV.C.2	Sampling standards and plans	
IV.C.3	Sample integrity	IV.C.3	Sample integrity	

## Certified Quality Engineer (CQE) Body of Knowledge Map 2015 – 2022

2015 BoK		2022 BoK		Notes
2015 BoK	Label	Code	Label	
IV.D.1	Measurement tools	IV.D.1	Measurement tools	
IV.D.2	Destructive and nondestructive tests	IV.D.2	Destructive and nondestructive tests	
IV.E	Metrology	IV.E	Metrology	
IV.F	Measurement Systems Analysis (MSA)	IV.F	Measurement Systems Analysis (MSA)	
V.A	Quality Control Tools	V.A	Quality Control Tools	
V.B	Quality Management and Planning Tools	V.B	Quality Management and Planning Tools	
V.C	Continuous Improvement Methodologies	V.C	Continuous Improvement Methodologies	
V.D	Lean tools	V.D	Lean tools	
V.E	Corrective Action	V.E	Corrective Action	
V.F	Preventive Action	V.F	Preventive Action	
VI.A.1	Types of data	VI.A.1	Types of data	
VI.A.2	Measurement scales	VI.A.2	Measurement scales	
VI.A.3	Data collection methods	VI.A.3	Data collection methods	
VI.A.4	Data accuracy and integrity	VI.A.4	Data accuracy and integrity	
VI.A.5	Descriptive statistics	VI.A.6	Descriptive statistics	
VI.A.6	Graphical methods for depicting relationships			Removed graphical methods for depicting relationships
VI.A.6	Data visualization techniques		New	
VI.A.7	Graphical methods for depicting distributions	VI.A.7	Graphical methods for depicting distributions	
VI.B.1	Terminology	VI.B.1	Terminology	
VI.B.2	Drawing statistical conclusions	VI.B.2	Drawing statistical conclusions	
VI.B.3	Probability terms and concepts	VI.B.3	Probability terms and concepts	
VI.C.1	Continuous distributions	VI.C.1	Continuous distributions	
VI.C.2	Discrete distributions	VI.C.2	Discrete distributions	

## Certified Quality Engineer (CQE) Body of Knowledge Map 2015 – 2022

2015 BoK		2022 BoK		Notes
2015 BoK	Label	Code	Label	
VI.D.1	Point estimates and confidence intervals	VI.D.1	Point estimates and confidence intervals	
VI.D.2	Hypothesis testing	VI.D.2	Hypothesis testing	
VI.D.3	Paired-comparison tests	VI.D.3	Paired-comparison tests	
VI.D.4	Goodness-of-fit tests	VI.D.4	Goodness-of-fit tests	
VI.D.5	Analysis of variance (ANOVA)	VI.D.5	Analysis of variance (ANOVA)	
VI.D.6	Contingency tables	VI.D.6	Contingency tables	
VI.E.1	Linear regression	VI.E.1	Linear regression	
VI.E.2	Simple linear correlation	VI.E.2	Simple linear correlation	
VI.E.3	Time-series analysis	VI.E.3	Time-series analysis	
VI.F.1	Objective and benefits	VI.F.1	Objective and benefits	
VI.F.2	Common special causes	VI.F.2	Common special causes	
VI.F.3	Selection of variable	VI.F.3	Selection of variable	
VI.F.4	Rational subgrouping	VI.F.4	Rational subgrouping	
VI.F.5	Control charts	VI.F.5	Control charts	
VI.F.6	Control chart analysis	VI.F.6	Control chart analysis	
VI.F.7	Pre-control charts			Removed pre-control charts
VI.F.8	Short-run SPC	VI.F.7	Short-run SPC	
VI.G.1	Process capability studies	VI.G.1	Process capability studies	
VI.G.2	Process performance vs. specifications	VI.G.2	Process performance vs. specifications	
VI.G.3	Process capability indices	VI.G.3	Process capability indices	
VI.G.4	Process performance indices	VI.G.4	Process performance indices	
VI.H.1	Terminology	VI.H.1	Terminology	
VI.H.2	Planning and organizing experiments	VI.H.2	Planning and organizing experiments	
VI.H.3	Design principles	VI.H.3	Design principles	
VI.H.4	One-factor experiments			Removed one-factor experiments

## Certified Quality Engineer (CQE) Body of Knowledge Map 2015 – 2022

2015 BoK		2022 BoK		Notes
2015 BoK	Label	Code	Label	
VI.H.5	Full-factorial experiments	VI.H.4	Full-factorial experiments	
VI.H.6	Two-level fractional factorial experiments	VI.H.5	Two-level fractional factorial experiments	
VII.A.1	Planning and oversight	VII.A.1	Risk terminology	New
VII.A.2	Metrics	VII.A.2	Types of risk management	New
VII.A.3	Mitigation planning	VII.C.5	Mitigation planning	
VII.B	Risk Assessment	VII.B.1	Risk management plan	New
		VII.B.2	Risk assessment	Moved from VII.B
VII.C.1	Identification and documentation	VII.C.1	Identification and documentation	
VII.C.2	Auditing and testing	VII.C.2	Risk management system evaluation	New
		VII.C.3	Risk treatment strategies	New
		VII.C.4	Risk monitoring	New