

CERTIFIED QUALITY INSPECTOR (CQI) BODY OF KNOWLEDGE MAP 2018

The Certified Quality Inspector Body of Knowledge (BoK) has been updated to ensure that the most current state of practice is being tested in the CQI examination. If you want to read more about how a BoK is updated, see the ASQ [Certification Handbook](#) on the www.asq.org website.

Part of the updating process includes conducting a job analysis survey to determine whether the topics in the previous BoK are still relevant to the current job role and to identify any new topics that have emerged since that previous BoK was developed. The results of the CQI job analysis survey show that almost all of the topics that were in the 2012 BoK are still relevant to the job roles of Quality Inspectors. The tables below show the key changes between the two BoKs.

The 2018 Certified Quality Inspector Body of Knowledge (CQI BoK) will be introduced at the **November 2018** administration. Both BoKs will be available online until January 1, 2019, at which time the 2012 BoK will be removed.

General comments about ASQ Body of Knowledge updates

When the Body of Knowledge (BoK) is updated for an ASQ exam, the majority of the material covered in the BoK remains the same. There are very few programs that change dramatically over a 5-7 year period. One of the points that we make to all of the exam development committees is that ASQ Certification Examinations 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 this “BoK Map” to highlight the changes between the two bodies of knowledge: old and new. The BoK map 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 bibliography for the exam program. See CQI references on the www.asq.org website. These are the source materials that the exam development committees use to write questions and verify answers.

Specific comments about the 2018 CQI Body of Knowledge updates

The CQI Body of Knowledge stayed mostly the same with the 2018 update. There were no changes to content in I. Technical Mathematics. In area II. Metrology, elements and examples were added to various sub-sections and area II.E.5 was renamed. In area III. Inspection and Test, a number of elements were added to various sub-sections. In area IV. Quality Assurance, a few elements were added throughout the section. The 2012 BoK IV.G. Technical reports topic was removed entirely from the new BoK. Alongside the addition and removal of content, there was one topic that received an increase in level of cognition.

Table 1 below portrays the change in items allocated to each section of the Body of Knowledge. Table 2 on Page 3 presents the 2018 CQI BoK and maps the topics to the 2012 BoK.

Table 1. BoK Section Item Allocation

BoK Sections	2012 BoK	2018 BoK	Change
I. Technical Mathematics	20	19	-1
II. Metrology	30	26	-4
III. Inspection and Test	30	33	+3
IV. Quality Assurance	20	22	+2

2012 BoK	2018 BOK Details	New Elements in 2018 BoK
I	I. TECHNICAL MATHEMATICS (19 Questions)	-1 questions (was 20)
I.A.	A. Basic Shop Math Solve basic shop math problems using addition, subtraction, multiplication, division of fractions and decimals, squares and square roots. Use methods such as truncating and rounding to obtain significant digits for positive and negative numbers. (Apply)	
I.B.	B. Basic Algebra Solve or simplify first-degree and single-variable equations. (Apply)	
I.C.	C. Basic Geometry Calculate general parameters such as area, circumference, perimeter, and volume for basic geometric shapes. Calculate complementary and supplementary angles. (Apply)	

I.D.	D. Basic Trigonometry Solve for angles and lengths using algebraic and trigonometric functions such as sine, cosine, tangent and the Pythagorean Theorem. (Apply)	
I.E.	E. Measurement Systems Convert units within and between English and metric measurement systems (SI) such as inch to microinch, liter to quart, and meter to millimeter. (Apply)	
I.F.	F. Numeric Conversions Use various numbering methods such as scientific notation, decimals, and fractions, and convert values between these systems. (Apply)	

2012 BOK	2018 BOK Details	New Elements in 2018 BOK
II	II. METROLOGY (26 Questions)	-4 questions (was 30)
II.A.	A. Common Gauges and Measurement Instruments <ol style="list-style-type: none"> 1. Variable gauges Identify and use variable gauges, including micrometers, calipers, dial indicators, and Coordinate Measuring Machines (CMM). Understand linear scales, such as steel rule, and gage blocks. Use borescopes, thermometers, and temperature probes. (Apply) 2. Attribute gauges Identify and use attribute gauges, including thread plugs, progressive rings, flush pins, pin gauges, and radius gauges. (Apply) 3. Transfer gauges Identify and use transfer gauges, including small-hole gauges, telescoping gauges, and spring calipers. (Apply) 4. Measurement scales Describe and distinguish between dial, digital, and vernier scales. (Remember) 	<p>2A1 added examples of linear scales and added borescopes, thermometers and temperature probes.</p> <p>2A2 added pin gauges.</p> <p>2A3 added telescoping gauges.</p>

II.B.	B. Special Gauges and Applications Identify and describe the following basic tools and components. (Remember) <ol style="list-style-type: none"> 1. Electronic gauging tools: oscilloscopes, multimeters, and pyrometers. 2. Automatic gauging components: machine vision, ultrasonic, X-ray, and laser. 3. Pneumatic gauging components: air columns, probes, and rings. 4. Force gauging: torque wrenches. 5. Environment instrumentation: hygrometer, chart recorder, and data logger. 	2B4 new topic, also test at application level in 3D2 2B5 new topic
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2012 BOK	2018 BOK Details	New Elements in 2018 BOK
II.C.	C. Gauge Selection, Handling, and Use <ol style="list-style-type: none"> 1. 10:1 rule Understand the 10:1 rule: inspection measurements should require better than the tolerance of a dimension by a factor of 10, and calibration standards should require better than inspection measurements by a factor of 10. (Understand) 2. Gauge selection Select gauges according to the feature or characteristic to be measured, the applicable tolerance and the accuracy, environment, and the resolution and capability of the test instrument. Determine whether the type of measurement should be direct, differential, or transfer. (Apply) 3. Gauge handling, preservation, and storage Identify and apply various methods of cleaning, handling, and storing gauges. (Apply) 4. Gauge correlation Identify and apply methods for establishing the correlation between measurement instruments such as gauge-to-gauge or manual-to-automated process. (Apply) 	2C1 new section 2C2 added “environment”.
II.D.	D. Surface Plate Tools and Techniques <ol style="list-style-type: none"> 1. Surface plate equipment Select and use height gauges, V-blocks, and other indicators, to measure various types of features. Understand the care, cleaning, calibration, and lapping of a surface plate. (Apply) 2. Angle measurement instruments Identify and use protractors, sine bars, and angle blocks. (Apply) 	2D1 added understanding the care, cleaning, calibration and lapping of a surface plate.

2012 BOK	2018 BOK Details	New Elements in 2018 BOK
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<p>II.E.</p>	<p>E. Specialized Inspection Equipment</p> <ol style="list-style-type: none"> 1. Measuring mass Describe and apply weights, balances, and scales. (Apply) 2. Measuring finish Describe and apply profilometers, and fingernail comparators. (Apply) 3. Measuring shape and profile Describe and apply mechanical comparators, roundness testers, precision spindles, and profile tracers. (Apply) 4. Optical equipment Describe and apply optical comparators, optical flats, and microscopes. (Apply) 5. Software-based measurement systems Define and describe the use of digital cameras, in-line optical sensors, vision inspection systems (white light/blue light), articulating arms, laser trackers, contracers and other digital systems for product inspection. Recognize software limitations with regard to locating functional datums, target points and areas, hole positions and the basic operation of the x, y, and z axes. (Understand) 6. Measuring Inclination Define and describe the measurement of the slope or slant of various equipment (mechanical/laser). (Understand) 	<p>2E5 renamed section and expanded subtext 2E5 cognitive level increased from remember to understand 2E6 new section</p>
<p>II.F.</p>	<p>F. Calibration</p> <ol style="list-style-type: none"> 1. Calibration systems Describe the principles and purpose of a calibration system, including the importance of establishing calibration intervals and uncertainty. Identify and use basic tracking and identification methods such as logs, stickers, radio frequency identification (RFID), barcodes, and other identification codes to control calibration equipment. (Apply) 2. Calibration standards and equipment traceability Describe the hierarchy of standards, from working standards through international standards and the documentation process of a measurement device traceable to the international standards. (Remember) 3. Gauge calibration environment Describe the effects that environmental conditions have on the calibration process, such as temperature, humidity, vibration and cleanliness of the gauge. (Apply) 4. Out-of-Calibration effects Describe the effects that out-of-calibration instruments can have on product acceptance and the actions to take in response to this situation. (Apply) 	<p>2F1 added uncertainty, and added examples of identification methods. 2F2 renamed topic, added old 2F3 Equipment traceability to 2F2 2F3 reworded subtext, did not change content</p>

2012 BOK	2018 BOK Details	New Elements in 2018 BOK
II.G.	<p>G. Measurement System Analysis (MSA) Define and describe the following elements of MSA. (Remember)</p> <ol style="list-style-type: none"> 1. Bias 2. Stability 3. Precision 4. Accuracy 5. Linearity 6. Repeatability and reproducibility (R & R) studies 	2G added Precision

2012 BOK	2018 BOK Details	New Elements in 2018 BOK
III	III. INSPECTION AND TEST (33 Questions)	+3 questions (was 30)
III.A.	<p>A. Blueprints, Drawings, Geometric Dimensioning & Tolerancing (GD&T) and Model Based Definitions</p> <ol style="list-style-type: none"> 1. Blueprints, engineering drawings and model based definitions Define and interpret various sections of technical drawings: title block, tolerances, change or revision blocks including notes scale, and size details. (Apply) 2. Terminology and symbols Define and interpret drawing views and details for product specifications or other controlling documents. Define and use various terms and symbols from the ASME Y14.5M Standard. (Analyze) 3. Position and bonus tolerances Calculate position and bonus tolerances from various drawings (Analyze) 4. Part alignment and datum structure Determine part alignment and setup using the datum structure. (Analyze) 	3A and 3A1 Topic title expanded
III.B.	<p>B. Sampling</p> <p>Define and interpret the following terms related to sampling. (Apply)</p> <ol style="list-style-type: none"> 1. Acceptance quality limit (AQL) 2. Random sampling 3. Lot and sample size 4. Acceptance number 5. Sampling plans 	

III.C.	<p>C. Inspection Planning and Processes</p> <p>1. Inspection types Define and distinguish between inspection types, such as incoming material, first article (first-piece), in process, and final. (Apply)</p> <p>2. Inspection errors Identify potential inspection errors such as bias, fatigue, flinching, distraction, and poor time management. (Apply)</p> <p>3. Product traceability Identify methods to trace products and materials, such as age control, shelf life, first-in-first-out (FIFO), barcoding, date codes, lot and part numbering. (Apply)</p> <p>4. Identification of non-conforming material Describe various methods of identifying nonconforming material, such as tagging, labeling, and segregating. (Apply)</p>	<p>3C2 added poor time management 3C3 added, barcoding, date codes, lot and part numbering 3C6 added reinspect</p>
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2012 BOK	2018 BOK Details	New Elements in 2018 BOK
	<p>5. Levels of severity Define and describe levels of severity (critical, major, and minor) and apply them to product features and defects. (Apply)</p> <p>6. Disposition of nonconforming material Describe disposition methods including rework, reprocess, reinspect, scrap, and customer waiver, as determined by a material review board (MRB) or other authority. (Apply) reinspect, scrap, and customer waiver as determined by a material review board (MRB) or other authority. (Apply)</p>	
III.D.	<p>D. Testing methods Define and use the following methods in various situations. (Apply)</p> <p>1. Nondestructive testing: X-ray, eddy current, ultrasonic, dye penetrant, magnetic particle, optical, visual, and profile.</p> <p>2. Destructive testing: tensile, force testing, and drop test.</p> <p>3. Functionality testing: tension, torque, leak testing and compression.</p> <p>4. Hardness testing: Brinell, Rockwell, durometer, and micro-hardness scales</p>	<p>3D1 added optical, visual and profile</p>
III.E.	<p>E. Software for test equipment Identify and describe basic tools (safeguarding, functional checks, comparison of test results, identification of attributes and parameters) used to ensure that the software for test equipment adequately and correctly performs its intended functions. (Remember)</p>	

IV	IV. QUALITY ASSURANCE (22 Questions)	+2 Questions (was 20)
VI.A.	<p>A. Basic Statistics and Applications</p> <ol style="list-style-type: none"> 1. Measures of central tendency Calculate mean, median, and mode. (Apply) 2. Measures of dispersion Calculate range, standard deviation, and variance. (Apply) 3. Measures of proportion Calculate percentage and ratio measures for various data sets. (Apply) 4. Graphical displays Define, interpret, and use scatter diagrams, tally sheets, and bar charts to display data effectively in various situations. (Apply) 5. Normal distribution Define various characteristics of normal distribution: symmetry, bell curve, and central tendency. (Understand) 	

2012 BOK	2018 BOK Details	New Elements in 2018 BOK
VI.B.	<p>B. Statistical Process Control (SPC)</p> <ol style="list-style-type: none"> 1. Common and special cause variation Explain the difference between these causes of variation. Determine whether a process is in statistical control by analyzing data patterns (runs, trends, and hugging), and identify what actions should be taken in response. (Evaluate) 2. Control limits and specification limits Define, describe, and distinguish between these limits as used in SPC. (Apply) 3. Variables charts Identify characteristics and uses of $\bar{X} - R$ and $\bar{X} - s$ charts. (Apply) 4. Attributes charts Identify characteristics and uses of p, np, c, and u charts. (Apply) 5. Process capability analysis Define and distinguish between C_p, C_{pk}, P_p, and P_{pk} studies and identify their application to various types of data. (Understand) 	
VI.C.	<p>C. Quality Improvement</p> <ol style="list-style-type: none"> 1. Terms and concepts Define basic quality improvement concepts such as defect detection and prevention, the cost of poor quality, total quality management (TQM), and the importance of customer satisfaction. (Understand) 2. Products and processes Define and distinguish between products and processes. Describe the interrelationships of product design, materials used, manufacturing processes, and final output, and how individual steps in a process can affect the final product or the system as a whole. (Understand) 	
2012 BOK	2018 BOK Details	New Elements in 2018 BOK

VI.D.	D. Quality Audits 1. Types of audits Define and describe types of audits, including internal, external, system, product, and process. (Understand) 2. Audit process Define and describe various stages of the audit process (planning, performance, and closure), including audit scope and purpose, resources needed, audit schedule, opening meeting, interviewing, data gathering, document and record review, analysis of results, closing meeting, audit documentation (reporting), recordkeeping, and verification of corrective actions. (Understand) 3. Audit tools Define and describe the purpose of checklists, log sheets, sampling plans, record reviews, document reviews and forward- and backward-tracing. (Understand) 4. Communication tools and techniques Define and describe the use of graphs, charts, diagrams, and other aids for written and oral presentations, including interview techniques and listening skills. (Understand) 5. Corrective action requests (CARs) Describe how CARs from audits can support quality improvement. (Understand)	4D2 added reporting
VI.E.	E. Quality Tools and Techniques Define and use the following quality tools and techniques. (Apply) 1. Pareto charts 2. Cause and effect diagrams 3. Flowcharts 4. Control charts 5. Check sheets 6. Scatter diagrams 7. Histograms	
2012 BOK	2018 BOK Details	New Elements in 2018 BOK

<p>VI.F.</p>	<p>F. Problem-solving Tools and Continuous Improvement Techniques Describe and use the following tools and techniques in various situations. (Apply)</p> <ol style="list-style-type: none"> 1. Plan-do-check-act (PDCA) or Plan-do-study-act (PDSA) cycles 2. Lean tools for eliminating waste: 5S, error-proofing, value-stream mapping, and lean concepts: kaizen, flow, pull. 3. Six sigma phases: define, measure, analyze, improve, control (DMAIC) 4. Failure mode and effects analysis (FMEA) 5. 8D Methodology 6. 5 Whys 7. Fault Tree Analysis 	<p>4F added 5, 6 and 7</p>
<p>VI.G.</p>	<p>G. Resources</p> <ol style="list-style-type: none"> 1. Environmental and safety support Define and use various resources related to personal and environmental safety: safety data sheets (SDS), material data sheet (MSDS), and personal protective equipment (PPE). (Apply) 2. Reference documents Identify and use national and international standards (ISO, ANSI, ASTM, QS) and customer requirements as authorities that support processes and procedures used to assure quality products. (Apply) 3. Employees as resources Describe how employees can be empowered and the value they add to project teams or quality improvement teams. Describe typical team roles and responsibilities: facilitator, ground rules, project or team charter. Describe the four stages of team development: forming, storming, norming, performing. (Remember) 4. Quality Documentation Basic quality documentation including correct form/revision for the process (ISO9001, First Article Inspection Report, ISIR, PPAPs). Proper usage of policy, procedure, work instructions and forms, proper documentation practices such as document control, filling out forms completely, correcting misspellings, and initialing changes. (Apply) 	<p>Removed old 4G3 subtopic: technical reports</p> <p>4G1 revised subtext</p>