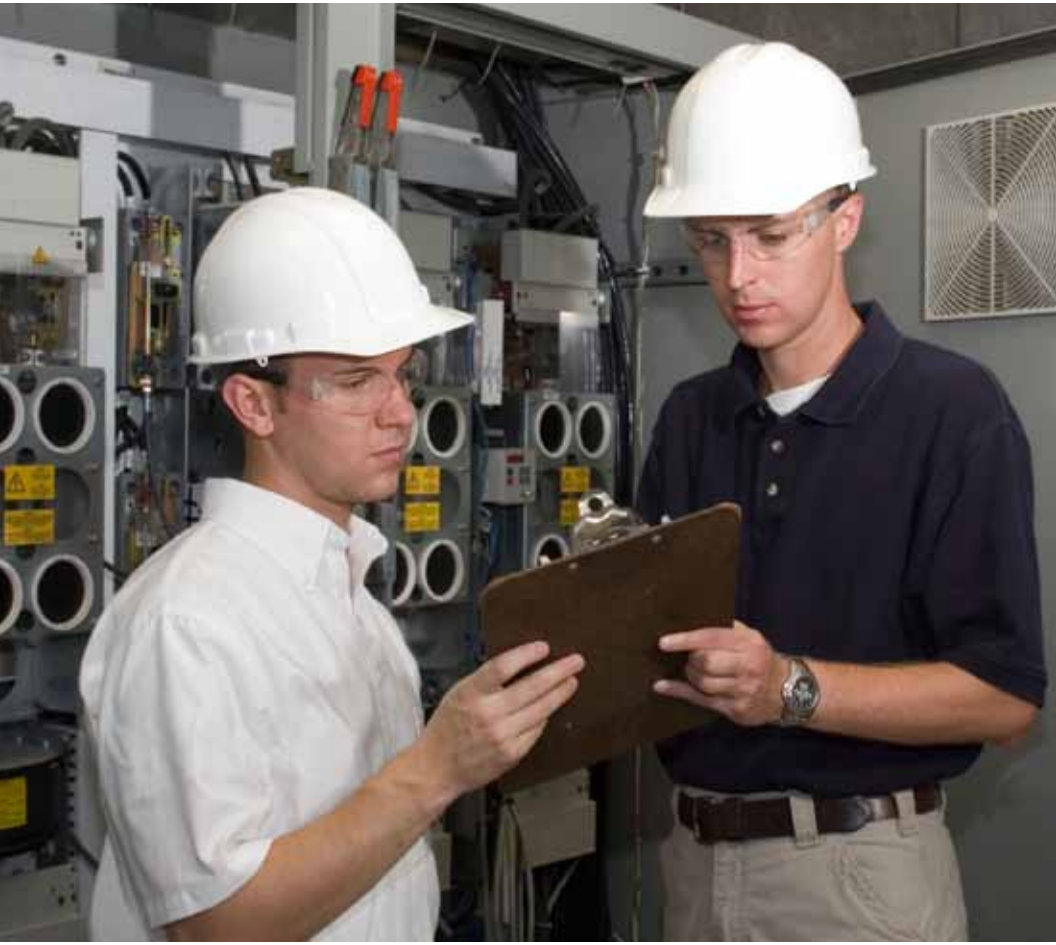
Certified Quality Inspector



Quality excellence to enhance your career and boost your organization's bottom line

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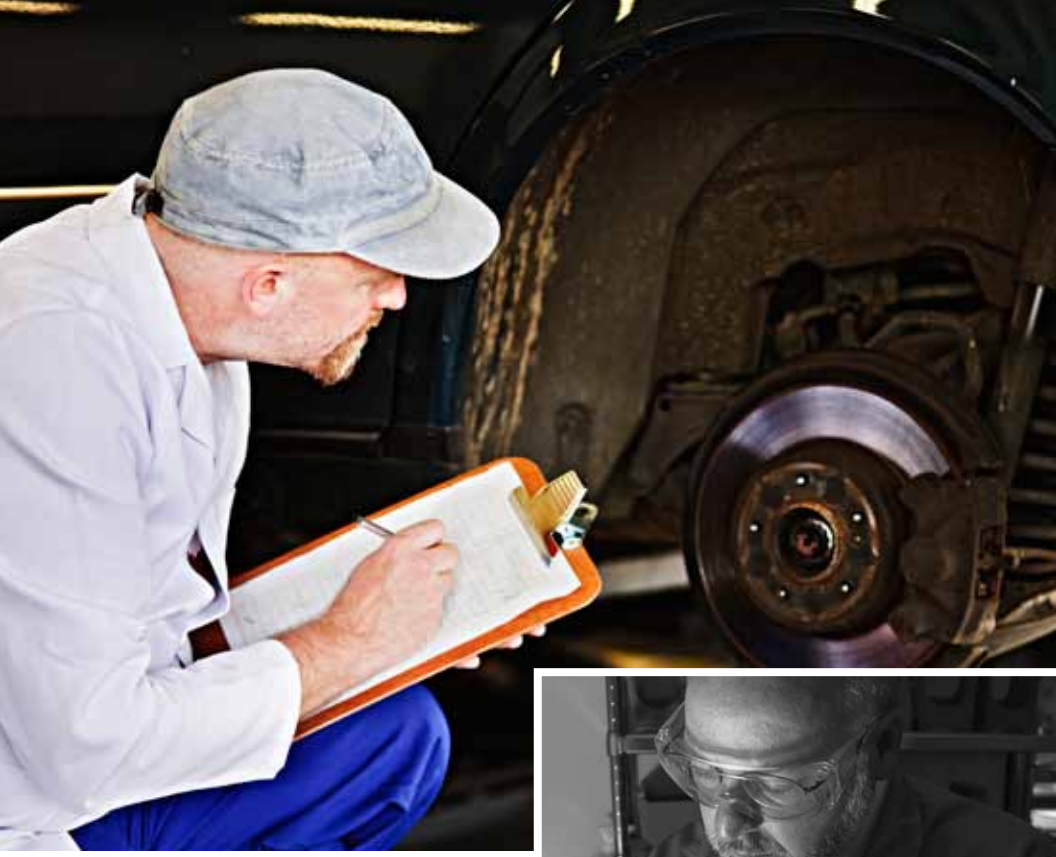
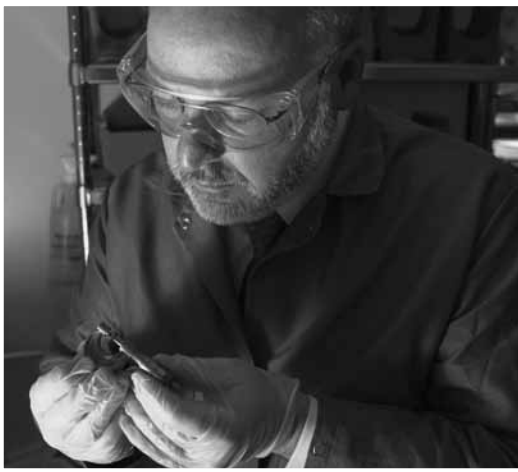




Certification from ASQ is considered a mark of quality excellence in many industries. It helps you advance your career, and boosts your organization's bottom line through your mastery of quality skills. Becoming certified as a Quality Inspector confirms your commitment to quality and the positive impact it will have on your organization.

Information

Certified Quality Inspector

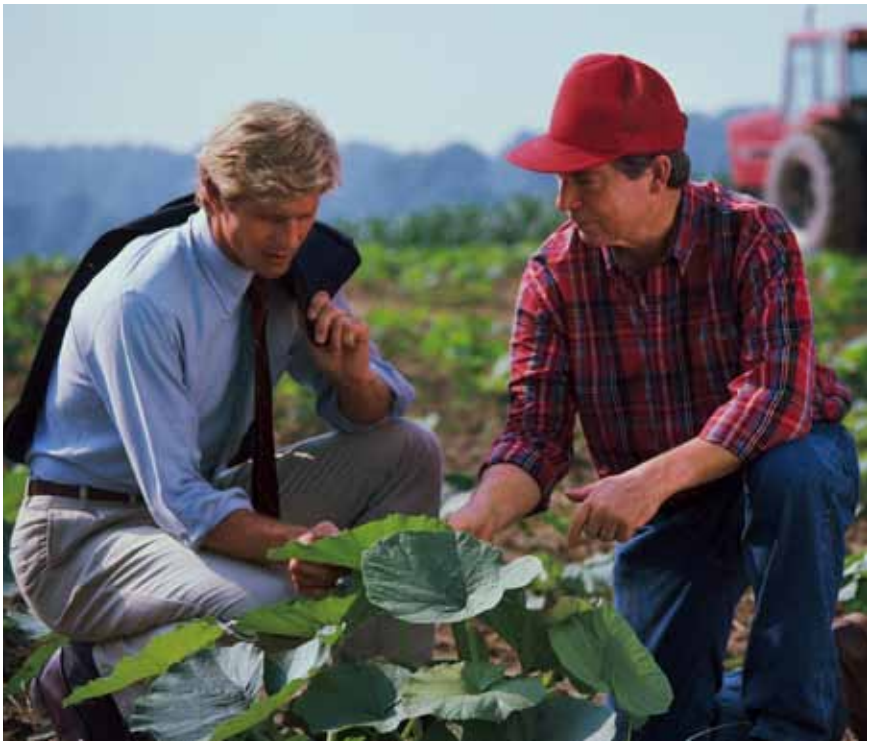
The Certified Quality Inspector is an inspector who, in support and under the direction of quality engineers, supervisors, or technicians, can use the proven techniques included in the Body of Knowledge. Under professional direction, the quality inspector evaluates hardware documentation, performs laboratory procedures, inspects products, measures process performance, records data, and prepares formal reports.

Examination

Each certification candidate is required to pass a written examination that consists of multiple choice questions that measure comprehension of the Body of Knowledge. The Quality Inspector examination is a four-hour, 100-question exam. It is offered in English.

Minimum Expectations for a Certified Quality Inspector

- Must know basic quality terms, definitions, and concepts.
- Must know basic statistical terms and techniques, how to plot data, and how to recognize out-of-control conditions.
- Must know the definition of PDCA and understand the team concept.
- Must understand types of measurement, measurement terminology, and the different types of measurement scales.
- Must know the difference between accuracy and precision and be able to select the appropriate measuring tools and techniques.
- Must know how to measure using surface plate layouts.
- Must be able to identify/ recognize inspection errors and initiate resolution.
- Must have basic calibration knowledge.
- Must be able to read and interpret blueprints and know definitions of critical, major, and minor characteristics.



- Must have a general knowledge of ASME Y14.5M, working knowledge of GD&T, and must understand the x, y, z coordinate system.
- Must be able to use inspection planning tools and perform a product audit; determine sample size for lots; pull random samples.
- Must have knowledge of testing methods.
- Must be able to identify and report nonconforming material.
- Must understand traceability (product, material, and calibration).
- Must have a strong knowledge of basic mathematical operations and perform measurement conversions; be able to solve for x; add and subtract degrees, minutes, and seconds.

Education and/or Experience

To apply for certification as a Quality Inspector, you must have:

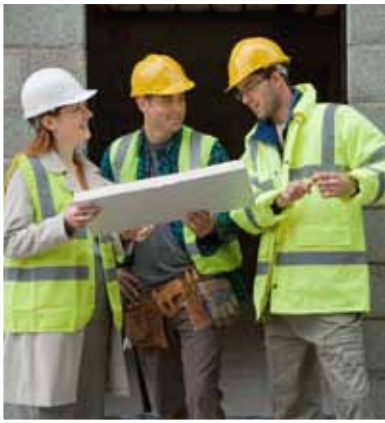
- Two years of on-the-job experience in quality inspection or a related field.
- If you do not have a high-school diploma or GED, you must have an additional three years of work experience.

For comprehensive exam information on the Quality Inspector certification, visit **www.asq.org/certification.**

Body of Knowledge

Certified Quality Inspector

The topics in this body of knowledge include additional detail in the form of subtext explanations and the cognitive level at which the questions will be written. This information will provide useful guidance for both the Exam Development Committee and the candidate preparing to take the exam. The subtext is not intended to limit the subject matter or be all-inclusive of what might be covered in an exam. It is meant to clarify the type of content to be included in the exam. The descriptor in parentheses at the end of each line of subtext refers to the maximum cognitive level at which the topic will be tested. A complete description of cognitive levels is provided at the end of this document.



I Technical Mathematics (20 Questions)

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)

B. Basic Algebra
Solve or simplify first-degree and single-variable equations. (Apply)

C. Basic Geometry
Calculate general parameters such as area, circumference, perimeter, and volume for basic geometric shapes. Calculate complementary and supplementary angles. (Apply)

D. Basic Trigonometry
Compute angles and lengths using trigonometric functions such as sine, cosine, tangent, and the Pythagorean Theorem. (Apply)

E. Measurement Systems
Convert units within and between English and metric measurement systems (SI) such as inch to micro-inch, liter to quart, meter to millimeter, etc. (Apply)

F. Numeric Conversions
Use various numbering methods such as scientific notation, decimals, and fractions, and convert values between these systems. (Apply)

II Metrology (30 Questions)

A. Common Gages and Measurement Instruments

1. **Variable gages**
   Identify and use variable gages, including micrometers, calipers, dial indicator, CMM, linear scales, etc. (Apply)
2. **Attribute gages**
   Identify and use attribute gages, including thread plug, progressive ring, flush pin, radius gage, etc. (Apply)

3. **Transfer gages**
   Identify and use transfer gages, including small-hole gages, spring calipers, etc. (Apply)
4. **Measurement scales**
   Describe and distinguish between dial, digital, and vernier scales. (Remember)

B. Special Gages and Applications
Identify and describe the following basic tools and components. (Remember)

1. **Electronic gaging tools: oscilloscopes, multimeters, pyrometers, etc.**
2. **Automatic gaging components: machine vision, ultrasonic, X-ray, laser, etc.**
3. **Pneumatic gaging components: air columns, probes, rings, etc.**

C. Gage Selection, Handling, and Use

1. **Gage selection**
   Select gages according to the feature or characteristic to be measured, the applicable tolerance and the accuracy, and the resolution and capability of the test instrument. Determine whether the type of measurement should be direct, differential, or transfer. (Apply)
2. **Gage handling, preservation, and storage**
   Identify and apply various methods of cleaning, handling, and storing gages. (Apply)
3. **Gage correlation**
   Identify and apply methods for establishing the correlation between measurement instruments such as gage-to-gage or manual-to-automated process. (Apply)

D. Surface Plate Tools and Techniques

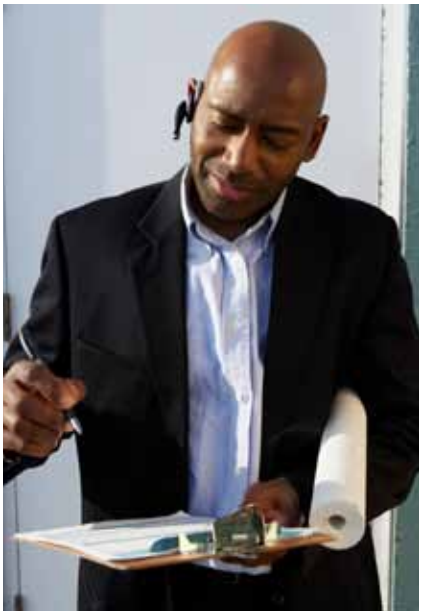
1. **Surface plate equipment**
   Select and use height gages, V-blocks, indicators, etc., to measure various types of features. (Apply)
2. **Angle measurement instruments**
   Identify and use protractors, sine bars, angle blocks, etc. (Apply)

E. Specialized Inspection Equipment

1. **Measuring mass**
   Describe and apply weights, balances, and scales. (Apply)
2. **Measuring finish**
   Describe and apply profilometers, fingernail comparators, etc. (Apply)
3. **Measuring shape and profile**
   Describe and apply mechanical comparators, roundness testers, precision spindles, profile tracers, etc. (Apply)
4. **Optical equipment**
   Describe and apply optical comparators, optical flats, microscopes, etc. (Apply)
5. **Digital vision systems**
   Define and describe the use of digital cameras, in-line optical sensors, and other digital systems for product inspection. (Remember)
6. **Coordinate measuring machine (CMM)**
   Describe the advantages and disadvantages of the CMM and the basic operation of the x, y, and z axes. Describe its limitations with regard to locating functional datums, target points and areas, and hole positions. (Understand)

F. Calibration

1. **Calibration systems**
   Describe the principles and purpose of a calibration system, including the importance of establishing calibration intervals. Identify and use basic tracking and identification methods such as logs, stickers, identification codes, etc., to control calibration equipment. (Apply)
2. **Calibration standards**
   Describe the hierarchy of standards, from working standards through international standards. (Remember)
3. **Equipment traceability**
   Describe the requirements for documenting traceability to standards. (Remember)
4. **Gage calibration environment**
   Describe the effects that environmental conditions, such as temperature, humidity, vibration and cleanliness of the gage, etc., can have on calibration. (Apply)
5. **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)



G. Measurement System Analysis (MSA)
Define and describe the following elements of MSA. (Remember)

1. **Bias**
2. **Stability**
3. **Accuracy**
4. **Linearity**
5. **Repeatability and reproducibility (R&R) studies**

III Inspection and Test
(30 Questions)

A. Blueprints, Drawings, Geometric Dimensioning & Tolerancing (GD&T)

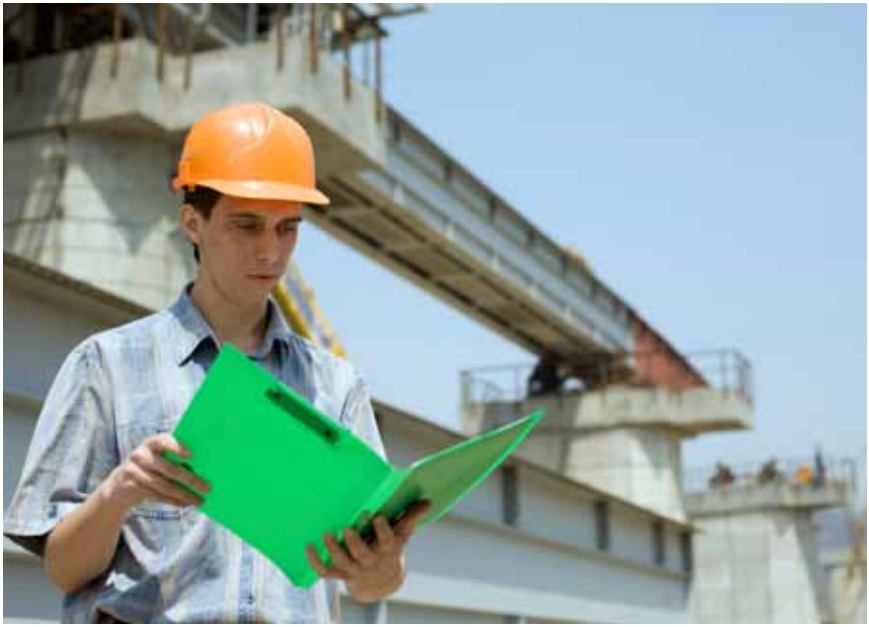
1. **Blueprints and engineering drawings**
   Define and interpret various sections of technical drawings: title block, tolerances, change or revision blocks, including notes, scale, and size details, etc. (Apply)
2. **Terminology and symbols**
   Define and interpret drawing views and details for product 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)

B. Sampling
Define and interpret the following terms related to sampling. (Apply)

1. **Acceptance quality limit (AQL)**
2. **Random sampling**
3. **Lot and sample size**
4. **Acceptance number**
5. **Sampling plans**

C. Inspection Planning and Processes

1. **Inspection types**
   Define and distinguish between inspection types such as incoming material, first-article (first-piece), in-process, final, etc. (Apply)



2. **Inspection errors**
   Identify potential inspection errors such as bias, fatigue, flinching, distraction, etc. (Apply)
3. **Product traceability**
   Identify methods to trace products and materials such as age control, shelf life, and first-in first-out (FIFO). (Apply)
4. **Identification of nonconforming material**
   Describe various methods of identifying nonconforming material such as tagging, labeling, and segregating. (Apply)
5. **Level of severity**
   Define and describe levels of severity (critical, major, minor, etc.) and apply them to product features and defects. (Apply)
6. **Disposition of nonconforming material**
   Describe disposition methods including rework, reprocess, scrap, customer waiver, etc., as determined by a material review board (MRB) or other authority. (Apply)

D. Testing Methods
Define and use the following methods in various situations. (Apply)

1. **Nondestructive testing: X-ray, eddy current, ultrasonic, dye penetrant, magnetic particle, etc.**
2. **Destructive testing: tensile, force testing, drop test, etc.**
3. **Functionality testing: tension, torque, leak testing and compression, etc.**
4. **Hardness testing: Brinell, Rockwell, durometer, and micro-hardness scales**

E. Software for Test Equipment
Identify and describe basic tools (e.g., 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)

IV Quality Assurance (20 Questions)

A. Basic Statistics and Applications

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, bar charts, etc., to display data effectively in various situations. (Apply)
5. **Normal distribution**
   Describe various characteristics of a normal distribution: symmetry, bell curve, central tendency, etc. (Understand)

B. Statistical Process Control (SPC)

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, hugging, etc.), 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 $\overline{X}$-R and $\overline{X}$-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)

C. Quality Improvement

1. **Terms and concepts**
   Define basic quality improvement concepts such as defect detection and prevention, the cost of poor quality, total quality management (TQM), the importance of customer satisfaction, etc. (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)

D. Quality Audits

1. **Types of audits**
   Define and describe various types of audits, including internal, external, system, product, process, etc. (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 and recordkeeping, verification of corrective actions, etc. (Understand)
3. **Audit tools**
   Define and describe the purpose of checklists, log sheets, sampling plans, record and 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)

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**

F. Problem-solving Tools and Continuous Improvement Techniques
Describe and use the following tools and techniques in various situations. (Apply)

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 modes and effects analysis (FMEA)**

G. Resources

1. **Environmental and safety support**
   Define and use various resources related to personal and environmental safety: material safety data sheet (MSDS), personal protective equipment (PPE), etc. (Apply)
2. **Reference documents**
   Identify and use national and international standards (e.g., ISO, ANSI, ASTM, QS) and customer requirements as authorities that support processes and procedures used to assure quality products. (Apply)
3. **Technical reports**
   Review, analyze, and interpret technical reports that are used to diagnose problems and communicate solutions. (Analyze)
4. **Employees as resources (Remember)**
   - 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, etc.
   - Describe the four stages of team development: forming, storming, norming, performing.

Note: Approximately 20% of the questions in each test will require calculation.

Six Levels of Cognition

Based on Bloom's Taxonomy (Revised)

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

Remember
Be able to remember or recognize terminology, definitions, facts, ideas, materials, patterns, sequences, methodologies, principles, etc. (Also commonly referred to as recognition, recall, or rote knowledge.)

Understand
Be able to read and understand descriptions, communications, reports, tables, diagrams, directions, regulations, etc.

Apply
Be able to apply ideas, procedures, methods, formulas, principles, theories, etc., in job-related situations.

Analyze
Be able to break down information into its constituent parts and recognize the parts' relationship to one another and how they are organized; identify sublevel factors or salient data from a complex scenario.

Evaluate
Be able to make judgments regarding the value of proposed ideas, solutions, methodologies, etc., by using appropriate criteria or standards to estimate accuracy, effectiveness, economic benefits, etc.

Create
Be able to put parts or elements together in such a way as to show a pattern or structure not clearly there before; be able to identify which data or information from a complex set is appropriate to examine further or from which supported conclusions can be drawn.

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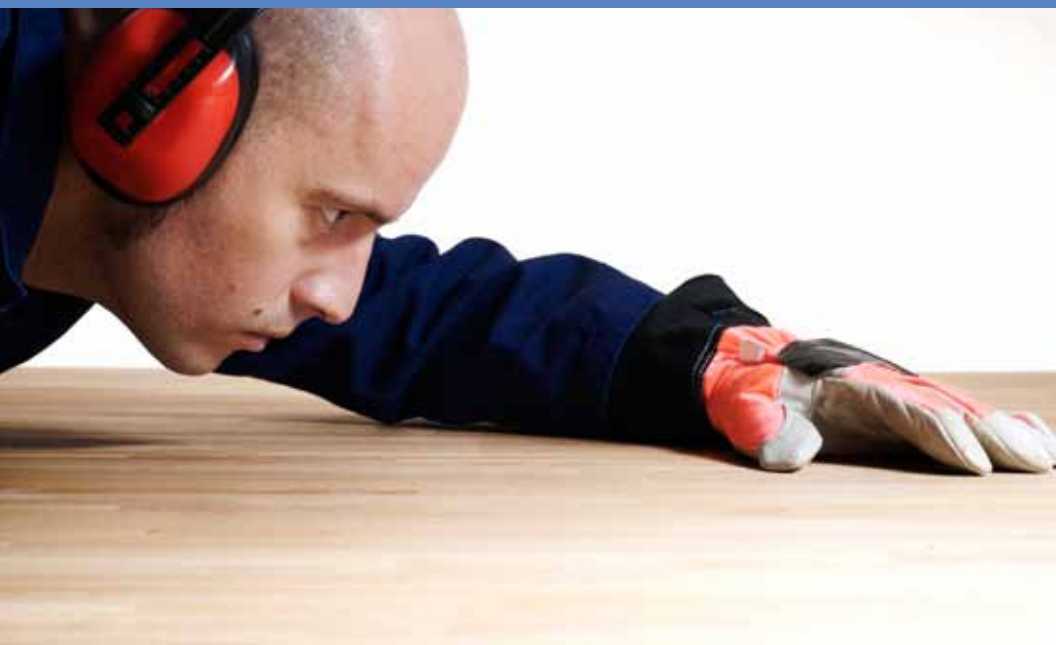

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