ASQ
AMERICAN SOCIETY FOR QUALITY™

CERTIFIED SIX SIGMA GREEN BELT

Certified Six Sigma Green Belt

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

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 Six Sigma Green Belt confirms your commitment to quality and the positive impact it will have on your organization.

Information

Certified Six Sigma Green Belt

The Six Sigma Green Belt operates in support of or under the supervision of a Six Sigma Black Belt, analyzes and solves quality problems and is involved in quality improvement projects. A Green Belt is someone with at least three years of work experience who wants to demonstrate his or her knowledge of Six Sigma tools and processes.

Proof of Professionalism

Proof of professionalism may be demonstrated in one of three ways:

- Membership in ASQ, an international affiliate society of ASQ, or another society that is a member of the American Association of Engineering Societies or the Accreditation Board for Engineering and Technology.
- Registration as a Professional Engineer.
- The signatures of two persons—ASQ members, members of an international affiliate society, or members of another recognized professional society—verifying that you are a qualified practitioner of the quality sciences.

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 Six Sigma Green Belt Certification is a four-hour, 100 multiple-choice question examination. It is offered in the English language only.

Required Experience

The Six Sigma Green Belt requires three years of work experience within the Body of Knowledge.

For comprehensive exam information on Six Sigma Green Belt certification, visit **www.asq.org/certification**.

Body of Knowledge

Certified Six Sigma Green Belt

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 rather is intended to clarify how topics are related to the role of the Certified Six Sigma Green Belt (SSGB). The descriptor in parentheses at the end of each subtext entry refers to the highest cognitive level at which the topic will be tested. A complete description of cognitive levels is provided at the end of this document.

I Overview: Six Sigma and the Organization (15 Questions)

A. Six Sigma and Organizational Goals

1. **Value of Six Sigma**
   Recognize why organizations use Six Sigma, how they apply its philosophy and goals, and the origins of Six Sigma (Juran, Deming, Shewhart, etc.). Describe how process inputs, outputs, and feedback impact the larger organization. (Understand)
2. **Organizational drivers and metrics**
   Recognize key drivers for business (profit, market share, customer satisfaction, efficiency, product differentiation) and how key metrics and scorecards are developed and impact the entire organization. (Understand)
3. **Organizational goals and Six Sigma projects**
   Describe the project selection process including knowing when to use Six Sigma improvement methodology (DMAIC) as opposed to other problem-solving tools, and confirm that the project supports and is linked to organizational goals. (Understand)

B. Lean Principles in the Organization

1. **Lean concepts and tools**
   Define and describe concepts such as value chain, flow, pull, perfection, etc., and tools commonly used to eliminate waste, including kaizen, 5S, error-proofing, value-stream mapping, etc. (Understand)
2. **Value-added and non-value-added activities**
   Identify waste in terms of excess inventory, space, test inspection, rework, transportation, storage, etc., and reduce cycle time to improve throughput. (Understand)
3. **Theory of constraints**
   Describe the theory of constraints. (Understand)

C. Design for Six Sigma (DFSS) in the Organization

1. **Quality function deployment (QFD)**
   Describe how QFD fits into the overall DFSS process. (Understand) *[Note: the application of QFD is covered in II.A.6.]*
2. **Design and process failure mode and effects analysis (DFMEA & PFMEA)**
   Define and distinguish between design FMEA (DFMEA) and process (PFMEA) and interpret associated data. (Analyze) *[Note: the application of FMEA is covered in II.D.2.]*
3. **Road maps for DFSS**
   Describe and distinguish between DMADV (define, measure, analyze, design, verify) and IDOV (identify, design, optimize, verify), identify how they relate to DMAIC and how they help close the loop on improving the end product/process during the design (DFSS) phase. (Understand)

II Six Sigma—Define (25 Questions)

A. Process Management for Projects

1. **Process elements**
   Define and describe process components and boundaries. Recognize how processes cross various functional areas and the challenges that result for process improvement efforts. (Analyze)
2. **Owners and stakeholders**
   Identify process owners, internal and external customers, and other stakeholders in a project. (Apply)
3. **Identify customers**
   Identify and classify internal and external customers as applicable to a particular project, and show how projects impact customers. (Apply)
4. **Collect customer data**
   Use various methods to collect customer feedback (e.g., surveys, focus groups, interviews, observation) and identify the key elements that make these tools effective. Review survey questions to eliminate bias, vagueness, etc. (Apply)
5. **Analyze customer data**
   Use graphical, statistical, and qualitative tools to analyze customer feedback. (Analyze)
6. **Translate customer requirements**
   Assist in translating customer feedback into project goals and objectives, including critical to quality (CTQ) attributes and requirements statements. Use voice of the customer analysis tools such as quality function deployment (QFD) to translate customer requirements into performance measures. (Apply)

B. Project Management Basics

1. **Project charter and problem statement**
   Define and describe elements of a project charter and develop a problem statement, including baseline and improvement goals. (Apply)
2. **Project scope**
   Assist with the development of project definition/scope using Pareto charts, process maps, etc. (Apply)
3. **Project metrics**
   Assist with the development of primary and consequential metrics (e.g., quality, cycle time, cost) and establish key project metrics that relate to the voice of the customer. (Apply)
4. **Project planning tools**
   Use project tools such as Gantt charts, critical path method (CPM), and program evaluation and review technique (PERT) charts, etc. (Apply)
5. **Project documentation**
   Provide input and select the proper vehicle for presenting project documentation (e.g., spreadsheet output, storyboards, etc.) at phase reviews, management reviews, and other presentations. (Apply)
6. **Project risk analysis**
   Describe the purpose and benefit of project risk analysis, including resources, financials, impact on customers and other stakeholders, etc. (Understand)
7. **Project closure**
   Describe the objectives achieved and apply the lessons learned to identify additional opportunities. (Apply)

C. Management and Planning Tools

Define, select, and use 1) affinity diagrams, 2) interrelationship digraphs, 3) tree diagrams, 4) prioritization matrices, 5) matrix diagrams, 6) process decision program (PDPC) charts, and 7) activity network diagrams. (Apply)

D. Business Results for Projects

1. **Process performance**
   Calculate process performance metrics such as defects per unit (DPU), rolled throughput yield (RTY), cost of poor quality (COPQ), defects per million opportunities (DPMO) sigma levels and process capability indices. Track process performance measures to drive project decisions. (Analyze)
2. **Failure mode and effects analysis (FMEA)**
   Define and describe failure mode and effects analysis (FMEA). Describe the purpose and use of scale criteria and calculate the risk priority number (RPN). (Analyze)

E. Team Dynamics and Performance

1. **Team stages and dynamics**
   Define and describe the stages of team evolution, including forming, storming, norming, performing, adjourning, and recognition. Identify and help resolve negative dynamics such as overbearing, dominant, or reluctant participants, the unquestioned acceptance of opinions as facts, groupthink, feuding, floundering, the rush to accomplishment, attribution, discounts, plops, digressions, tangents, etc. (Understand)
2. **Six Sigma and other team roles and responsibilities**
   Describe and define the roles and responsibilities of participants on Six Sigma and other teams, including Black Belt, Master Black Belt, Green Belt, Champion, executive, coach, facilitator, team member, sponsor, process owner, etc. (Apply)
3. **Team tools**
   Define and apply team tools such as brainstorming, nominal group technique, multi-voting, etc. (Apply)
4. **Communication**
   Use effective and appropriate communication techniques for different situations to overcome barriers to project success. (Apply)

III Six Sigma—Measure (30 Questions)

A. Process Analysis and Documentation

1. **Process modeling**
   Develop and review process maps, written procedures, work instructions, flowcharts, etc. (Analyze)

2. **Process inputs and outputs**
   Identify process input variables and process output variables (SIPOC), and document their relationships through cause and effect diagrams, relational matrices, etc. (Analyze)

B. Probability and Statistics

1. **Drawing valid statistical conclusions**
   Distinguish between enumerative (descriptive) and analytical (inferential) studies, and distinguish between a population parameter and a sample statistic. (Apply)
2. **Central limit theorem and sampling distribution of the mean**
   Define the central limit theorem and describe its significance in the application of inferential statistics for confidence intervals, control charts, etc. (Apply)
3. **Basic probability concepts**
   Describe and apply concepts such as independence, mutually exclusive, multiplication rules, etc. (Apply)

C. Collecting and Summarizing Data

1. **Types of data and measurement scales**
   Identify and classify continuous (variables) and discrete (attributes) data. Describe and define nominal, ordinal, interval, and ratio measurement scales. (Analyze)
2. **Data collection methods**
   Define and apply methods for collecting data such as check sheets, coded data, etc. (Apply)
3. **Techniques for assuring data accuracy and integrity**
   Define and apply techniques such as random sampling, stratified sampling, sample homogeneity, etc. (Apply)
4. **Descriptive statistics**
   Define, compute, and interpret measures of dispersion and central tendency, and construct and interpret frequency distributions and cumulative frequency distributions. (Analyze)
5. **Graphical methods**
   Depict relationships by constructing, applying and interpreting diagrams and charts such as stem-and-leaf plots, box-and-whisker plots, run charts, scatter diagrams, Pareto charts, etc. Depict distributions by constructing, applying and interpreting diagrams such as histograms, normal probability plots, etc. (Create)

D. Probability Distributions
Describe and interpret normal, binomial, and Poisson, chi square, Student's t, and F distributions. (Apply)

E. Measurement System Analysis
Calculate, analyze, and interpret measurement system capability using repeatability and reproducibility (GR&R), measurement correlation, bias, linearity, percent agreement, and precision/tolerance (P/T). (Evaluate)

F. Process Capability and Performance

1. **Process capability studies**
   Identify, describe, and apply the elements of designing and conducting process capability studies, including identifying characteristics, identifying specifications and tolerances, developing sampling plans, and verifying stability and normality. (Evaluate)
2. **Process performance vs. specification**
   Distinguish between natural process limits and specification limits, and calculate process performance metrics such as percent defective. (Evaluate)
3. **Process capability indices**
   Define, select, and calculate Cp and Cpk, and assess process capability. (Evaluate)
4. **Process performance indices**
   Define, select, and calculate Pp, Ppk, Cpm, and assess process performance. (Evaluate)
5. **Short-term vs. long-term capability**
   Describe the assumptions and conventions that are appropriate when only short-term data are collected and when only attributes data are available. Describe the changes in relationships that occur when long-term data are used, and interpret the relationship between long- and short-term capability as it relates to a 1.5 sigma shift. (Evaluate)
6. **Process capability for attributes data**
   Compute the sigma level for a process and describe its relationship to Ppk. (Apply)

IV Six Sigma—Analyze (15 Questions)

A. Exploratory Data Analysis

1. **Multi-vari studies**
   Create and interpret multi-vari studies to interpret the difference between positional, cyclical, and temporal variation; apply sampling plans to investigate the largest sources of variation. (Create)
2. **Simple linear correlation and regression**
   Interpret the correlation coefficient and determine its statistical significance (p-value); recognize the difference between correlation and causation. Interpret the linear regression equation and determine its statistical significance (p-value). Use regression models for estimation and prediction. (Evaluate)

B. Hypothesis Testing

1. **Basics**
   Define and distinguish between statistical and practical significance and apply tests for significance level, power, type I and type II errors. Determine appropriate sample size for various test. (Apply).
2. **Tests for means, variances, and proportions**
   Define, compare, and contrast statistical and practical significance. (Apply)
3. **Paired-comparison tests**
   Define and describe paired-comparison parametric hypothesis tests. (Understand)
4. **Single-factor analysis of variance (ANOVA)**
   Define terms related to one-way ANOVAs and interpret their results and data plots. (Apply)
5. **Chi square**
   Define and interpret chi square and use it to determine statistical significance. (Analyze)

V Six Sigma—Improve and Control (15 Questions)

A. Design of Experiments (DOE)

1. **Basic terms**
   Define and describe basic DOE terms such as independent and dependent variables, factors and levels, response, treatment, error, repetition, and replication. (Understand)
2. **Main effects**
   Interpret main effects and interaction plots. (Apply)

B. Statistical Process Control (SPC)

1. **Objectives and benefits**
   Describe the objectives and benefits of SPC, including controlling process performance, identifying special and common causes, etc. (Analyze)
2. **Rational subgrouping**
   Define and describe how rational subgrouping is used. (Understand)
3. **Selection and application of control charts**
   Identify, select, construct, and apply the following types of control charts: $\bar{X}$-R, $\bar{X}$-s, individuals and moving range (ImR/XmR), median ($\tilde{x}$), p, np, c, and u. (Apply)
4. **Analysis of control charts**
   Interpret control charts and distinguish between common and special causes using rules for determining statistical control. (Analyze)

C. Implement and Validate Solutions
Use various improvement methods such as brainstorming, main effects analysis, multi-vari studies, FMEA, measurement system capability re-analysis, and post-improvement capability analysis to identify, implement, and validate solutions through F-test, t-test, etc. (Create)

D. Control Plan
Assist in developing a control plan to document and hold the gains, and assist in implementing controls and monitoring systems. (Apply)

Levels of Cognition

Based on Bloom's Taxonomy—Revised (2001)

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 (Knowledge Level)
Recall or recognize terms, definitions, facts, ideas, materials, patterns, sequences, methods, principles, etc.

Understand (Comprehension Level)
Read and understand descriptions, communications, reports, tables, diagrams, directions, regulations, etc.

Apply (Application Level)
Know when and how to use ideas, procedures, methods, formulas, principles, theories, etc.

Analyze (Analysis Level)
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 (Evaluation Level)
Make judgments about the value of proposed ideas, solutions, etc., by comparing the proposal to specific criteria or standards.

Create (Synthesis Level)
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 are appropriate to examine further or from which supported conclusions can be drawn.

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