

Certified Quality Engineer (CQE) Exam Preparation Course



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Instructor Introduction



- **John A. Conte, PE**
- **Instructor for the American Society for Quality (ASQ) past 15 years (Engineering Statistics, SPC, CQE & SSBB certification exam preparation), LSSMBB Instructor at Villanova, and Adjunct Professor at University of Missouri, College of Engineering**
- **9 ASQ Certifications including CSSBB, CQE, CRE, CSQE, CQA, CQI, CQM/OE**
- **Registered Professional Engineer in both Texas and Missouri (40+ years)**
- **35 years experience in Quality, Quality Information Systems, Process Improvement, and Bayesian Statistics at AT&T Western Electric, AT&T Bell Labs and DSC Communications (telecommunications industry)**
- **15 years experience teaching Engineering Statistics for ASQ, Villanova University and University of Missouri**
- **BS and MS in Industrial Engineering, Quality and Reliability Engineering Major, University of Missouri**

Course Introduction



- **The American Society for Quality and the CQE**
 - asq.org/certification
- **CQE Exam**
 - Created in 1968 as alternative to PE License
 - Scheduled twice a year June and December 1968 to 2016
 - Now scheduled by appointment six two week periods a year
 - Corporate and Conference Special Exams
 - Application and Deadline for next offering?
- **The CQE Body of Knowledge**
 - 33 words in 1968
 - 2700+ words in 2015
- **This Course only covers:**
 - III-E Reliability and Maintainability
 - IV-C Acceptance Sampling Z1.4 Standard
 - VI-A,B,C,D,E,F,G & H Quantitative Methods and Tools

Course Content – Given on ASQ.ORG

Certified Quality Engineer Certification Preparation



This course is intended for students who plan on taking the Certified Quality Engineer exam. It helps prepare you by focusing on the most difficult topics on the exam.

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This course provides a very thorough overview of the reliability, acceptance sampling, and quantitative methods topics covered in the body of knowledge for the ASQ Certified Quality Engineer (CQE) exam. It is designed to teach these topics in particular since they are the topics most commonly failed on the CQE exam.

Prerequisites



Prerequisites

This course is designed to teach the reliability, acceptance sampling, and quantitative methods topics included in the BOK, so no prior knowledge of statistics is necessary. However, a solid understanding of basic algebra and the ability to work with algebraic formulas is required. Experience as a quality engineer is required to qualify for the exam.

Prerequisites



Order of operations

From Wikipedia, the free encyclopedia

In [mathematics](#) and [computer programming](#), the **order of operations** (sometimes called **operator precedence**) is a rule used to clarify which procedures should be performed first in a given [mathematical expression](#).

For example, in mathematics and most computer languages, multiplication is done before addition; in the expression $2 + 3 \times 4$, the answer is 14. Brackets, "(and)", "{ and }", or "[and]", which have their own rules, may be used to avoid confusion, thus the preceding expression may also be rendered $2 + (3 \times 4)$, but the brackets are unnecessary as multiplication still has precedence without them.

Since the introduction of modern algebraic notation, multiplication has taken precedence over addition.^[1] Thus $3 + 4 \times 5 = 4 \times 5 + 3 = 23$. When exponents were first introduced in the 16th and 17th centuries, exponents took precedence over both addition and multiplication and could be placed only as a superscript to the right of their base. Thus $3 + 5^2 = 28$ and $3 \times 5^2 = 75$. To change the order of operations, originally a [vinculum](#) (an overline or underline) was used. Today, [parentheses or brackets](#) are used to explicitly denote precedence by grouping parts of an expression that should be evaluated first. Thus, to force addition to precede multiplication, we write $(2 + 3) \times 4 = 20$, and to force addition to precede exponentiation, we write $(3 + 5)^2 = 64$.

PEMDAS



REMEMBER: ORDER OF OPERATIONS

PLEASE **E**XCUSE **M**Y
DEAR **A**UNT **S**ALLY

Please = Parentheses

Excuse = Exponents

My Dear = Multiplication and/or Division

Aunt Sally = Addition and/or Subtraction



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Prerequisites



Greek alphabet

From Wikipedia, the free encyclopedia

The **Greek alphabet** is the script that has been used to write the [Greek language](#) since the 8th century BC.^[2] It was derived from the earlier [Phoenician alphabet](#),^[3] and was the first alphabetic script to have distinct letters for vowels as well as consonants. It is the ancestor of the [Latin](#) and [Cyrillic scripts](#).^[4] Apart from its use in writing the Greek language, both in its ancient and its modern forms, the Greek alphabet today also serves as a source of [technical symbols and labels](#) in many domains of mathematics, science and other fields.

Prerequisites

Letter	Name	Sound	
		Ancient ^[5]	Modern ^[6]
Α α	alpha, άλφα	[a] [a:]	[a]
Β β	beta, βήτα	[b]	[v]
Γ γ	gamma, γάμμα	[g]	[ɣ] ~ [ʝ]
Δ δ	delta, δέλτα	[d]	[ð]
Ε ε	epsilon, έψιλον	[e]	[e]
Ζ ζ	zeta, ζήτα	[zd] ^A	[z]
Η η	eta, ήτα	[ɛ:]	[i]
Θ θ	theta, θήτα	[tʰ]	[θ]
Ι ι	iota, ιώτα	[i] [i:]	[i]
Κ κ	kappa, κάππα	[k]	[k] ~ [ç]
Λ λ	lambda, λάμδα	[l]	[l]
Μ μ	mu, μυ	[m]	[m]

Letter	Name	Sound	
		Ancient ^[5]	Modern ^[6]
Ν ν	nu, νυ	[n]	[n]
Ξ ξ	xi, ξι	[ks]	[ks]
Ο ο	omicron, όμικρον	[o]	[o]
Π π	pi, πι	[p]	[p]
Ρ ρ	rho, ρώ	[r]	[r]
Σ σ/ς ^[8]	sigma, σίγμα	[s]	[s]
Τ τ	tau, ταυ	[t]	[t]
Υ υ	upsilon, ύψιλον	[y] [y:]	[i]
Φ φ	phi, φι	[pʰ]	[f]
Χ χ	chi, χι	[kʰ]	[x] ~ [ç]
Ψ ψ	psi, ψι	[ps]	[ps]
Ω ω	omega, ωμέγα	[ɔ:]	[o]

1968 CQE Body of Knowledge



1. Fundamental concepts of probability, statistical quality control and design of experiments.
2. Quality planning and management.
3. Reliability and maintainability.
4. Quality cost analysis.
5. Metrology, inspection and testing.
6. Data processing.
7. Quality auditing.
8. Human factors and motivation.

1968 CQE Exam



- **Four hours in morning for 90 Principle questions**
- **Four hours in Afternoon for 90 Applications questions**
- **Open Book**
- **Slide rule and statistical tables**
- **Complete 1968 exam can be found at**
 - www.contesolutions.com/1972_QP_Questions.pdf

Current Exam



- **Five hours**
- **160 Questions multiple choice questions**
- **Reliability 3 to 6 questions**
- **Acceptance Sampling 4 to 8 questions**
- **Quantitative Methods and Tools 35 questions**
- **Only the simplest of electronic calculators TI-30Xa**
- **No smart phones, no iPads, no personal computers**
- **Open Book but no multiple choice question/answers are allowed in the exam room**

What are you taking to the exam?



- Electronic calculator
- This notebook with the “Sample questions” removed
- All materials “Bound”
- Dictionary?
- Statistical Tables?
- CQE Handbook by ASQ Press?
- ???
- ???

Course Outline



- **Monday**
 - Introductions, Probability
 - Reliability, Combinations, Normal Distribution
- **Tuesday**
 - Binomial, Poisson, Hypergeometric Distributions
 - Acceptance Sampling
- **Wednesday**
 - Central Limit Theorem and Confidence Intervals
 - Hypothesis Tests on Means, Proportions, Variances
- **Thursday**
 - Hypothesis Tests on Paired t and various GOF Tests
 - Statistical Process Control
- **Friday**
 - Review of sample problems
 - Process Capability
 - Design of Experiments

Detailed look at CQE BoK



- **Escape to iBooks – cqe-bok-2015**

Student Introductions



- **Name**
- **Where have you lived most of your life**
- **Current company and location**
- **Current Job Function**
- **Given the CQE BoK – familiar subjects**
- **Given the CQE BoK – unfamiliar subjects**

Let's Start



- **Open student notebook to tab 6**
 - **Descriptive Statistics**
 - ✦ Measure of Central tendency
 - ✦ Measures of Variation
 - ✦ Use of the calculator
 - ✦ Coefficient of Variation
 - ✦ Skip Central Limit Theorem until Wednesday morning
 - ✦ Frequency Distributions
 - ✦ Descriptive versus Inferential Statistics
 - ✦ Sampling
 - ✦ Probability terms and concepts