CPI / LSS Acronyms, Terms, and Definitions

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	Term	Definition	References
1	$\binom{n}{r}$	See Combinations.	CQE IX-34
2	4-M diagram	'Man-Machine-Material-Method.' See Fishbone Diagram. May also include Measurement and Environment (5M & E).	CQE VIII-14
3	5S	"Seiri" - **Separate (Sort & Scrap)** needed tools, parts, and instructions from unneeded materials to be removed/**scrap**ped later. "Seiton" - **SIMPLIFY (straighten, Store, and Set in order)**. Neatly arrange and identify parts and tools for ease of use. "Seiso" - **SYSTEMATICALLY Sweep, Scrub** & **Shine**. Conduct a cleanup campaign. "Seiketsu" - **STANDARDIZE** & **Spread**. As a habit, beginning with self, then the workplace, be clean and tidy. "Shitsuke" - **SUSTAIN & Systemize**. Apply discipline in following procedures to ensure regular review / cleaning / inspection of area occurs (quarterly review on calendar. Map/zones established). *Generally* , steps in keeping things neat, clean, and organized.	CQM Handbook p.133
4	7 Wastes	See Muda	
5	8-D (8 Disciplines)	See Kepner-Trego	
6	α	Alpha risk. See Producer's Risk	CQE VI-6
7	A8402	Quality Management and Quality Assurance-- Vocabulary. Defines the fundamental terms relating to quality concepts, as they apply to all areas, for the preparation and use of quality management and assurance standards.	CQM Handbook p.373
8	Aa	See Achieved availability	CQE VII-18
9	A_c	See Accept Number	CQE VI-5
10	Accept Number (A_c or c)	The number of defectives that (if found in a random sample) allows acceptance of the balance of the lot. The defectives must be set aside.	CQE VI-5, 10
11	Acceptable quality level (AQL)	This is the maximum percent defective that is considered satisfactory *as a process average* by the producer and the consumer. The probability of accepting an AQL lot should be high. It is also defined as the maximum percentage of nonconforming units ina batch or sample that, for the purposes of acceptance sampling, can be considered satrisfactory as a process average.	CQE VI-5, II-4
12	Accuracy	See validity	CQM Handbook p. 184
13	Achieved Availability	See Primer for definition and equation	CQE VII-18
14	Activity Network Diagram	See Arrow Diagram	CQE VIII-46
15	Affinity Diagram	Problem solving technique. Links ideas as with mind mapping, to form patterns of thought. See Memory Jogger (p. 12-18). Also referred to as the KJ Method in honor of its creator, Dr. Kawakita Jiro.	CQE VIII-34
16	Agile Manufacturing	See Lean	CQM Handbook p.133
17	Ai	See Inherint Availability	CQE VII-17
18	Alpha risk	Type I risk. See Producer's Risk	CQE VI-6
19	Altschuler, G.	Came up with the ARIZ (algorithm to solve an inventive problem) and TRIZ (sequence of 9 action steps) methods for solving complex problems with inventive solutions.	CSSBB XI-41/42
20	Analysis of Variance	Analysis of Variance. Also called ANOVA. Developed by Sir Ronald Fisher to determine if the within-treatment variation is significant in comparison to the treatment means. NOTE: ANOVA is NOT robust to non-normal populations. See book for equations for normal vs. non-normal populations. Regarding GR&R, see p. VI-96. Also note: Calculated F value equals row mean square divided by error mean square.	CQE IX-21
21	Analytic Study	A study in which action will be taken on a process to improve performance in the future (per Deming).	CQE IX-12
22	Andon board	Lighted overhead display showing current status and problems. A subset of the visual factory.	CSSBB IX-56
23	ANOVA	See Analysis of Variance.	CQE IX-21
24	ANSI Standards	ANSI/ASQ standards for everything from QM/QA, to systems guidelines, statistics, etc. See Primer for extensive list.	CQE III-30-31
25	ANSI/ASQ Q9000, 1, 2, 3, 4	Same as ISO 9000, 9001, 9002, 9003, 9004. See definitions in Primer.	CQE III-17
26	ANSI/ASQ Z1.4	See MIL-STD-105E	CQE VI-7
27	ANSI/ASQ Z1.9	See MIL-STD-414	CQE VI-7
28	Ao	See Operational Availability	CQE VII-18
29	AOQ	Average Outgoing Quality. Equal to the percent defective x probability of acceptance. Max AOQ = AOQL.	CQE VI-14
30	AOQL	See Average Outgoing Quality Limit	CQE VI-14
31	AQL	See Acceptable Quality Level	CQE VI-5
32	ARIZ	See Altschuler, G.	CSSBB XI-41/42
33	Arrow Diagram	Similar to Program Evaluation and Review Techniques (PERT), Critical Path Method (CPM), Node/activity on node diagrams (AON), Precedence diagrams (PDM), and countless other network diagrams. Used to identify critical paths, slack time, milestones, etc. Check it out in the Primer if, and only if, it comes up on the exam.	CQE VIII-46
34	AS9100	This standard applies to the aerospace industry and incorporates the European standard of prEN 9000-1. The use of this standard facilitates an organization's ability to adhere to industry specific safety and reliability requirements.	CQM Handbook p.379
35	ASQ Code of Ethics	See Primer. Basic common-sense approach to professionalism and integrity.	CQE II-28
36	ASQ Standards	ANSI/ASQ standards for everything from QM/QA, to systems guidelines, statistics, etc. See Primer for extensive list.	CQE III-30-31
37	Assignable cause	See Special Cause	
38	Attribute	A characteristic or property that is appraised in terms of whether it does or does not exist, with respect to a given requirement.	CQE II-4
39	Attribute (Binomial)	Regarding sampling, an item that does or does not meet inspection standards	CQE VI-5

40	Attribute (Poisson)	Regarding sampling, a non-conformity or flaw that does or does not exist	CQE VI-5
41	Attribute Charts	See also, Control Charts. Summary of attribute- and variable-type control charts can be found in Memory Jogger II, page 37. Attribute Chart equations are on page 39. Variable Chart equations on page 40. Table of constants on page 42.	CQE X-49
42	Attribute Data	Counted data. Nearly always a whole number. Answers 'how many' or 'how often'.	CQE IX-8
43	Audit Charter	A statement of audit policy, objectives, and procedures.	CQA VIII-2/7
44	Audit Records	Completed audit records include the formal report, report response, and completed corrective actions	CQA VI-15/16
45	Auditor Candidate	Per ISO 10011, auditor candidates must have four years of full-time practical work experience, not including training, at least two years of which are in quality, and participating in a minimum of four audits, for a total of at least 20 days.	CQA III-9/11, IV-11
46	Audits	Purpose/benefits (IV-2). Types of Audits, Old vs. New Methods, Philosophy (IV-3-5). Objectives (IV-6). General Audit Matrix (IV-7). Responsibilities (IV-9). Glossary of terms (IV-13-16). **Process Audit**: Audit designed to evaluate the effectiveness of a quality assurance program examining the knowledge of, compliance to, and adequacy of current production methods. **Quality Audit**: Includes Product, Process, and System audits. Note that each may be included as a subset of the audit that follows it. Verifies that the Quality Assurance program complies with established requirements. **Compliance Audit**: Evaluation for contractual compliance of the quality system. **Assessment Audit**: Limited in scope. **Management Audit**: **Random Audit**: Unscheduled and unannounced. Often used to assess emergency responsiveness. Need for such audits is relatively rare. **Specific Objective** / **Specific Activity Audit**: May be an inspection performance audit. **Product Audit**: Customer-oriented sampling of finished goods. Should be oriented around customer specification limits. **Surprise Audits**: Usually occur only where health and safety and/or federal regulations are at stake. The three broad stages of an audit include 1) Preparation, 2) Performance, and 3) Reporting (CQA-VIII-3).	CQE IV-2-16 CQA Various
47	Availability (equipment)	Loading Time = Available Time - Planned Downtime Availability = (Loading Time - Downtime) / Loading Time = Operation Time / Loading Time	CSSBB X-51
48	Average Outgoing Quality Limit (AOQL)	From the Dodge-Romig tables. Equal to the maximum AOQ.	CQE VI-14
49	Axiomatic Design Theory	Includes four domains: Customer, Function, Physical, and Process. In each case, the previous domain represents the 'why' and the given domain provides information to the next domain as to 'how' to fulfull its wants. Very similar to QFD sequence. In order, includes the four steps of 1) establish design objectives, 2) generate ideas to create solutions, 3) analyze possible solutions for best fit, and 4) implement the selected design.	CSSBB XI-11 & 44
50	β	Beta risk. See Consumer Risk. Calculatable. If goal is Beta = 0.05, then Z = 1.96 and -1.96. Use z = (x-bar - population mean) / (sample stdev/sqrt(sample size)). Resulting values (for -1.96 and 1.96) produce the confidence interval where Beta risk is 0.05. A sample mean that falls outside the CI has 95% chance of actually coming from a different population.	CQE VI-5
51	Balanced Scorecard	See also Norton and Kaplan. Business planning process that gives consideration to factors other than financial ones, including 1) Financial, 2) Internal Business Process, 3) Learning and Growth, and 4) Customer Perspectives. It provides more perspectives for stakeholder interests, and is referred to as the balanced scorecard. Used to evaluate a company's overall business strategy.	CSSBB III-42
52	Barriers to Improvement	See Primer	CQE VIII-2
53	Bathtub curve	See Taguchi loss function	CQE II-104
54	Bayesian Sampling	Discovery sampling procedures sometimes used for determining appropriately small but reasonable sample sizes during audits (during audits, time is a factor, so sample sizes are generally smaller than inspection sampling)	CQA IV-27/28
55	Bell Curve	See Normal Distribution. See book for formulas, graph, and applications.	CQE IX-36
56	Benchmarking	Management tool to improve quality and overall conpetitiveness. See Primer for details.	CQE Primer II-44. CQM Primer III-41/42, IV-125/127
57	Benefit-Cost Analysis	Decision-making tool that looks specifically at money (sum of all benefits anticipated $ / Sum of all costs anticipated).	CQM Handbook p.323
58	Bernoulli Principle	Daniel Bernoulli (1733) stated that "expected value equals the sum of the values of each of a number of outcomes multiplied by the probability of each outcome relative to all the other possibilities."	CQE IX-32
59	Beta Risk (β)	Type II risk. See Consumer Risk	CQE VI-5
60	Bias	See validity	CQM Handbook p. 184
61	Big Q (vs. little q)	Big Q is big picture quality-- plant-wide/global systems. Little q is more a focus on product performance to specifications. Big Q is improvement systems, integration of quality, customer focus, etc.	
62	Bimodal Distribution	When plotted data gives the appearance of two bell curves, side-by-side. Two-humped distribution. Often jokingly referred to as the "Dolly Parton" distribution. Often caused by special cause such as two cavities in a mold, or the same parts being run off of two different production lines. See also Memory Jogger II (p. 72).	CQE VIII-24
63	Binomial distribution	See book for formulas, graph, and applications	CQE IX-37, 39-40
64	Bloom's Taxonomy	(bottom) Knowledge, Comprehension, Application, Analysis, Synthesis, Evaluation (top)	CQM Handbook p.426

65	Blue Print Reading (GD&T)	See GD&T	CQE V-36-51
66	Bottleneck	See Constraint	
67	Boundaryless Organization	Adapts workload to particular needs. Allows roles and structures to change based on specific situations rather than having rigid defintions. However, job descriptions might still exist for some roles.	
68	Bowman	Along with Goodstein, co-developer of SWOT analysis.	CSSBB II-28
69	Box-Behnken	Central composite design which requires three factor levels (like the CCF; unlike the CCF & CCI which require five factor levels). See Central Composite Desisgn	CSSBB VIII-60
70	Boxplots	Five point representation of data. Central line represents the median. Upper and lower quartiles of the data define the ends of the box (that is, 25% of the data falls in each of the two halfs of the box). The upper and lower quartiles of the data defijne the ends of the box. Minimum and maximum data points are drawn as points at the end of lines (whiskers) extending from the box. Outliers are added as asterisks. Invented by John W. Tukey in 1977.	CQE IX-22
71	Brainstorming	Intentionally uninhibited technique for generating creative ideas when the best solution is not obvious. See Primer for steps involved and details. Examples include round-robin, freestyle, Crawford Slip, and electronic (the last two allowing annonymity).	CQE II-66
72	Breakthrough Achievement	Paradigm shift in design or concept (quartz watches). Best way to take market share from even a 'revolutionary improvement' company. See primer.	CQE VIII-8
73	Brinell Hardness Testing	See Primer. See also hardness testing method summary matrix in Primer, p. VI-81.	CQE VI-79
74	Burst Point	See PERT diagram	CQE Primer p.II-48 - 49
75	c	See Accept Number	CQE VI-5
76	C(n,r)	See Combinations.	CQE IX-34
77	Calibration	See list of definitions in Primer (VI-89). Note specifically sensitivity, reproducibility, accuracy, and precision (VI-94). Also bias and linearity (VI-95).	CQE VI-89-95
78	CAR	Corrective Action Request. Form started by an auditor, to be completed by the auditee, to address major and minor nonconformances noted during an audit. The form is used to request and record corrective a tion root cause analysis, temporary and permanent actions, and the time for response. Any format and title will do, as long as the form and the requireements serve the intended purpose. CARs must be formally responded to and closed out, with documentation retained and forwarded to the auditor for approval.	CQA VII-3
79	Cause-and-Effect diagram	See Fishbone diagram or Ishikawa diagram.	CQE VIII-14
80	Cavanaugh, R.R	Co-Author of 'The Six Sigma Way.' See Pande, P.S. for more information.	CSSBB II-22
81	CCC	Circumscribed Central Composite (Box-Wilson). Higher order design which requires five factor levels. See Central Composite Design	CSSBB VIII-60
82	CCD	See Central Composite Designs (includes CCD & CCI)	
83	CCF	Face Centered Composite. Design which requires three factor levels. See Central Composite Design	CSSBB VIII-60
84	CCI	Inscribed Central Composite (Box-Wilson). Higher order design which requires five factor levels. See Central Composite Design	CSSBB VIII-60
85	CE	See concurrent engineering	CQM Handbook p.141,145
86	Central Composite Design (CCD)	Includes CCC & CCI. One of several classes of response surface designs. As described by Verseput (2001), they are popular because 1) sequential runs of linear or curvature effects can be made, 2) they provide much information from a minimum of runs, and 3) they are quire flexible over different experimental regions. CCC & CCI are rotatable-- that is, the variance is the same at all points that are equidistant from the design center. The variance therefore remains unchanged when the design is rotated around the center.	CSSBB VIII-60
87	Central Limit Theorem	If a random variable X has a mean m and a finite variance σ^2, as n increases, X-bar approaches a normal distribution with mean μ and variance $\sigma_{x\text{-bar}}^2$. Where $\sigma_{x\text{-bar}}^2 = \sigma^2/n$ and n is the number of observations on which each mean is based. In words, the distribution of sample averages will approach normal regardless of the shape of the parent population (this is why x-bar & R charts work.	CQE IX-12, 13
88	Central Tendency	See mean, median, or mode.	CQE IX-14-16
89	Champy, James	See Reengineering. Co-authored book with Michael Hammer (1990). See Primer.	CQE VIII-9
90	Change Agent	Individuals who play a specific role in the planning and implementation of the change management process. They may be insiders or outsiders. The person who takes the lead in transforming a company into a quality organization by providing guidance during the planning phase, facilitating implementation, and supporting those who pioneer the changes.	CQM Handbook p.12, 433
91	Chebyshev's Theorem	See Tchebysheff's Theorem. See also Camp-Meidel extension.	CQE IX-20
92	Checklists	Used for inspecting machinery or product, or when learning to operate complex or delicate equipment. A grocery list is a good example. See also Checksheets.	CQE VIII-20
93	Checksheets	Tools for organizing and collecting facts and data. Usually used to record counted, measured, and locational data. Three kinds include Recording Checksheets, Checklists, and Measles Charts. See Primer also for 'Mnemonic' or 'Memory Hook' Checksheets. See also Memory Jogger II (p. 31-35).	CQE VIII-19-21
94	Chi-square test	See summary table on p. XI-31. Used to compare a sample variance with a known, same population variance. Note: If the calculated Chi-square for any test is greater than the critical (table) value, the null hypothesis is rejected. Degrees of freedom is calculated as (# rows - 1) x (# columns - 1). Contribution to the Chi-Square total from one cell is calculated as $((O - E)/E)^2$. Required for calculations of Goodness of Fit, Contingency Coefficient, Freedman's Test, and Mood's Median Test.	CQE XI-31
95	Ciampa, Dan	Coined the term Total Quality, or TQ.	CQM Primer VII-15-16
96	CMM (Coordinate Measuring Machine)	See Primer. See also gage summary matrix on p. VI-63-64.	CQE VI-62
97	C^n_r	See Combinations.	CQE IX-34
98	Code	Adding / subtracting a constant or multiplying / dividing by a factor to simplify data collection	CQE IX-11
99	Coefficient of Determination	Used in regression analysis. Measured on a scale from 0 to 1.	CSSBB VII-17/18

100	Coefficient of Variance	standard deviation divided by the mean. Expressed as a percentage (σ/x-bar x 100)	CQE IX-17
101	Combinations	The number of distinct combinations of n distinct objects taken r at a time. This may be denoted by the symbol C^n_r, nCr, C(n,r), or $\binom{n}{r}$. Calculated as n!/r!(n-r)!. Unlike Permutations, Combinations do not take order into account, therefore ABC=ACB=CAB=CBA=BAC=BCA.	CQE IX-34
102	Commodity Producer	Company strategy. See Leading Edge for strategy & product types list.	CQM Primer III-15
103	Common Causes	Generally represents about 80% of all causes. Usually not operator dependent, but *process*-dependent. Cannot be changed without management assistance. Note that reducing Common Cause variation is one of the primary strengths of Six Sigma methodology.	
104	Community	Often used to mean Society as a whole. Often used to describe the Customer(s) for a product or service.	CSSBB III-9/11
105	Competetive Force Review		CQM Primer III-9
106	Complement (of an event)	Deals with probability. The complement of an event A is all sample points in the sample space but not in A. The complement of A is 1-P_A.	CQE IX-28
107	Components of Variance (COV)	May be developed for a ANOVA experiment, like GR&R. Can determine 1) the extent of contribution by each source of variation, 2) how much of the variance is due to differences in treatment means, and 3) how much of the variance is due to experimental error.	CSSBB VII-66
108	Compound Event	Deals with probability. A composition of two or more events. Example the sum of two tossed dice is dependent upon the values of two simple events, thereby making it a compound event.	CQE IX-27
109	Compression Test	See Primer	CQE VI-82
110	Concurrent Engineering	Working in parallel where possible. Saves time when processes are independent prior to bringing them together in the design or assembly processes.	CQM Handbook p.141,145
111	Conditional Probability	The conditional probability of an event A given that B has occurred is P(A I B) = P(A 🗁 B) / P(B) (assuming P(B) does not equal zero)	CQE IX-28
112	Confidence	1 - α. See Producer's Risk	
113	Confidence Interval	CI for mean, see CQE XI-32. For Variation or Proportion, see CQE XI-33. Per *Basic Statistics* (Kiemele, Schmidt, & Berdine), "the range within which a parameter of a population (e.g., mean, standard deviation, etc.) may be expected to fall, on the basis of measurement, with some specified confidence level or confidence coefficient" (page J-4).	CQE XI-32,33
114	Configuration Management	Defined by Juran and Gyrna as "the collection of activities needed to define, identify, manage, record, or approve the hardware and software characteristics of a product." See Primer for IEEE definition.	CQE III-26-27
115	Conflict Resolution	See competing/avoiding/collaborating, etc. definitions in Primer.	CQE II-81
116	Consequential Metrics	See Secondary Metrics.	CSSBB V-20
117	Constraint	The slowest step in a process. Technically, the slowest step in a process is defined as the bottleneck. If the productivity of the bottleneck is below the rate required to meet customer demand, then the bottleneck is also the constraint. However, this is a definitional subtlety that is usually not understood or intended when most practitioners use the term.	
118	Consumer's Confidence	1 - β. Also known as Power. See Consumer's Risk	CQE VI-6
119	Consumer's risk (beta risk, or β)	Also called Type II risk or beta risk. Only comes into play if we FAIL to reject the null. May cause me to keep my process the same when I should change it. The probability of accepting a bad lot. 1 - β = Consumer's confidence. See also Producer's Risk.	CQE VI-5
120	Contingency Table	Dunno. But the expected (theoretical) value for a cell in a contingency table is calculated as (row total x column total) / grand total. Contingency coefficient requires a chi-square calculation.	CSSBB VII-69/70
121	Contract Review	Reviews must ensure 1) requirements are defined and documented, 2) any requirement different than the quote is resolved, 3) the company can meet the contract requirements, and 4) there is a defined method for amendment of contracts.	CQE III-19
122	Control Charts	Method of plotting dynamic (time-dependent) data developed by Dr. Walter Shewhard. More than a dozen different types exist, for use with either Variable or Attribute data. See Primer for specific details. See also Memory Jogger II. When to use which Chart (p. 37). Formulas for attribute data (p. 39) and variable data (p. 40) charts. Table of constants (p. 42). Interpretation (p. 43-47). Basic rules for out of control are 1) 1 point beyond control (3 sigma) limits, 2) trend of 8 points in an up or down direction, 3) 8 consecutive points on one side of the center line, 4) 4 of 5 consecutive points beyond the 1-sigma limits, or 5) 2 of 3 consecutive points beyond the 2-sigma limits.	CQE VIII-25, X-15-56
123	Coordinate Measuring Machine (CMM)	See Primer. See also gage summary matrix on p. VI-63-64.	CQE VI-62
124	COPQ	Cost of poor quality. See Primer.	CQE II-91-99
125	COQ	Cost of quality. See Primer.	CQE II-91-99
126	Corrective Action Request	See CAR	CQA VI-2/10
127	Corrective and Preventive Action	ISO 4.14.1 states that 'A supplier must establish and maintain documented procedures for corrective and preventive action. The action taken to eliminate actual or potential nonconformities shall be appropriate to the magnitude of the porblems and associated risks. The supplier shall make appropriate changes to the documented procedures based on corrective and preventive action results.'	CQE VIII-48
128	Correlation Charts	See Scatter Diagrams	CQE VIII-27
129	Correlation Coefficient	Often written as 'r'. Calculated to determine the degree of relationship between two variables (see Scatter Diagrams). r = (Σ(X-X-bar)(Y-Y-bar))/sqrt((Σ(X-X-bar)^2 Σ(Y-Y-bar)^2). r = -1.0 (strong negative); r = -0.5 (slight negative); r = 0 (no correlation); r = +0.5 (slight positive); r = +1.0 (strong positive correlation). Line of best fit can be calculated (see Regression Analysis). See also Memory Jogger II (p. 145-149).	CQE VIII-30
130	Correlation Coefficient	Used in regression analysis, and denoted with the letter 'r' or 'R'. As correlation decreases (scatter increases), r^2 decreases as well.	CSSBB VII-18
131	Cost of Quality (COQ, COPQ)	Cost of poor quality. See Primer. A quality cost system can be used to align quality and company goals, provide an overview of quality, and help to prioritize company resources. Historically, categories of costs include direct costs (direct materials and direct labor), indirect costs or overhead (indirect materials, indirect labor, fixed costs, and general & administrative costs), and selling costs. Prevention of poor quality is far cheaper than appraisal, which in turn is cheaper than failure (both internal and external).	CQE II-91-99 CQM IV-52-64

132	COV	See Components of Variance	CSSBB VII-66
133	Covariates	See Primer	CQE XI-69
134	Cp	See Process Capability	CQE X-2-6
135	Cpk	See Process Capability	CQE X-2-6
136	CPM (Critical Path Method)	Activity-oriented Project Management tool. Applies normal and 'crash' costs (costs associated with applying more resoureces to complete the project in a shorter amount of time). Similar to PERT (which is event-oriented).	CQE II-51-53
137	Cr	Inverse of Cp. See Process Capability	CQE X-3
138	Crash	See PERT diagram	CQE Primer p.II-48 - 49
139	Creativity Stages	1) Generate: Create a list of as many ideas as possible, 2) Percolate: Allow time to think over these and other ideas, 3) Illuminate: Return to the list and discuss what has been "discovered." Add/delete/combine, etc., 4) Verify: Test out some fo the ideas that appear more feasible.	CQM Handbook p.120-121
140	Critical Defect	A defect classification that experience or judgment indicates is likely to cause unsafe conditions for those who use, maintain, or depend on the product; or a defect likely to prevent performance of the end-item function. Example: a defect that can cause automobile brakes not to perform.	CQE VI-5
141	Critical Path	See PERT diagram	CQE Primer p.II-48 - 49
142	Critical to Quality	See CTQ	CSSBB V-18
143	Crosby (Phillip) 1928 -	Defined quality as "Conformance to requirements." Known as the "Quality Executive" and proponent of "Zero defects." Big believer in senior management taking ownership of quality (like Juran). Preaches four absolutes of Quality Management (see Primer, page II-13). Also responsible for the 14 step approach to quality deployment (Primer, p. II-13). Advocated a core of quality specialists within an organization (see points 2 and 13 of his 14 points).	CQE II-3; II-12-13
144	CTQ	In time sequence, this includes 1) Identify the Customers, 2) Identify the Customers needs, 3) Identify the Customers' basic requirements, 4) Add additional requirements as needed, and 5) validate the requirements with the Customer. Per Eckes (2001).	CSSBB V-18
145	Culture	Shared values, norms, and assumptions. Visible as orientation to power, risk, mistakes, and outsiders. Shaped by policies and procedrues, structure, day-to-day management decisions, and rewards.	
146	Customer Satisfaction	See Kano Model. For a list of pitfalls in determining customer satisfaction, see CQM Handbook p.225-226.	CQM Handbook p.217-218
147	Customer Types	See CQM Handbook for definitions including Primary Customer, Secondary Customer, Indirect Customer, External Customer, Consumer/End User, Intermediary, False Customer, and Internal Customer.	CQM Handbook p.199-200
148	CuSum	Cumulative Sum control chart. May use a V-mask if manually generated.	CSSBB IX-48/49
149	CWQC (Company-Wide Quality Control)	See Ishikawa	CQE II-20
150	Cycle Time	The time required to complete one cycle of an operation. If cycle time for every operation in a complete process can be reduced to equal takt time, products can be made in single-piece flow.	*Lean Thinking* J. Womack
151	Cycle Time Reduction	Self explanatory. Reducing time improves productivity and reduces costs. See primer for case study in Single Minute Exchange of Dies (SMED).	CQE VIII-5
152	Data Accuracy	Considerations for data accuracy and integrity	CQE IX-10
153	Data Analysis	Guidelines for data collection, analysis, and reporting	CQE IX-9
154	Data Coding	Adding / subtracting a constant or multiplying / dividing by a factor to simplify data collection	CQE IX-11
155	Data Collection	Guidelines for data collection, analysis, and reporting	CQE IX-9
156	Data Integrity	Considerations for data accuracy and integrity	CQE IX-10
157	Data Layer	Link across different media, such as audio, video, text data, and data bases. See Knowledge Management.	CSSBB II-31
158	Data Reporting	Guidelines for data collection, analysis, and reporting	CQE IX-9
159	Defect	A flaw or nonconformity on an item or part which may or may not cause the item or part to fail its specifications.	CQE VI-5
160	Defect Location Checksheet	See Measles Chart. See also Checksheets in general.	CQE VIII-21
161	Defective	A unit of product that contains *one or more defects,* at least one of which causes the unit to fail its specifications	CQE VI-5
162	Define Phase	Together with Measure, should represent about half of the total project time. Define phase should identify key processes, goals, scope, and project priority, among other items.	CSSBB V-21
163	Definitions	For a list of Quality Terms and Definitions, see Primer, II-4-11. Audit terms, Primer IV-13-16. Quality Planning & Control Terms, Primer V-2-3. Sampling terms, Primer VI-5-6. Force/Hardness testing definition, VI-81-86. Calibration definitions (VI-89). Sampling & Measurment definitions (VI-104-106). Reliability (VII-27-28).	CQE II-4 - 11
164	Degrees of Freedom (DF)	See DF	CQE XI-
165	Deming (Dr. Edward)	"Quality control does not mean achieving perfection. It means the efficient production of quality that the market expects."	CQE II-3
166	Deming (Dr. W. Edwards) 1900 - 1993	Founder of the third wave of the industrial revolution (quality explosion). Big into Quality Philosophy. Strongly associated with the Japanese and JUSE (Japanese Union of Scientists and Engineers). Well known for his Fourteen Obligations of Top Managment (II-15), Seven Deadly Diseases that Management must Cure (II-15), and Deming's Chain Reaction (II-16).	CQE II-14-16
167	Deming Cycle	Plan-Do-Check-Act. See Shewhart Cycle.	CQE VIII-3, 4
168	Dependent events	When P(A I B) does not equal P(A). Ex. 20% of the time it rains. 30% of the time it's cloudy. 67% of the time when it's cloudy, it rains. P(A I B) = 67%, but P(A) = 20%. Rain must be dependent upon clouds. See independent events.	CQE IX-28
169	Dependent Variable	A factor that results in a response variable and can be equated to an independent variable.	CSSBB XI-13

170	Deployment Flowchart	Swimlanes process flow chart. See book for example.	CQM Handbook p.104
171	Descriptive Statistics	Numerical descriptive measures create a mental picture of a set of data. These measures calculated from a sample are numerical descriptive measures called statistics. When they describe a population, they are called parameters. The two most important measures are of central tendency and dispersion.	CQE IX-12
172	Design Input Checklist	Primer, p. V-9	CQE V-9
173	DF (Degrees of Freedom)	"Number of comparisons required to make an estimate" 1-way ANOVA degrees of freedom (no factors. Only levels/treatments. DF(Treatments) = number of treatments minus 1 DF(Error) = DF(total) - DF(Treatments) DF(Total) = DF Number of sample values minus 1 Two-way ANOVA (both Factors AND Levels/Treatments. DF(Factors) = Number of factors minus 1 DF(Treatments) = Number of treatments minus 1 DF(Interaction) = (Number of interactions minus 1) - DF(Factors) - DF(Treatments) DF(Error) = DF(Total) - DF(Interactions) - DF(Factor) - DF(Treatment) DF(Total) = Total number of all sample values minus 1 When experimenting, one degree of freedom is required to compute the overall mean. n-1 degrees of freedom are required for each factor (where n is the number of levels for the factor). Degrees of freedom required for interactions are the product of the interactions for the factors involved in the interactions.	
174	DFA	Design for Assembly. A subset of DFX	CSSBB 38/39
175	DFM	Design for Manufacturability. A subset of DFX	CSSBB 38/39
176	DFX	Design for 'X'. Includes such items as Design for Safety, Reliability, Testability, Features, Manufacturability, Servicability, Standardization, Assembly, Maintainability, Function, Ergonomics, Appearance, Packaging, Cycle Time, etc. Design for Six Sigma encompasses DFX.	CSSBB XI-38/39
177	Dial Indicators	See Primer. See also gage summary matrix on p. VI-63-64.	CQE VI-49
178	Dispersion	See range, variance, and standard deviation	CQE IX-17
179	Distributions	See book for formulas, graph, and applications of various distributions	CQE IX-36, 37
180	Dodge-Romig Tables	Attribute plans for effective sampling inspection when the process average is known. If average is not known, see MIL-STD-105E.	CQE VI-7
181	DOE	Design of Experiments. See SDE (Statistically Designed Experiments). See also Mixture DOE.	CQE XI-50-70
182	Dunn & Bradstreet	Reports that deal with business financial status and financial ratios.	CQM Primer VII-36
183	Dynamic Data	Time-Sequence data (opposite of Static Data). Examples include control charts, run charts, or trend charts.	CQE VIII-6
184	E	Event being observed. Usually used in probability calculations. Example: $P(E)=n_e/N$ means 'the probability that the Event will occur equals the number of observations of the event, divided by the Number of times the experiment is repeated.	CQE IX-26
185	Eckes, G.	Author of 'The Six Sigma Revolution.' See CTQ.	CSSBB V-18
186	Economical Safety Factor	equal to the square root of (loss when exceeding functional limits) / (loss when exceeding tolerance specs.)	CSSBB XI-25
187	Eddy Current Testing	Non-destructive test. See Primer.	CQE VI-74-75
188	Education	Leads to increased knowledge. Not to be confused with training, which leads to measurable, value-added skills.	
189	Effectiveness (Equipment)	Equals Availability x efficiency x quality rate	CSSBB X-51
190	Enumerative Statistics	Enumerative data is data that can be counted (classifying people by age, income, etc.). May be analyzed using chie square, binomial, or Poisson distributions.	CQE IX-12
191	Enumerative Study	A study in which action will be taken on the universe (per Deming). Ex. Census information	CQE IX-12
192	Equal Variance Test	See summary table on p. XI-31	CQE XI-31
193	Error-Proofing	Designing a process/product that can't be made wrong. Evaluate where mistakes can happen. Install poke-yokes (hard physical or electronic error-proofing). Sometimes (although not ideally) may include at-the-operation inspection.	
194	Evolutionary Improvement	Steady improvement. Good when no competition present, but see 'Revolutionary Improvement' and 'Breakthrough Achievement.'	CQE VIII-8
195	EVOP	Evolutionary Operation. Sequential experimental designs. See Primer definition.	CQE XI-69
196	EWMA	See Exponential Weighted Moving Average	CSSBB IX-51-60
197	Exit Rate	The average rate at which products exit a manufacturing or transactional process. Exit rate is determined by the rate of the slowest step in the process. Thus, if one step takes 10 days while all other steps take 5 days, the exit rate cannot average faster than one product every 10 days (presuming a simple series process). In Theory of Constraints, Exit Rate of a process is determined by the process bottleneck.	
198	Exponential distribution	See book for formulas, graph, and applications. Note: Mean = Standard Deviation for this distribution.	CQE IX-36
199	Exponential Weighted Moving Average	Form of control chart used to detect small, incremental shifts in the average.	CSSBB IX-51-60
200	Fast Follower	Company strategy. See Leading Edge for strategy & product types list.	CQM Primer III-15
201	Fatigue Test	See Primer	CQE VI-82
202	Fayol, Henri	Developed fourteen principles of management, which included issues such as how power and authority needed to be subdivided into reporting relationships, and the subordination of individual interests to the common good.	CQM Handbook p.275
203	Feigenbaum (Dr. Armand V.) 1920 -	Defined quality as "The total composite product and service characteristics of marketing, engineering, manufacturing and maintenance through which the product and service in use will meet the expectations of the customer." Well known for Quality Systems and Total Quality Control (SPC, or Statistical Process Control. See Primer page II-36 for his definitionof TQC). Several famous quality quotations (II-18, bottom).	CQE II-3; II-17-18

204	Field Work	Audit term that encompasses questioning/interviewing as well as observing processes	CQA V-21
205	File Hardness Testing	See Primer. See also hardness testing method summary matrix in Primer, p. VI-81.	CQE VI-81
206	Fishbone diagram	Also known as Ishikawa, 4-M, or Cause-and-Effect Diagram. Breaks problems into bite-sized pieces. Keeps asking 'why' until root cause is obtained. Using Machine, Material , Measurement, Method, Manpower, and Environment (Mother Nature) as typical starting points. First known use was by Tomiko Hashimoto. Go figure. Looks pretty, but it's nothing more than a glorified outline. See also Memory Jogger II, p. 23-30. People, Policy, Procedures, and Plan are the 4-Ps often used for transactionals.	CQE VIII-14
207	Five Forces of Competetive Strategy	See Michael Porter	CSSBB III-42
208	Flow Chart	See Process Flow Chart	CQE VIII-16-18
209	Fluorosopy	Non-destructive test. See Primer.	CQE VI-77
210	Focus Group	Small groups of 2-12 people that gather to focus on a specific topic	CSSBB III-28
211	Follett, Mary Parker	Added to Max Weber's work on bureaucracy and lines of authority by adding the factor of relationships, both within the organization and between the organization and its environment, as a consideration for management.	CQM Handbook p.275
212	Force Measurement	Non-destructive test. See Primer. See also force measurement terms list on page VI-83-86	CQE VI-79
213	Forming	Stage 1 of team development (forming, storming, norming, & performing). Proud to be selected, anxious, new team experience, forming team structure.	CQM Handbook p. 45
214	Fourteen Obligations of Top Managmenet	See Deming (Dr. W. Edwards)	CQE II-15
215	Fourteen step approach to Quality Improvement	See Crosby	CQE II-13
216	Freedman's Test	Requires a chi-square calculation	CSSBB VII-54,57,87
217	F-Test	Fisher's Test. See ANOVA or Analysis of Variance.	CQE IX-21
218	Gage Blocks	See Primer. See also gage summary matrix on p. VI-63-64.	CQE VI-45-46
219	Gage Repeatability and Reproducibility (GR&R)	See Primer	CQE VI-96
220	Gage Types	See summary in Primer, p. VI-63-64.	CQE VI-63-64
221	Gamma Radiography	Non-destructive test. See Primer.	CQE VI-77
222	Gantt Chart	Project Management tool. Chart like those used in MS Project project management software. See Memory Jogger (p. 9). Named for Henry Gantt. Displays activities or events as a function of time (or sometimes cost). See Primer for list of advantages and disadvantages.	CQE II-54
223	Gantt, Henry	Developed the Gantt chart for project management. Proposed the concept of providing incentives to employees based on output.	CQM Handbook p.274-5
224	Gaussian distribution	See Normal Distribution. See book for formulas, graph, and applications.	CQE IX-36
225	GD&T (Geometric Dimensioning and Tolerancing)	See Primer for details. Tolerancing (p. V-36-37), statistics associated with tolerancing (V-38), allowances and fits (V-39), material conditions (V-40-41), characteristics and symbols (V-42-43), datum planes (V-44), blueprint definitions (V-43-51), orthographic projections (V-34-35, information included on all blueprints (V-29-31).	CQE V-36-51
226	Gemba	Japanese for "in the area" or "go see." Implies that you can't fix anything from the computer or the desk. You must go to the people/deck plates/shop floor/heart of the process and observe/interact with it.	
227	Geometric Dimensioning and Tolerancing (GD&T)	See GD&T	CQE V-36-51
228	Gilbreth, Frank & Lillian	Focused on increasing productivity, and developed the motion study method in order to analyze work processes.	CQM Handbook p.274
229	Goodness of Fit	Requires a chi-square calculation	CSSBB VII-54,57,87
230	Goodstein	Along with Bowman, co-developer of SWOT analysis.	CSSBB II-28
231	GR&R	Gage Repeatability and Reproducibility. See Primer, p. VI-96.	CQE VI-96
232	Grade	A category or rank given to entities having the same functional use, but differing requirements for quality. Per ISO 8402, clause 3.14.	ISO 8402
233	Hammer, Michael	See Reengineering. See Primer for published book (with James Champy) and article (1990).	CQE VIII-9
234	Hardness Testing	See Primer. See also hardness testing method summary matrix in Primer, p. VI-81.	CQE VI-79
235	Harry, Mikel	Father of Six Sigma, and author of several books, including 'Six Sigma.' He promotes Six Sigma methodology as useful for companies with a focus on cost savings, customer satisfaction, internal problems, and even design improvements.	CSSBB II-24
236	HASACC Plan	Hazard Analysis and Critical Controls Plan. See FMEA	
237	Hawthorne Effect	The positive change in behavior due to being singled out for attention. First noted at the Hawthorne Plant of Western Electric Company in the 1930s. Studies to determine the best level of lighting, length of workday, and length of rest periods showed that performance was related more to team involvement than to the factors that the teams were working to improve.	CQM Handbook p.275
238	Hayakawa	Stressed that in communicating, the words or symbols are not the actual thing being discussed. Clarity of understanding requires that the receiver "gets the message" that was intended to be conveyed, rather than receiving just the words/symbols/etc.	CQM Handbook p.302
239	Heijunka	Japanese word meaning “leveling.” In many ways, "heijunka" is the Lean equivalent of Theory of Constraints, helping organizations to meet demand by balancing work across all process steps and eliminating bottlenecks.	SME
240	Herzberg's satisfiers and hygiene factors (dissatisfiers)	Two categories into which work motivation falss: satisfiers and dissatisfiers. Dissatisfiers included things such as work conditions, salary, company policies, and relationships w/ supervisor(s). Satisfiers include responsibility, achievement, advancement, and recognition. Dissatisfiers must be taken for granted (minimum requirements). Satisfiers then add levels of motivation.	CQM Handbook p. 24

241	Heteroscedasticity	The condition of inconsistent error variance	CSSBB VII-58
242	Histogram	Also known as a relative frequency graph. Bar graph of data, with each bar representing the data from a specific range of numbers. Examples include column graphs (vertical) and bar graphs (horizontal). Require a minimum of 50-100 data points. display a static picture of process behavior. Note, selecting the proper number of data points that fall within a given bar or interval (that is, the 'frequency') has a significant impact on the usefulness of the graph. See also Memory Jogger II (p. 66-75). For list of rules for number of classes of data, see Memory Jogger II (p. 68).	CQE VIII-22-24
243	Holographic Testing	Non-destructive test. See Primer.	CQE VI-78
244	Homoscedasticity	The condition of consistent or equal error variance.	CSSBB VII-58
245	HOQ	See QFD	
246	Hoshin "catch ball"	See Hoshin Kanri	
247	Hoshin kanri (Hoshin Planning)	"Hoshin" means "policy" or "target." "Kanri" means "deployment" or "management." Japanese-based strategic planning/policy deployment process which involves consensus at all levels as plans are cascaded throughout the organization, resulting in actionable plans and continual monitoring and measurement.	CQM Handbook p. 74-75, 443
248	Hoshin Kanri (Hoshin Planning)	Execution tool used to deploy an existing strategic plan throughout the organization. Focus is to identify the vital few breakthrough achievements. Divided into two parts: 'ho' means 'method' and 'shin' means 'shiny metal showing direction.' 'Kanri' means 'planning.'	CQE II-39
249	House of Quality	See QFD	CQE III-39
250	Hypergeometric distribution	See book for formulas, graph, and applications	CQE IX-37, 38
251	Hypothesis Tests	What test should I run? See CQE XI-48 for variable data, CQE XI-49 for attribute data.	CQE XI-48-49
252	∩ (Intersection)	Deals with probability. The intersection of two events (A 🗁 B) is composed of all sample points that are in *both* A *and* B. The same as P(A) x P(B).	CQE IX-27
253	I.D.	See Interrelationship Digraph.	CQE VIII-34
254	IEC Standards	ANSI/ASQ standards for everything from QM/QA, to systems guidelines, statistics, etc. See Primer for extensive list.	CQE III-30-31
255	Imai (Masaaki)	See kaizen.	CQE VIII-4
256	Impact Test	See CQE Primer	CQE VI-82
257	Independent events	When P(A I B) equals P(A). Ex. 50% of the time the coin lands on heads. 16.7% of the time the die lands on the number 6. 16.7% of the time die lands on the numbe 6 when the coin lands on heads. P(A I B) = 16.7% and P(A) = 16.7%. The die roll is independent of the coin flip (see Dependent events.	CQE IX-28
258	Indicator Errors	See Primer. See also gage summary matrix on p. VI-63-64.	CQE VI-51
259	Indifference Quality Level (IQL)	Quality level somewhere between the AQL and RQL. It is normally defined as the quality level having probability of acceptance of 0.50. IQL is rarely used, so they'll probably ask one question on the exam just to annoy you.	CQE VI-10
260	Inference Tests	See summary table on p. XI-31	CQE XI-31
261	Inherint Availability (Ai)	Measure of potential avialability. See Primer for equation.	CQE VII-17
262	Inspection and Testing	See Primer for theory, records, and equipment.	CQE III-22-24
263	Inspection Types	Matrix of inspection types, functions, and descriptions is in Primer, p. V-24	CQE V-24
264	Integrated Business Processes	p.287	
265	Interferometry	See Primer. See also gage summary matrix on p. VI-63-64.	CQE VI-60
266	Interrelationship Digraph	Similar to Affinity Diagram. Technique created for the more complex problems or issues that managment may face, where direct, exact relationships may be difficult to determine.	CQE VIII-34
267	Intersection (∩)	Deals with probability. The intersection of two events (A ∩ B) is composed of all sample points that are in *both* A *and* B. The same as P(A) x P(B).	CQE IX-27
268	Interval Data	Data is arranged in order and differences can be found. However, there is no inherent starting point and ratios are meaningless (ex. Temperatures of steel rods (degs. F) after one hour of cooling) Central Location: Arithmetic Mean. Dispersion: Standard or Average Deviation. Significance Test: t-test, F-test, or correlation analysis.	CQE IX-6
269	IQL	See Indifference Quality Level	CQE VI-10
270	Ishikawa (Dr. Kaoru) 1915 - 1989	Founder of company-wide Quality Control (CWQC. See Primer p. II-36 for definition). Father of Japanese Quality Control and Total Quality Control (TQC- first coined by Feigenbaum). In the 1950s, instigated "next operation as customer," "training of workers," "empowerment," "customer satisfaction," "elimination of sectionalism," "management of workers," and other now-vogue ideas.	CQE II-19-20
271	Ishikawa diagram	See 'Fishbone diagram' or Cause-and-Effect Diagram.	CQE VIII-14
272	ISO 10011	Details rules/procedures for conducting audits	CQA VI-13
273	ISO 10012	Quality Assurance requirements for measuring equipment and metrological confirmation system for measuring equipment. See Primer for details.	CQE VI-100
274	ISO 9000, 9001, 9002, 9003, 9004	See definitions in Primer or Handbook. For categories, see CQM Handbook p.374-376.	CQE Primer p.III-17 CQM Handbook p.373
275	ISO Standards	ANSI/ASQ standards for everything from QM/QA, to systems guidelines, statistics, etc. See Primer for extensive list.	CQE III-30-31
276	Iterative Approach (to DOE)	The recognition that sequential experimentation will often yield more satisfactory results than 'one big experiment.'	CSSBB VII-15-16
277	JCAHO	Joint Commission on Accreditation of Healthcare Organizations. See CQM Primer.	CQM Handbook p.379
278	Jidoka	Japanese term refering to quality at the source. Conveys the idea that each step in a process needs to ensure its own quality, rather than trying to inspect later in the process after more work has been invested.	*Lean Thinking* J. Womack
279	Jiro, Dr. Kawakita	Developer of the Affinity Diagram (also referred to as the KJ Method, in his honor).	CSSBB IV-91/92

280	JIT (Just-in-Time)	Producing and delivering the right items at the right time and in the right amounts.	CSSBB X-56
281	Joint Commission on Accreditation of Healthcare Organizations	QSRMD. See CQM Handbook.	CQM Handbook p.379
282	Juran (Dr. Joseph M) 1904 -	Defined quality as "Fitness for use." Developed the 80/20 Pareto concept. Advocate of the "revolutionary rate of improvement" concept. Preached top-management involvement (like Crosby). The 'Juran Trilogy' includes Quality Planning, Quality Control, and Quality Improvement.	CQE II-3, II-21-22
283	Just-in-Time	See JIT	CSSBB X-56
284	Kaizen	From Japanese 'kai' meaning 'change' and 'zen' meaning good.' Connotes 'gradual and unending improvement.' Originates from Masaaki Imai (yes, that's his name). Applies to doing little things better and setting and achieving increasingly higher standards. Focus is on small, gradual *evolutionary* improvements (as opposed to tools like DMAIC that are designed for *revolutionary* change).	CQE VIII-4
285	kanban	Japanese for "signal". Tool/technique/system of signals and control (1-for-1 replacement)	CSSBB IX-56
286	Kano Analysis	Also called the Kano Model. Used to analyze Customer requirements, often as part of the Define Phase. Requirements include basic, variable, delighter (latent), and satisfiers.	CSSBB V-17
287	Kano Model	Model for customer satisfaction, including satisfaction/dissatisfaction vs service dysfunctional/ service fully functional. Evaluates what must be present vs. exciters/delighters. One dimensional factors drive satisfaction in direct relationship to their presence.	CQM Handbook p.217-218
288	Kaplan, R.S.	See also Norton and Balanced Scorecard. Advocated a business planning process that gives consideration to factors other than financial ones, including 1) Financial, 2) Internal Business Process, 3) Learning and Growth, and 4) Customer Perspectives. It provides more perspectives for stakeholder interests, and is referred to as the balanced scorecard.	CSSBB III-42
289	Kendall Coefficient of Concordance	Non-parametric test which makes a ranking evaluation by comparison with a critical value of Chi-Square. This definition is true of Mood's Median Test, The Kendall Coefficient of Concordance, and the Kruskal - Wallis test.	CSSBB VII-72/84
290	Kepner-Trego	Same as 8-D (8 disciplines) problem-solving process. Technique that involves 1) Name the team, 2) identify/quantify the problem, 3) implement containment, 4) identify possible causes, 5) develop and verify possible corrective actions, 6) implement corrective actions, 7) leverage corrective actions/learning points across all similar processes, 8) congratulate team.	
291	KJ Method	Named after Dr. Kawakita Jiro, founder of Kawayoshida Research Center. See Affinity Diagram.	CQE VIII-34
292	Knoop Hardness Testing	See Primer. See also hardness testing method summary matrix in Primer, p. VI-81.	CQE VI-79
293	Knowledge Management (or Architecture)	The set of active processes that supports organizational learning. Includes linkage of people to data (user interface or 'processing layer'), data storage devices ('data depository'), and data layer (link across different media, such as audio, video, text, and database).	CSSBB II-30
294	Kotter, J.P.	Recognized authority on organizational change. Surprisingly, recommends all five of the following responses to overcome resistance to change (in order), 1) educate and communicate the necessary change, 2) enlist employee participation in the project, 3) provide training or counseling support, 4) use manipulation to obtain support, and 5) use threats or direct force (really!).	CQM Primer II-34
295	Kruskal - Wallis test	Non-parametric test which makes a ranking evaluation by comparison with a critical value of Chi-Square. This definition is true of Mood's Median Test, The Kendall Coefficient of Concordance, and the Kruskal - Wallis test.	CSSBB VII-72/84
296	Laser Designed Gaging	See Primer. See also gage summary matrix on p. VI-63-64.	CQE VI-62
297	Lead Time	The total time a customer must wait to receive a product after placing an order. When scheduling and production system are running at or below capacity, lead time equals throughput time plus delivery time. When demand exceeds the capacity of a system, there is additional waiting time before the start of scheduling and production, and lead time equals queue time plus throughput time plus delivery time. See ***throughput time***.	Bonney, with due deference to George, Womack, Goldratt, Schook, others
298	Leading Edge	Company strategy used by companies that want to be first to market. Strategy - Product mixes include: Leading Edge - First to market; Fast follower - high quality, good price; Commodity Producer - High volume, Competetive; Trailing Edge - Customer needs the product.	CQM Primer III-15
299	Lean	Only produced what is needed, when it is needed. Relates to reducing cycle time and improving agility / flexibility. Lean thinking includes value stream mapping, spaghetti diagrams, visual control, work balance analysis, and monument identification.	CQM Handbook p.133, 141-143
300	Lean Enterprise	In summary, it is an entire enterprise involved in improvement. As Womack puts it, "make value flow."	CSSBB X
301	Level 1-4 Documents	Level 1: Quality Manual. Level 2: Procedures. Level 3: Work Instructions. Level 4: Records.	
302	Likert Scale	Ranking scale commonly used for Customer satisfaction (as in, on a scale from 1 to 5, how satisfied are you with...).	CSSBB VI-24/25
303	Liquid Penetrant Testing	Non-destructive test. See Primer.	CQE VI-72
304	Loss to Society	See also Taguchi Loss Function. $L(y) = k(y-m)^2$ where k = cost of a defective product divided by the square of the full tolerance (ex. +/- 3 tolerance = 6^2 in denominator). y = desired target. m = actual units. L(y) = Loss to society.	CQE II-104
305	Lot percent defective (LPD)	This percentage is estimated by dividing the number of defectives by the sample size and then mulitplying by 100 (ex. D / N x 100)	CQE VI-5
306	Lot Size (N)	A collection of units of similar product from which a sample is drawn and inspected	CQE VI-5
307	Lot Tolerance Percent Defective (LTPD)	Lot Tolerance Percent Defective. From the Dodge-Romig tables. See Rejectable Quality Level	CQE VI-10
308	LPD	See Lot percent defective	CQE VI-5
309	LTPD	Lot Tolerance Percent Defective. From the Dodge-Romig tables. See Rejectable Quality Level	CQE VI-10
310	Magnetic Particle Testing	Non-destructive test. See Primer.	CQE VI-70-72
311	Maintainability	See Primer definition.	CQE VII-17
312	Major Defect	This is a defect other than critical that may cause the product to fail, cause poor performance, shortened life, or prevent interchangeability. Ex. A defect in the motor that stops the car along the highway.	CQE VI-5

313	Malcolm Baldridge Award	Named after former Secretary of Commerce. Instigated through Public Law 100-107 in 1987. Purpose is to promote TQM (Total Quality Management). Emphasis is on business results. Categories include 1) Leadership, 2) Strategic Planning, 3) Customer and Market Focus, 4) Information and Analysis, 5) Human Resource Focus, 6) Process Managmenet, and 7) Business Results. See Primer for details or handbook for details.	CQE Primer p.III-12, 13 CQM Handbook p.369-371
314	Managerial Grid	Two-axis perspective of managerial attention, including task-focus on the X-axis and people-focus on the Y-axis. X-only focus shows authority focus. Y-only focus shows "country club" mentality. Strong focus on both is best. Focusing on neither means the manager is pretty much useless.	CQM Handbook p.276
315	MAR	Maintenance Action Rate (1/MTBMA)	CQE VII-17
316	Market Segmentation	See Segmentation	CQM Handbook p.209-210
317	Masaaki Imai	Guy credited with inventing kaizen process. See kaizen.	CQE VIII-4
318	Maslow's Hierarchy of needs	5 stages of needs. 1) Physiological (eat, sleep, shelter), 2) Safety (economic & physical security), 3) Belonging (acceptance by family & friends), 4) Esteem (held in high regard/status, 5) Self-actualization (to achieve one's best)	CQM Handbook p. 25
319	Material Review Board (MRB)	See MRB	CQE V-25
320	Matrix Data Analysis	Used to show the relationship between objectives and methods, results and causes, tasks and people, etc. The objective is to determine the strength of relationship between a grid of rows and columns. The intersection of the grid will clarify the problem strength.	VIII-40
321	Matrix Diagram	See Matrix Data Analysis	CQE VIII-40
322	Matrix Organization	An attempt to create a hybrid product/project approach. It shares functional specialists, and can lower costs, but can also create competing priorities.	CSSBB IV-63
323	MBTI	Myers-Briggs Type Indicator. Test that breaks out personality into four letters: (E)xtrovert vs. (I)ntrover, (S)ensing vs. I(N)tuitive, (T)hinking vs. (F)eeling, and (J)udging vs. (P)erceiving. Useful for team building as well as for ensuring that all personalities and perspectives are equally represented. Answers the questions 1) Where do you prefer to focus your attention, 2) How do you acquire information, 3) How do you make decisions, and 4) How do you orient toward the outer world?	CQM Handbook p.276
324	McGregor, Douglas	Formulated the theory X vs. theory Y model. Theory X takes a negative view of human nature, assuming that most employees do not want to work and will require continual prodding. Theory Y takes a positive view, believing that employees want to work, and will seek responsibilities that can offer solutions to organizational problems and their own personal growth. Not directly related to Theory Z (see William Ouchi).	CQM Handbook p.275
325	MDT	Mean down time	CQE VII-18
326	Mean	x-bar. The sum total of all data values divided by the number of data points.	CQE IX-14
327	Mean Maintenance Action Time (MMT)	See MMT	CQE VII-18
328	Means Matrix		CQM Handbook p.77
329	Measles Chart	Used to collect locational data. Also known as a Defect Location Checksheet. Picture of the inspected item, on which an inspector marks the location of defects using a simple check, X, or dot.	CQE VIII-21
330	Measurement Error	Error of a measuring instrument is the indication of a measuring instrument minues the true value. See Primer for a list of sources of measurement error (VI-88).	CQE VI-87
331	Measuring Instruments	see Primer, VI-41-64. For a summary of gage types, accuracy, and application, see Primer, p. VI-63-64.	CQE VI-41-64
332	Median	Middle value when the data is arranged in ascending or descending order. For an even set of data, the median is he average of the two middle values.	CQE IX-15
333	Micrometers	See Primer. See also gage summary matrix on p. VI-63-64.	CQE VI-51-52
334	Microwave Testing	Non-destructive test. See Primer.	CQE VI-78
335	MIL-STD-105E	Tables of sampling plans for attributes. Three types of sampling used include: Single Sampling- Where lots are inpsected and the decision to accept or reject is based on one sample (Table on VI-17&18). Double sampling- Where the decision to accept or reject is based on a maximum of two samples (Table on VI-19). Multiple sampling- Where the decision to accept or reject the lot is based ona maximum of seven samples. If average is known, see Dodge-Romig Tables.	CQE VI-7
336	MIL-STD-414	Tables of sampling plans for variable data.	CQE VI-7
337	Mind Mapping		
338	Minor Defect	A defect that is not likely to reduce materially the usability of the unit. Ex. A scratch on the side of a car.	CQE VI-5
339	Mission Statement	Department Mission Statements should concisely state how the strategic quality goals and need of the organization will be implemented. Should include specific quantitative goals. The Company Mission Statement should address how the company will realize its vision and strategic goals. Should also include concise statements of objectives to be achieved. See also Vision Statement.	CQE II-30
340	Mixture DOE	Special case DOE designed around mixed ingredients. The major design assumptions are similar to those in a factorial design (assumptions of independence, normalcy, & homoscedasticity). Two ingredients constitute the entire sample space. Mixture components, as a proportion, must sum to unity. The measured response is dependent upon ingredient proportions, and not on measured amounts. See also Simplex-Lattice Mixture Designs	CSSBB VIII-52
341	MMT	See Primer for equation and definition	CQE VII-18
342	Mode	Most frequently occurring number in a data set	CQE IX-15
343	Mohs Hardness Testing	See Primer. See also hardness testing method summary matrix in Primer, p. VI-81.	CQE VI-81
344	Monte Carlo Simulation	See Primer	CQE VII-31
345	Mood's Median Test	Non-parametric test which makes a ranking evaluation by comparison with a critical value of Chi-Square. This definition is true of Mood's Median Test, The Kendall Coefficient of Concordance, and the Kruskal - Wallis test. Requires a chi-square calculation.	CSSBB VII-72/84
346	MRB (Material Review Board)	Cross-functional team, often including internal and Customer experts to review the appropriateness of use for non-conforming parts.	CQE V-25

347	MSA	Measurement System Analysis (also, rarely, Manufacturing Systems Audit). See Gage Repeatability and Reproducibility (GR&R). Measurement System Analysis includes an overall evaluation of consistency/accuracy of a measurement system. GR&R is a subset of MSA.	CQE VI-96
348	MTBF	Reliability. Mean Time Between Failures	CQE VII-17
349	MTBMA	Mean Time Between Maintenance Actions (1/maintenance action rate)	CQE VII-17
350	MTTR	Maintainability. Mean time to Repair	CQE VI-19
351	Muda	Japanese for 'waste.' Includes all non-value-added activity. Specifically, 1) **O**verproduction, 2) **T**ransportation, 3) **I**nventory, 4) **M**otion 5) **C**orrection/repair, 6) **O**ver-processing, 7) **W**aiting (use the accronym O-TIM-COW). Note that the "8th waste" refers to the waste of human potential-- skills & knowledge possessed by employees that the company never offers opportunity for them to utilize.	CSSBB IX-56
352	Muda	Japanese for waste.	CQM Handbook p.138
353	Multinomial distribution	See book	CQE IX-41-42
354	Mutually Exclusive events	If event A contains no sample points in common with event B, then they are said to be mutually exclusive.	CQE IX-29
355	Myers-Briggs Type Indicator	See MBTI	CQM Handbook p.276
356	Mystery Shopper	A hired "customer" who is paid by the organization to test the system (eats in your restaurant and reports whether the food was good/timely/server smiling & helpful, etc.).	CQM Handbook p.223
357	N	See Lot Size	CQE VI-5
358	n	See Sample Size	CQE VI-6
359	National Committee for Quality Assurance	NCQA. See CQM Handbook.	CQM Handbook p.379
360	NCQA	National Committee for Quality Assurance. See CQM Primer.	CQM Handbook p.379
361	nCr	See Combinations.	CQE IX-34
362	Negative Skew	When the 'tail' of a distribution points to the left (toward the 'negative' numbers on the number line). See also Memory Jogger II (p. 72).	CQE VIII-24
363	Neutron Radiography	Non-destructive test. See Primer.	CQE VI-76
364	New Quality Management Tools	See 'Seven New Quality Management Tools.' Relations Diagrams, Affinity Diagrams, Systematic Diagrams, Matrix Diagrams, Matrix Data Analysis, Process Decision Program Charts, and Arrow Diagrams.	CQE VIII-33
365	Newman, P.R.	Co-Author of 'The Six Sigma Way.' See Pande, P.S. for more information.	CSSBB II-22
366	NGT (Nominal Group Technique)	Developed at University of Wisconsin in 1968 by Andre Delbecq and Andrew Van deVen. Limits team interactions to reduce peer pressure. See Primer for details (not often used).	CQE II-67
367	Noise factor	Factor which cannot be controlled by the designer and which can cause unknown variability, or an error in the response factor.	CSSBB XI-13
368	Nominal Data	Data consists of names or categories only. No ordering scheme is possible (ex. 17 brown, 15 red, and 11 green marbles) Central Location: Mode. Dispersion: Information only. Significance Test: Chi-Square	CQE IX-6
369	Nominal Group Technique (NGT)	See NGT	CQE II-67
370	Non-Destructive Testing	Tests that do not impair future use of a sample (VI-65). Choosing most suitable method (VI-65). Basic Techniques (VI-66). Comparison of techniques (VI-67)	CQE VI-65-80
371	Non-disclosure agreement	The non-disclosure agreement is a legal document often used between organizations to indicate htat confidentiality will be maintained.	CQA VIII-28
372	Normal distribution	Bell curve. Distribution obtained when all special causes of variation are eliminated from a process. See book for formulas, graph, and applications	CQE IX-36, VIII-23
373	Normal Inspection	The usual starting point within each inspection level. Shifting from normal to reduced or tightened inspection depends on the quality levels observed within the selected inspection level. See VI-21 for switching rules.	CQE VI-5
374	Norming	Stage 3 of team development (forming, storming, norming, & performing). Team coalesces, cooperation, willing to dialogue, conflicts reduced, focus on team objective.	CQM Handbook p. 45
375	Norton, D.P.	See also Kaplan and Balanced Scorecard. Advocated a business planning process that gives consideration to factors other than financial ones, including 1) Financial, 2) Internal Business Process, 3) Learning and Growth, and 4) Customer Perspectives. It provides more perspectives for stakeholder interests, and is referred to as the balanced scorecard.	CSSBB III-42
376	nPr	n(n-1)(n02).....(n-r+1) = n!/(n-r)!	CQE IX-33
377	OC Curve	See Operating Characteristics Curve	CQE VI-9
378	Odds	Chances favoring an event divided by the chances not favoring an event. Odds have no part in quality engineering analysis or applications.	CQE IX-25
379	On Target	See validity	CQM Handbook p. 184
380	Operating Characteristics Curve	Quantifies Alpha and Beta risk. OC Curve is a graph of the percent defective in a batch versus the probability that the sampling plan will accept that batch. The 'ideal' OC curve has zero alpha or beta risk (see VI-9 & 10 for examples, VI-11 for equation, Appendix Table II for values).	CQE VI-9
381	Operation	An activity or activities performed on a product by a single machine. Constrast with ***process***.	*Lean Thinking* J. Womack
382	Operational Availability	Ao. See Primer for equation	CQE VII-18
383	Optical Comparators	See Primer. See also gage summary matrix on p. VI-63-64.	CQE VI-62
384	Optical Flats	See Primer. See also gage summary matrix on p. VI-63-64.	CQE VI-61

385	Ordinal Data	Data is arranged in some order but differences between values cannot be determined or are meaningless (ex. Number of low, middle, and high income consumers using a product) Central Location: Median. Dispersion: Percentages. Significance Test: Sign or Run Test.	CQE IX-6
386	Organizational Learning	Creation, assimilation, application, and disemination of knowledge within a company.	CSSBB II-30
387	Organizational Memory	Stored information from a Firm's history.	CSSBB II-30
388	Original Quality Tools	See 'Seven Original Quality Management Tools.' Cause-and effect diagrams, flow charts, checksheets, histograms, control charts, paretor charts, and scatter diagrams (see problem solving chart in Primer). See Problem Solving Steps in Primer.	CQE VIII-11, 12
389	Orthagonal Arrays	Fractional factorial designs that cannot take into account interactions. Developed by Taguchi.	CSSBB XI-19
390	Ouchi, William	Formulated the theory Z model, which refers to a Japanese style of management characterized by long-term employement, slow promotions, considerable job rotation, consensus-style decision making, etc. Not directly related to Theory X vs. Theory Y (see McGregor, Douglas).	CQM Handook p.275
391	P(A + B)	Probability of A or B. See P(A U B)	CQE IX-30
392	P(A ∩ B)	P(A ∩ B) = P(A) x P(B I A). Multiplicative law applies.	CQE IX-31
393	P(A ∩ B)	Probability of A and B. See P(A ∩ B)	CQE IX-31
394	P(A I B)	Conditional probability of event A given that B has occurred. P(A I B) = P(A ∩ B) / P(B). Note that if P(A I B) = P (A) then the two events are independent (ex. Die roll and coin flip). If not equal, the two events are dependent (ex. Rain and cloudiness).	CQE IX-28
395	P(A U B)	P(A U B) = P(A) + P(B) - P(A ∩ B) = Probability of A or B. Additive law applies.	CQE IX-30
396	P(E)	Probability that an event will be observed. P(E) =n_e/N (that is, the probability that the Event will occur equals the number of observations of the event, divided by the Number of times the experiment is repeated).	CQE IX-26
397	P(E_t)	P(E_t) = P(E_1) + P(E_2) + P(E_3) + ….	CQE IX-26
398	P(n,r)	see nPr	CQE IX-33
399	P_a	Sampling. Probability of Acceptance.	CQE VI-11-14
400	Paired t-test	See summary table on p. XI-31	CQE XI-31
401	Pande, P.S,	Co-author, along with Newman and Cavanaugh, of 'The Six Sigma Way.' Describes three separate 'valid' reasons for companies not embracing Six Sigma. These include, 1) Company currently employs an effective improvement method, 2) Current changes are currently overwhelming company resources, and 3) Potential gains are not sufficient to fund Six Sigma.	CSSBB II-22
402	Parameter	A population value (as opposed to a Statistic, which is a sample value).	CSSBB VI-12
403	Pareto Chart	Specialized forms of column graphs. Used to prioritize problems so that the major problems can be identified. Named after Vilfredo Pareto (1848-1923). Graphic display of the principal of the 'vital few' and the 'trivial many' (also called the 80-20 rule). See also Memory Jogger II (p. 95-104)	CQE VIII-31-32
404	PDCA	Plan-Do-Check-Act. See Shewhart Cycle.	CQE VIII-3, 4
405	PDPC	See Process Decision Program Chart	CQE VIII-38
406	PDSA	Plan-Do-Study-Act. See Shewhart Cycle.	CQE VIII-3, 4
407	Perceptual Map	A specialized matrix diagram that captures the perceptions of the customer. An alternative to QFD (uses a Likert scale, if anyone cares).	CSSBB III-40
408	Performance Index	PI = (purchased costs + nonproductive costs) / (purchased costs)^2	CQM Handbook p.252
409	Performing	Stage 4 of team development (forming, storming, norming, & performing). Team has matured, smooth cohesive unit, focus on process, feelings of satisfaction, achieving goals.	CQM Handbook p. 45
410	Permutations	An ordered arrangement of n distinct objects is called a permutation. The number of ways of ordering n distinct objects taken r at at ime is designated by the symbol nPr or P(n,r) or P^n_r. Calculated as n!/(n-r)!. Permutations take order into account, therefore the items ABC, ACB, CAB, CBA, BAC, and BCA are all counted as different.	CQE IX-33
411	PERT (Program Evaluation and Review Technique)	Accronym for Program Evaluation and Review Technique. Event-oriented project management tool. Uses Critical Path formula. See Primer for equations, advantages, and disadvantages. Activity Network Diagram (AND) is a simpler version of the CPM, which in turn is simpler than the PERT method. AND plus time equals CPM. Add pessimistic, expected, and optimistic times for each activity, and you get a PERT. Critical Path is the longest amount of time from 1st to last task. Slack time is available time for steps not on the critical path. Sink point is where more than one activity comes into an activity. Burst point is more than one path leaving an activity. Crashing is throwing extra resources at an event to reduce time.	CQE II-48 - 49
412	Plug Gages	See Primer. See also gage summary matrix on p. VI-63-64.	CQE VI-57
413	Pneumatic Gages	See Primer. See also gage summary matrix on p. VI-63-64.	CQE VI-59-60
414	P^n_r	see nPr	CQE IX-33
415	Poisson distribution	See book for formulas, graph, and applications. Table on CQE XII-3	CQE IX-37, 41-42
416	poka-yoke	Japanese for 'mistake-proof'	CSSBB IX-56
417	Polymodal	Same as a bimodal distribution, except with more than two humps. See also Memory Jogger II (p. 72).	CQE VIII-24
418	Porter, Michael	Developed the Five Forces of Competetive Strategy	CSSBB III-42
419	Positive Skew	When the 'tail' of a distribution points to the right (toward the 'positive' numbers on the number line). See also Memory Jogger II (p. 72).	CQE VIII-24
420	Postaudit	Full review of a project things gone right and things gone wrong in order to learn and apply project experiences to the future (no reinventing the wheel, and no falling into the same pits twice).	CQM Handbook p.345-6
421	Power	1 - β. See Consumer's Risk.	
422	Pp	See Process Capability	CQE X-2-6
423	Ppk	See Process Capability	CQE X-2-6
424	Pr	Inverse of Pp. See Process Capability.	CQE X-3

425	Precision	See reliability.	CQM Handbook p. 184
426	prEN 9000-1	See AS9100	CQM Handbook p.379
427	Primary Metrics	Define Phase. Include such items as conformance quality, color range, and average age of receivables. See also Secondary or Consequential Metrics.	CSSBB V-20
428	Prioritization Matrices	Similar to Matrix Data Analysis. See Memory Jogger II (p. 105-114).	CQE VIII-44
429	Probability	The mechanism by which we take statistics and begin to make inferences about a population. Mathematically, probability is the ratio of the chances favoring anevent to the total number of chances both for and against the event. Probability is always expressed as a ratio.	CQE IX-25
430	Problem Solving Methods	ISO 4.14.1.1 states that 'When an internal or external nonconformance occurs, a supplier shall use a disciplined problem solving methodology. In the case of an external nonconformance, the supplier shall further respond in a method prescribed by the customer.' 7 steps include, 1) Identify problem, 2) List the possible root causes, 3) Search most likely root causes, 4) ID potential solutions, 5) Select and implement a solution, 6) follow up to evaluate the effect, 7) standardize (CQM Handbook p. 116-117). 1-4 = Plan, 4 = Do, 6 = Check, and 7 = Act. 1 = Recognize, Define, and Measure, 2 - 3 = Analyze, 4 - 5 = Improve, 6 - 7 = Control & Validate.	CQE VIII-48
431	Problem Statement	Define Phase. Should detail the issue that the team wants to improve, as well as a baseline metric and the anticipated improvement in that metric.	CSSBB V-4 & 21
432	Procedures	Level 1: Quality Manual. Level 2: Procedures. Level 3: Work Instructions. Level 4: Records.	CQM Handbook p.153
433	Process	A series of individual operations required to create a design, completed order, or product.	*Lean Thinking* J. Womack
434	Process Capability	Cp, Cpk, Pp, and Ppk. Cp = (USL-LSL)/6σ-hat (where σ-hat = estimated standard deviation (R-bar/d_2)). Cpk = the lesser of Cp_{upper} and Cp_{lower} (Cpl = (X-bar-LSL)/3σ-hat, and Cp_u = (USL-X-bar) / (3σ-hat). Pp and Ppk use identical formulas to Cp and Cpk except with actual, calculated σ instead of estimated σ-hat. See Memory Jogger II (p. 132-136).	CQE X-2-6
435	Process Decision Program Chart	Used to chart the course of events that will take us from a start point to our final complex goal. Various events are charted and contingencies are planned for based on uncertainty of obtaining intermediate goals. Similar to contingency planning or risk management. May be developed by using a Gantt chart along with the question 'what if' associated with each step. Primarily used for new, unknown processes.	CQE VIII-38
436	Process Flow Chart	Flow followed by product, containers, paperwork, operators actions, or an administrative (transactional) procedure. Excellent starting point for process improvement, since it helps show waste points and points where measurements may be taken. See Primer for example and definitions for certain shapes. For shapes, see also CQM Handbook p.149.	CQE VIII-16-18
437	Process Mapping	See Process Flow Chart	CQE VIII-16-18
438	Producer's Confidence	1 - α. Also called Confidence. See Producer's Risk	CQE VI-6
439	Producer's Risk (alpha risk, or α)	Also called Type I risk, alpha risk, or level of significance. Only comes into play if we reject the null. May cause me to change my process unnecessarily. The probability of rejecting a good lot. 1 - α = Producer's Confidence. See also Consumer's Risk. Note: alpha may be calculated for a designed experiment as follows: Full Factorial Designed experiment alpha = $(2^k)^{1/4}$, where k = number of factors.	CQE VI-6
440	Project Charter	Define Phase. Designed to help the team focus on the correct problem, align the solution toward organizational goals, and help ensure Champion support.	CSSBB V-2 & 5
441	Project Management	Includes planning, scheduling, and controlling a series of activities and tasks with a specified objective, starting and ending dates, and resources.	CSSBB IV-4/5
442	Pull	A lean organization produces only what the customer required, at a rate determined by a "takt time," the number of hours available for production divided by the number of units needed to satisfy customer demand. Establish the content of each job so that you can deliver on this schedule. This pace represents the "pull" of the customer" (Society of Manufacturing Engineers).	SME
443	Pulse Echo	Non-destructive test. See Primer.	CQE VI-69
444	QCO	Quick Change-Over. Requires 5-S, standardized work, separating internal and external processes (those that can be done while the machine is still running vs. what must be done when machine is shut down). See SMED (Single Minute Exchange of Dies). Move as much internal time as possible to external time. Then minimze internal time.	
445	QFD	Quality Function Deployment. Developed by Ishikawa for the Kobe Shipyard to pass along the characteristics of Quality to the product development team. See Axiomatic Design Theory. Hauser suggests the following sequence to capture customer needs in design, 1) engineering characteristics, 2) parts characteristics, 3) key process operations, 4) production requirements.	CSSBB XI-11
446	QFD (Quality Function Deployment)	Tool that is sometimes referred to as "the voice of the Customer" or as the "House of Quality." The process to ensure that the customer's wants and needs are heard and translated into technical characteristics. Includes a cross-functional team of sales, marketing, design engineering, manufacturing engineering, and operations. First applied in Kobe shipyards in 1972 by Yoyi Akao and Associates. See Primer for more details. Its real strength is in bringing people together with the information they need.	CQE III-39 CQM Handbook p.237
447	QIS (Quality Information System)	See Primer for details.	CQE II-56 -59
448	QS-9000	This standard applies to the automotive industry, and was developed by the "Big Three" automotive manufacturers (Chrysler, Ford, and General Motors). Incorporates teh requirements of ISO 9001:1994 and additional requirements for quality management system attributes of business planning, advanced product quality planning (APQP), satisfaction, and continuous improvement. An international standard (ISO/TS 16949) for the auto industry has also been developed,and incorporates the QS-9000 requirements plus a few additions (ex. the need for measuring employee satisfaction).	CQM Handbook p.379

449	QSRMD	See Quality System Regulations for Medical Devices	CQM Handbook p.379
450	Quality (Definition)	ASQ defines Quality as "the totality of features and characteristics of a product that bear on its ability to satisfy a given need." See also definitions by Juran (Fitness for use), Deming, Crosby (Conformance to requirements), and Feigenbaum (The total composite product and service characteristics of marketing, engineering, manufacturing and maintenance through which the product and service in use will meet the expectations of the customer). Per TS-16949, "the degree to which a set of inherent characteristics fulfils requrirements")	CQE II-3
451	Quality Characteristics	Definitions of terms, see Primer p. V-2-3. List of Product and Service Characteristics, p. V-4. Product and Process Characteristics, p. V-5.	CQE V-2-5
452	Quality Circle	Dr. Kaoru Ishikawa. Bottom-up approach. See Primer.	CQE II-20
453	Quality Control Management	Emphasized by Feigenbuam (USA) and Ishikawa (Japan) in the early 1980s.	CSSBB II-40/43
454	Quality Council	Team for guiding continuous quality improvement. Should be cross-functional, but may take place on any level of the organization (although most commonly focused on upper management).	
455	Quality Determinants	See Primer for a list of items which help to determine quality in the categories of 'Products' and 'Services'	CQE II-3
456	Quality Documentation System	Quality documentation heirarchy includes Level I through Level IV documents. See Primer for definitions.	CQE III-14
457	Quality Function Deployment (QFD)	See QFD. See also House of Quality.	CQE III-39
458	Quality Management Principles	Per TS-16949 and ISO-9000:2000, the eight quality management principles include: Customer focus, Leadership, Involvement of people (empowerment, motivation, etc.), Process approach, System approach to management, Continual improvement, Factual approach to decision making, and Mutually beneficial supplier relationship.	TS-16949
459	Quality Management Standards	ANSI/ASQ standards for everything from QM/QA, to systems guidelines, statistics, etc. See Primer for extensive list.	CQE III-30-31
460	Quality Management Tools	See 'Original Quality Tools' and 'New Quality Tools.'	CQE VIII-11, 12; VIII-33
461	Quality Manual	Provides, in writing, a description of the organization and the policies of the qualtiy assurance system. See Primer for list of items usually included in the manual.	CQE III-15
462	Quality Plan	See Primer	CQE II-36-37
463	Quality Policy	Top management's formally stated intentions and direction for the organization pertaining to quality. Per the CQA Primer, Section III, the principal perpose of a Quality Policy Statement is to define the company's interest in quality of products and services.	CQM Handbook p.457
464	Quality System Regulation for Medical Devices	The Food and Drug Administration (FDA) updated the Good Manufacturing Practices requirements 21 CFR Part 820 used to regulate manufacturers of medical devices to include the ISO 9001 standard requirements. Two quality models used in healthcare include JCAHO and NCQA	CQM Handbook p.379
465	Quality Teams	See Primer for details.	CQE II-63
466	Quality Tools	See 'Seven Original Quality Tools'	CQE VIII-11
467	Quality Value/ Execution Matrix	See Primer. Matrix explains relationships of doing right or wrong, the right or wrong way.	CQE III-11
468	r	Used in regression analysis. Correlation coefficient. As correlation decreases (scatter increases), r^2 decreases as well.	CSSBB VII-18
469	Radar Charts	See Memory Jogger (p. 131)	
470	Radiography	Non-destructive test. See Primer.	CQE VI-76
471	Random Number Table	Example in Primer, p. VI-8	CQE VI-8
472	Range	The difference between the smallest and largest values in a set of data.	CQE IX-17
473	Ratio Data	An extension of the interval level that includes an inherent zero starting point. Both differences and ratios are meaningful (ex. Product A costs $300 and product B costs $600 (B is 2x the cost of A)). Central Location: Geometric or Harmonic Mean. Dispersion: Percent Variation. Significance Test: t-test, F-test, Correlation Analysis.	CQE IX-6
474	R_e	See Reject Number	CQE VI-6
475	Record Retention	Per ISO 9001:1994, Section 4.16, "Retention times of quality records shall be established and recorded." No specific durations are required.	CQA VI-15/16
476	Recording Checksheet	Used to collect measured or counted data. See Checksheets, or Primer example.	CQE VIII-19-20
477	Reduced inspection	Switching to reduced inspection is usually done when quality levels are observed to be getting better. See VI-21 for switching rules.	CQE VI-6
478	Reengineering	Compliment to kaizen. Neither better nor, debatably, worse. -- The fundamental rethinking and redesign of operating processes and organizational structure, focused on the organization's core competencies to achieve dramatic improvements in organizational performance (Lowenthal, 1994). -- The fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical contemporary measures of performance, such as cost, quality, service, and speed (Hammer, 1994).	CQE VIII-9, 10
479	Reject number (R_e)	The number of defectives that (if found in a random sample) dictates rejection of the entire lot and returns it for screening (or 100 percent inspection)	CQE VI-6
480	Rejectable Quality Level (RQL)	This defines unsatisfactory quality. In the Dodge-Romig plans, the term 'lot tolerance percent defective (LTPD) is used instead of RQL. The probability of accepting a RQL lot should be low. May also be known as consumer's risk in some tables (standardized at 0.1)	CQE VI-10
481	Relations Diagram	Shigeru, 1988. See Interrelationship Digraph.	CQE VIII-42
482	Reliability	See MTBF	CQE VII-17
483	Reliability	Same as repeatability, precision, spread. Measure of how closely grouped a sample is (ideal process capability, or Cp). Not to be confused with reproducibility.	CQM Handbook p. 184
484	Reliability Terms	See definitions in Primer	CQE VII-27

485	Repeatability	See reliability.	CQM Handbook p. 184
486	Reproducibility	See validity	CQM Handbook p. 184
487	Resolution (for DOEs)	Resolution II = confounding of the main effects (Factors). Resolution III = Confounding between Factors and two-factor interactions. Resolution IV = Confounding between Factors and three-factor interactions, plus confounding between 2 f.i. Resolution V = Confounding between Factors and 4 f.i., plus 2 f.i. with 3 f.i.	CSSBB VIII-4,8,18
488	Resonance	Non-destructive test. See Primer.	CQE VI-70
489	Response Surface Designs		
490	Revolutionary Improvement	Steep rate of improvement. Often necessary in highly competetive markets (technology). Better than 'Evolutionary Improvement.' However, see 'Breakthrough Achievement.'	CQE VIII-8
491	Ring Gages	See Primer. See also gage summary matrix on p. VI-63-64.	CQE VI-57
492	Risk Management	Handbook definitions include 1) The formal process by which risk factors are systematically identified, assessed, and provided for, 2) A formal, systematic method of managing that concentrates in identifying and controlling areas or events that have a potential of causing unwanted change, and 3) In the project context, is the art and science of identifying, analyzing, and responding to risk factors throughout the life of a project and in the best interest of its objectives. See also CQM Primer VII-69.	CQM Handbook p.343 CQM Primer p.VII-69
493	Robustness	Insensetivity to variation. When statistics from a procedure are not affected by moderate deviations from theoretical expectations.	CQE IX-20
494	Rockwell Superficial Hardness Testing	See Primer. See also hardness testing method summary matrix in Primer, p. VI-81.	CQE VI-79
495	RQL	See Rejectable Quality Level	CQE VI-10
496	Run Charts	See trend analysis. See also Memory Jogger II (p. 121).	CQE VIII-6
497	s	Sigma. See Standard Deviation. σ is calculated mathematically as sqrt($(\Sigma(X-\mu)^2/N)$	CQE IX-17
498	S/N Ratio	Noise factors are not controllable by the designer. Signal (mean) may be desired to be large, small, or close to some normal value. A smaller S/N ratio is desirable when shrinkage, wear, or deterioration concerns are at issue. A high S/N ratio is desirable when life, strength, or fuel efficiency are concerns. An average S/N ratio is desirable with clearness or weights.	CSSBB XI-13
499	Sample percent defective	Number of sample defectives divided by the sample size and then mulitplied by 100 (d/N x 100)	CQE VI-6
500	Sample Size (n)	One or more units selected at random from a lot without regard for their quality	CQE VI-6
501	Sample size break-even point	See Sampling Costs	CQE VI-4
502	Sampling	Principles (VI-2), Advantages vs. disadvantages (VI-2), Precautions (VI-3), terms and definitions (VI-5-6)	CQE VI-2-6
503	Sampling Costs	TC = A + Bn_{max} + Cn-bar where TC = Total Cost, A = Overhead costs, B = Cost/unit of sampling, n_{max} = Max sample size, C = Cost/unit of inspecting, and n-bar = Average sample size. No Inspection: Total Cost = NpD where N = number of items/lots, p = % defective in lot, and D = Cost if a defective passes. 100% Inspection: Total Cost = NC where N = number of items/lots, and C = Inspection cost/item. Sampling: Total Cost = nC + (N-n)pDP_a + (N-n)(1-P_a)C, where N = Number of items/lots, n = Number of items/sample, C = Inspection cost/item, p=% defective in lot, D=Cost if a defective passes, and Pa=Probability of acceptance. Sample Size Break-Even Point: D/C where D = Cost if a defective passes, and C = Inspection cost/item.	CQE VI-4
504	Sampling errors	In sampling we never know whether the lot is good or bad. We only know what the sampels tell us. See the Lot Quality Decision Matrix (alpha and beta risk matrix)	CQE VI-6
505	Sampling Plan	For attribute data, consists of Sample Size (n), the Accept number (A_c), and the Reject number (R_e)	CQE VI-6
506	Sampling Tables	See MIL-STD-105E (attribute sampling plan which includes single sampling, double sampling, and multiple sampling (VI-6). Also, MIL-STD-414 (ANSI/ASQ Z1.9) sampling plans for variables. Dodge-Romig tables are attribute plans for effective sampling inspection when the process average is known. Sequential Sampling (VI-33). For a matrix of attribute and variable sampling plans, their sampling types, applications, and key features, see Primer, p. VI-35.	CQE VI-6
507	Scatter Diagram	Graphic display of many data points which represent the relationship between two different variables. See Correlation Coefficient. See also Memory Jogger (p. 145-149).	CQE VIII-27
508	SDE	Statistically Designed Experiments. Most widely pushed by Taguchi. Assumes independence, normalcy, & homoscedasticity. Methodology includes 1) Set objectives, 2) select process variables, 3) select an experimental design, 4) execute the design, 5) verify the data, 6) analyze and interpret results, and 7) present the results. It is vital to have the right team develop the experiment, or the following errors could be made: 1) unwarranted assumptions made about the process, 2) undesireable combinations of factors selected, 3) violation of the known laws of physics, 4) too large or small design sizes, 5) inappropriate confounding, 6) imprecise measurement, 7) unacceptable prediction error, or 8) undesireable run order. Objectives may include 1) response surface determination, 2) screening objectives, 3) comparative objectives, or 4) optimal mixture proportions (among others).	CQE XI-50-70
509	Secondary Metrics	Define Phase. Same as Consequential Metrics. Include such items as Defects per Unit and Technical Support.	CSSBB V-20
510	See page 136 - 140 of CQM Handbook for definitions to add to this sheet		
511	Segmentation	See CQM Handbook for definitions and concepts, including no segmentation, complete segmentation, various single segmentations, segmentation by multiple criteria, patterns, homogenous preferences, diffused preferences, clustered preferences, etc..	CQM Handbook p.209-210
512	Service Quality	The single most important form of quality.	
513	Seven Deadly Diseases that management must cure	See Deming (Dr. W. Edwards)	CQE II-15

514	Seven New Quality Management Tools	Relations Diagrams, Affinity Diagrams, Systematic Diagrams, Matrix Diagrams, Matrix Data Analysis, Process Decision Program Charts, and Arrow Diagrams.	CQE VIII-33
515	Seven Original Quality Tools	Cause-and effect diagrams, flow charts, checksheets, histograms, control charts, paretor charts, and scatter diagrams (see problem solving chart in Primer). See Problem Solving Steps in Primer.	CQE VIII-11, 12
516	Sharma, A	Along with Moody, co-authored the book, "The Perfect Engine: How to win in the new economy by building to order with fewer resources' (just rolls of the tongue, doesn't it?). See definition of Standard Work	CSSBB X-44
517	σ-hat	Estimated σ value (as opposed to calculated σ). See also Memory Jogger II (p. 136).	CQE X-3
518	Shear Test	See Primer	CQE VI-82
519	Shewhart Cycle	Plan-Do-Check-Act. Continuous improvement technique. Same as Deming Cycle, PDSA Cycle (Plan-Do-Study-Act), or PDCA Cycle. Invented by Walter Shewhart, but popularized by W. Edwards Deming in Japan.	CQE VIII-3, 4
520	Shewhart, Dr. Walter	Best known for his development of Control Charts and the Plan-Do-Check-Act cycle.	CQE VIII-3, 4
521	Shore Scleroscope Hardness Testing	See Primer. See also hardness testing method summary matrix in Primer, p. VI-81.	CQE VI-80
522	SI	System International D'unites (VI-37). For a list of SI system units, see Primer, p. VI-39	CQE VI-37-39
523	Sigma Levels	6-Sigma = 3.4 PPM. 5-Sigma = 233 PPM. 4.5-Sigma = 1350 PPM. 4-Sigma = 6210 PPM. 3-Sigma = 66800.	CSSBB XII-12
524	Signal Factor	Action used to obtain a response	
525	Significance (level of)	Also called Alpha risk. See Producer's Risk. The probability of rejecting the null hypothesis when it is true.	CSSBB VII-22
526	Simple Event	Deals with probability. A simple event cannot be decomposed. Example: A coin must be either Heads or Tails. I die rolled will be either 1, 2, 3, 4, 5, or 6. No compounding is occuring.	CQE IX-26
527	Simplex-lattice Mixture Designs	Designed experiments characterized by regression functions that are referred to as cononical polynomials. Like any Mixture DOE, proportions must total 1.0. There is no requirement that the same replicate number of tests results exist for all test conditions. The number of design points (Y) is calculated as (q + m -1)! / m! (q-1)!	
528	Sine Bar	See Primer. See also gage summary matrix on p. VI-63-64.	CQE VI-55-56
529	Sink Point	See PERT diagram	CQE Primer p.II-48 - 49
530	SIPOC / SIPOOC	Accronym for Suppliers, Inputs, Process, Outputs, Customers. A business model that helps everyone within the company see the company from an overall process perspective by 1) providing a framework applicable to processes of all sizes, 2) displaying cross-functional activities in simple terms, and 3) helping to maintain a big business picture. When applied at a Strategic level, an additional "O" may be included to evaluate desired Outcomes (Suppliers, Inputs, Process, Outputs, Outcomes, Customers)	CSSBB III-5 & 6
531	Slack Time	See PERT diagram	CQE Primer p.II-48 - 49
532	SMART	Acronym for a tool Specific, Measurable, Achievable, Relevant, and Timely. Often used for problem solving, goal setting, etc.	
533	SMED	Single Minute Exchange of Dies (see Primer for case study)	CQE VIII-5
534	SMED	Concept of performing a change-over in a 'single digit' of time. That is, 9 minutes or less. 'single minute' is somewhat of a misnomer.	CSSBB X-45 & 56
535	Sonodur Hardness Testing	See Primer. See also hardness testing method summary matrix in Primer, p. VI-81.	CQE VI-80
536	Spearman Rank Correlation Coefficient	Non-parametric test which makes a ranking evaluation through the determination of a r_s value.	CSSBB VII-72/84
537	Special Causes	Generally only about 20% of causes. Caused by a unique reason. Can be addressed on a case-by-case basis. May be operator dependent.	
538	Sponsor	Team initiators, resource supports, boundary managers, and coaches. Generally not on the team.	
539	Spread	See reliability.	CQM Handbook p. 184
540	σ_r	See σ-hat	CQE X-3
541	Stages of Creativity	See Creativity Stages	CQM Handbook p.120-121
542	Stakeholders	Stakeholders in a company project include 1) stockholders and owners, 2) management and employees, 3) suppliers, 4) customers, and 5) society. See ISO-9000 -1, Section 4-2 (Shareholders and their expectations).	CQM Primer III-10/11
543	Standard Deviation	σ for population, S for a sample. The square root of variance.	CQE IX-18-19
544	Standard Work	According to Sharma (2001), standard work is 'the best combination of machines and people working together to produce a product or service at a particular point in time.'	CSSBB X-44
545	Static Data	Summary data (not in time sequence). Opposite of Dynamic Data.	CQE VIII-6
546	Statistic	A Sample value (as opposed to a Parameter, which is a population value).	CSSBB VI-12
547	Stem and Leaf Plots	Effectively a histogram made up of the actual values, rather than simple bars. Has the same benefits as a histogram, but without losing the actual data. See CQE Primer for example. See also Memory Jogger II (p. 74).	CQE IX-23,24
548	Stochastic variation	Random variation.	CSSBB VII-58
549	Storming	Stage 2 of team development (forming, storming, norming, & performing). Individualistic thinking, tug of external loyalties, fluctuating attitudes, confrontations, team's task sinks in	CQM Handbook p. 45
550	Stress-Strength Interference	See Primer	CQE VII-29-30
551	Supplier Certification Process	1) Develop certification process (selection, evaluating, rating, communication, and reaction processes) 2) Identification of supplier categories for which certification would be advantageous. 3) Evaluation of selected suppliers against defined criteria 4) Reporting of evaluation results, awarding of certification for those who qualify, and clarification of future interrelated processs (ex. supplier reporting requirements). 5) Ongoing monitoring of supplier performance, with actions taken in accordance with the defined certification process.	CQM Handbook p.251

552	Supplier Communication Requirements	See CQM Handbook list for quote requirements, product technical req., process req., product verification and traceability req., quality system req., delivery, order, corrective action requirements, etc.	CQM Handbook p.247
553	Supplier performance	May be measured using Past Performance Index (PPI), Supplier performance index (SPI), Commodity Performance Index (CPI), Quality Performance Index (QPI), and/or Delivery Performance Index (DPI). See also Performance Index (PI).	CQM Handbook p.252
554	Supplier Quality Audits	See Primer for multiple categories and areas of concern	CQE III-59
555	Supplier Selection Criteria	Consider product, financial, technology, service capabilities, quality philosophy, management/leadership philosophy, growth potential, stability, geography, etc. It's more than just low cost (see Deming's 14 points).	CQM Handbook p.245-246
556	Surface Plates	See Primer. See also gage summary matrix on p. VI-63-64.	CQE VI-48
557	Surveys	Only moderately useful (often subjective, skewed toward the negative, skewed by regional personalities, and minimally useful with "thrilling" information). Various methods of surveys, including written/mail surveys, telephone surveys, in-person interviews, focus groups, customer councils, joint planning meetings, panels, comment cards/suggestion boxes, observation, mystery shoppers, and listening posts. See CQM Handbook for details.	CQM Handbook p.219-223
558	SWOT	Acronym for Strengths (internal, good), Weaknesses (internal, bad), Opportunities (external, good), and Threats (external, bad). Method used by companies to evaluate themselves and plan a strategy. Primary weakness is objectivity when the SWOT is being performed (voiced by Goodstein, Bowman, & Porter)	CSSBB II-29
559	$S_{x\text{-}bar}$	$S_{x\text{-}bar} = \sigma / \sqrt{n}$. See Central Limit Theorem	CQE IX-13
560	Systematic Diagram	Systematic method to outline all the details needed to complete a given objective. It is an orderly structure similar to a family tree chart or an organization chart. Organization is by levels of importance. Suspiciously similar to the cause-and-effect diagram process, except starts with the 'whys' and moves toward the 'hows.'	CQE VIII-36
561	Tacit Knowledge	Knowledge that resides in the minds of employees, but not in a database (also less formally referred to as 'tribal knowledge.'	CSSBB II-30
562	Taguchi (Dr. Genichi) 1924 -	Best known for the Taguchi Loss Function (financial loss to society after an article is shipped), and Designed Experiments (DOE). His system began with optimizing the design of products and processes. His tools tell us how to make something happen (proactive) versus responding to things that have already happened. Also performed work on signal-to-noise ratio.	CQE II-23-24
563	Taguchi Loss Function	Theoretical quadratic (or parabolic) relationship that calculates loss to society due to poor quality products. See Primer for equation and example. See also Loss to Society for equation.	CQE II-104
564	Takt Rate	Takt is the German word for "beat" or "metronome". Mathematical calculation; the rate of customer demand divided by the the available production time. Note that by definition takt rate is a measure of units per time (eg. 3 parts per day). Not to be confused with takt time, the inverse of takt rate, which measures time per unit (eg. 8 hours per part). For a comparison of related definitions, see Takt Time, Cycle Time, Exit Rate, and Throughput Time	
565	Takt Time	Takt is the German word for "beat" or "metronome". Mathematical calculation; the available production time divided by the rate of customer demand (Womack). Note that by definition takt time is a measure of time per unit (eg. 8 hours per part). Not to be confused with takt rate, the inverse of takt time, which measures units per time (eg. 3 parts per day). For a comparison of related definitions, see Takt Rate, Cycle Time, Exit Rate, and Throughput Time	*Lean Thinking* J. Womack
566	Taylor, Frederick	One of the first contributors to the scientific theory of management, which had the aim of finding the one best way to perform a task so as to increase productivity. He emphasized efficiency, not satisfaction, of workers. He did this by breaking a job down into small-task components that could be studied to find the more efficient way of doing it.	CQM Handbook p.274
567	TC	Total Cost (see Sampling Costs)	CQE VI-4
568	Tchebysheff's Theorem	Given a number K greater or equal to 1 and, for any set of n measurements, at least $(1\text{-}1/K^2)$ of the measurements will lie within K standard deviations of their mean. This applies to any set of measurements, regardless of the shape of the distribution. See also Camp-Meidel extension.	CQE IX-20
569	Team Approach	See Primer for details.	CQE II-63
570	Team Leader	Organizes and leads meetings. Updates sponsors/steering committees. Supports factors for effective teamwork.	
571	Team Operating Guidelines	Breakdown of topics and definitions in Primer.	CQE II-75
572	Team Phases	See forming, storming, norming, and performing	CQM Handbook p. 45
573	Team Problem-solving Techniques	See Primer for details.	CQE II-65
574	Technical Assessment	A technical assessment of an organization is targeted at a functional area, process, or practice. An assessment might be done to 1) identify strengths and weaknesses of a company, 2) establish a baseline for the selected business process, or 3) evaluate safety programs and potential risks and liability losses. Assessment would evaluate finances, R&D, and overall business practices.	CQM Primer III-26/28
575	Technical Drawings	Blueprints. See GD&T	CQE V-27
576	Televised X-Ray (TVX)	Non-destructive test. See Primer.	CQE VI-77
577	Tensile Test	See Primer	CQE VI-82
578	Terrorist	Term used for a former customer who turns on you after a negative experience.	CQM Primer V-37
579	Testing Types	Nondestructive testing comparison matrix (VI-67). List of tests is extensive in Primer (VI-63-80)	CQE VI-65-80
580	Testing/Training Designs	Models for proving training effectiveness are listed in the Primer.	CQM Primer VIII-29-30
581	TGW / TGR	Things Gone Right / Things Gone Wrong. See Post Audit	CQM Handbook p.345-6
582	Theory of Constraints	See TOC	CSSBB X-2/6
583	Theory X vs. Theory Y	See McGregor, Douglas	CQM Handook p.275

584	Theory Z	See Ouchi, William	CQM Handook p.275
585	Third Wave of the industrial revolution	See Deming (Dr. W. Edwards)	CQE II-14
586	Three-Wire Method	See Primer. See also gage summary matrix on p. VI-63-64.	CQE VI-58-59
587	Through Transmission	Non-destructive test. See Primer.	CQE VI-69
588	Throughput Time	In curricula that include Lean, Six Sigma, and Theory of Constraints Bodies of Knowledge, Throughput time refers to the end-to-end time for a product to move from the start to the end of a process (ie. the sum of the time to complete step 1, plus time to complete step 2, plus..., plus time to complete step Last). This is differentiated from Cycle Time, which generally refers to the time from when a product enters one step in the process until the time it enters the next step in the process. Note that Throughput Time, Cycle Time, Lead Time, and Exit Rate are terms that are very often confused in conversation and should be very clearly defined when discussing. Also, Throughput Time should be differentiated from "Throughput" in pure ToC, which technically refers to a financial metric. Additional and conflicting definitions can be found from many reputable sources (two cited below for reference). "The time required for a product to proceed from concept to launch, order to delivery, or raw materials into the hands of the customer. This includes both processing and queue time. Contrast with processing time and lead time" (Womack). "The comparison between the processing times and the takt time (calculated as Available Capacity/Customer Demand) is a preliminary measure of the value and waste. This takt time is mostly used as an ideal time for each operation to achieve (ideally, the cycle time for each operation should be the takt time)" (Ohio State University).	*Bonney, with due deference to George, Womack, Goldratt, Schook, others*
589	Tightened Inspection	Switching to tightened inspection is usually done when quality levels are observed to be getting worse. See VI-21 for switching rules.	CQE VI-6
590	TL 9000	See CQM Handbook	CQM Handbook p.379
591	TOC	Theory of Constraints. Body of knowledge / CPI approach which emphasizes that the constraint in any process determines the overall productivity of the process. The corollary of this thinking model is that any improvements that do not impact the system constraint cannot improve overall productivity. Per the Indiana Quality Council, "Involves concepts such as maximizing throughput, the requirement of continuous improvement, and the concept of system thinking in managing change and solving problems. Recognizes that subsystems are interdependent. Focus is on "the weakest link." Three key measures used in the evaluation of a system are 1) throughput, 2) inventory, and 3) operational expenses. Goldratt describes the correct sequence for the Theory of Constraints process as 1) identify system constraints, 2) exploit system constraints, 3) subordinate on the solution, and 4) improve the system" (CQM Primer II-41/43).	CSSBB X-2/6 CQM Primer IV-82/84
592	Torque	See Primer. See also gage summary matrix on p. VI-63-64.	CQE VI-54
593	Total Quality Control	Emphasized by Feigenbuam (USA) and Ishikawa (Japan) in the early 1980s.	CSSBB II-40/43
594	Total Quality Management	See TQM	
595	TPM	Accronym. Involves equipment availability. See Availability, also Effectiveness. The six big losses to equipment effectiveness include 1) equipment failure, 2) set-up and adjustment, 3) idling and minor stoppages, 4) reduced speed, 5) process defects, and 6) reduced yield.	CSSBB X-51
596	TQ	Total Quality. First coined by Dan Ciampa	CQM Primer VII-15-16
597	TQM	A management system for a customer focused organization that involves all employees in a continuous improvemt of all aspects of the organization. It's an integrative system that uses strategy, data, and effective communications to integrate the quality discipline into the culture and activities of the organization. 1) Customer focused, 2) Total Employee Involvement, 3) Process Centered, 4) Integrated System, 5) Strategic and Systematic Approach, 6) Continual Improvement, 7) Fact-Based Decision Making, 8) Communications (same as ISO-9000 items, except #8 for ISO is Supplier-focus). See barriers listed on CQM Handbook p.273.	CQM Handbook p.270-272
598	Trailing Edge	Company strategy. See Leading Edge for strategy & product types list.	CQM Primer III-15
599	Training	Leads to measurable, value-added skills. Not to be confused with education, which leads simply to increased knowledge.	CQM Handbook p.385-386
600	Tree Diagram	See Systematic Diagram	CQE VIII-36
601	Trend Analysis	Time sequence (dynamic) data analysis. Identifies change over time, patterns, cycles, process shifts, increasing or decreasing variability, etc. Quality Improvement tool. Examples include Control Charts, Run Charts, and Trend Charts.	CQE VIII-6
602	TRIZ	See Altschuler, G. Incorporates 'tricks,' 'physical effects,' and combinations of the two. Theory of inventive problem-solving.	CSSBB XI-41/42
603	T-Test	Test to compare the means (averages) of two samples in an effort to determine the likelihood that both samples originated from the same population. Often used in conjunction with the F-test (see ANOVA)	CQE IX-21
604	Tukey	John Tukey. Inventor of the Boxplot (1977) and stem-and-leaf plots (1977).	CQE IX-22
605	TVX (Televised X-Ray)	Non-destructive test. See Primer.	CQE VI-77
606	U	Union. Deals with probability. A U B means the Union of event A and event B, and contain *all* sample points in event A, *or* B, *or* both.	CQE IX-27
607	Ultrasonic Tesing	Non-destructive test. See Primer.	CQE VI-68
608	Unequal Variance Test	See summary table on p. XI-31	CQE XI-31
609	Union (♍)	Union. Deals with probability. (A ♍ B) means the Union of event A and event B, and contain *all* sample points in event A, *or* B, *or* both.	CQE IX-27
610	Universal Bevel Protractor	See Primer. See also gage summary matrix on p. VI-63-64.	CQE VI-55
611	Validity	Same as reproducability, accuracy, on target, or bias. Measure of how close average of a sample compares to optimal target (nominal spec.). Not to be confused with repeatability.	CQM Handbook p. 184
612	Variability	Total Product Variability is the total variability in a product, which includes the variability of the measurement process (see Primer, VI-87 for equations)	CQE VI-87
613	Variable	Regarding sampling, not only is an item determined to be good or bad, buta also how good or how bad.	CQE VI-6

614	Variable Data	Measured data. Nearly always can extend to multiple decimal points. Answers 'how long,' 'what volume,' how much time,' or 'how far.' Generally measured with some instrument or device.	CQE IX-8
615	Variance	$\sigma^{2,}$ The sum of the squared deviations from the mean, divided by the sample size.	CQE IX-12, 17
616	Venn Diagram	Diagram consisting of intersecting circles, usually used in studies of probability (union and intersection)	CQE IX-27
617	Vernier Scale	See Primer. See also gage summary matrix on p. VI-63-64.	CQE VI-52
618	Vickers Hardness Testing	See Primer. See also hardness testing method summary matrix in Primer, p. VI-81.	CQE VI-79
619	Vision Statement	Describes a future state, perhaps 5 to 10 years into the future. Not to be confused with a Mission Statement, which generally refers to day-to-day views	CQE II-30
620	Visual Inspection	Non-destructive test. See Primer.	CQE VI-68
621	Weber, Max	Believed bureaucracy to be the ideal organizational structure, since everyone would clearly understand their responsibilities, and that lines of authority would provide more predictable and efficient output.	CQM Handbook p.275
622	Weibull distribution	See book for formulas, graph, and applications. The scale parameter is always the point where 63.21% of the population fall below it.	CQE IX-36
623	Work Instructions	See Procedures	CQM Handbook p.153
624	X-Ray Techniques	Non-destructive test. See Primer.	CQE VI-77
625	Z-Test	See summary table on p. XI-31	CQE XI-31

This definitions sheet was developed independently by R. Scott Bonney, Educaton Chair for ASQ 1114 & 1128 (Hampton and Tidewater, Virginia) as a study aid and open book exam aid for Quality Engineering, Quality Auditing, and Lean Six Sigma training and exams. Please feel free to update and distribute. However, the author requests that you forward him your updates, comments, and suggestions at **757-729-1482** or **rsbonney@bon-tech.org**

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