
**THE
SOFTWARE QUALITY ENGINEER
SOLUTIONS TEXT**

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SECTION VI

SOFTWARE METRICS & ANALYSIS - SAMPLE QUESTIONS

6.1. The level of usage of debugging tools by programmers is listed below:

0. No debugging tool used at all other than an editor
1. Editor with trace aide used
2. Editor with trace and flow aide used
3. Editor with trace, flow and cross-reference used

Which scalar type measurement is this an example of?

- a. Ordinal
- b. Scalar
- c. Nominal
- d. Interval

Solution: This question requires a knowledge of the fundamentals of measurement theory which deal with the representational conditions of measurements and scales of measurements. By definition, when ranking data, the ordinal scalar type is used.

Answer a is correct.

Reference: *CSQE Primer*, Section VI - 10/11.

6.2. Which of the following is NOT relevant for measuring effectiveness of inspections?

- a. Number of defects per inspector
- b. Major defects found and compared to other evaluation methods
- c. How management reports and tracks inspection results
- d. The number of defects found in later phases of development

Solution: Note that a negative response is requested. The primary purpose of inspections is to find defects. Answers **a**, **b**, and **d** all relate to the effectiveness of finding defects and therefore can be used to measure the effectiveness of the inspection. Answer **c** is not a measure of the effectiveness of an inspection.

Answer c is the correct, incorrect, choice.

Reference: *CSQE Primer*, Section VI - 19/26 and 29/32 (and logic).

SECTION VI

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- 6.3. What action should management take when a line chart shows a steady variance of project performance from the plan?
- Adjust the plan accordingly
 - Do nothing
 - Accept the deviation as allowable within the scope of the plan
 - Take immediate action to correct

Solution: The best thing for management to do is adjust the plan according to the problem or risk identified. No action may be appropriate, but it should not be the first option. Accepting the deviation and not adjusting the plan is the same as doing nothing. Since the variance is steady, immediate action is probably not necessary.

Answer a is correct.

Reference: *CSQE Primer*, Section VI - 35/36 (and logic).

- 6.4. The premise that the very act of measuring leads to improvement is known as:
- The Hawthorne effect
 - Pareto analysis
 - Goal/Question/Metric paradigm
 - Cause and effect

Solution: The Hawthorne effect is a commonly observed human phenomenon which states that the very act of measuring leads to improvements in quality or productivity because people feel that their efforts are warrant special attention through the act of observation.

Answer a is correct.

Reference: *CSQE Primer*, Sections II - 106 and VI - 15.

- 6.5. Interrelationship digraphs should be used in which of the following situations?
- When the course of events is known
 - When critical times must be developed
 - When value analysis needs to be done
 - When root causes and effects are needed

Solution: Answer **a**, course of events, is used in the process decision program chart. Answer **b**, critical times, is built into the activity network diagram. Answer **c**, value analysis, is a method of logic used in tree diagrams. Answer **d**, root causes and effects, is determined as part of the interrelationship diagram method.

Answer d is correct.

Reference: *CSQE Primer*, Section VI - 82/83.

SECTION VI

SOFTWARE METRICS & ANALYSIS - SAMPLE QUESTIONS

6.6. The following list of data field items is an example of what type of data integrity problem?

Developer
Computer programmer
Programmer
Software engineer

- a. Standardization
- b. Quality
- c. Duplication
- d. Fuzzy logic

Solution: In databases, a unique representation for data ensures the most accurate results. The practice of data standardization accomplishes this. Although this is a data quality issue, data quality is more commonly recognized as an issue of multiple variations of the same item, such as the spelling of a city name.

Answer a is correct.

Reference: *CSQE Primer*, Section VI - 56 (and logic).

6.7. The groundwork for software metrics:

- a. Was established in the late 1980s
- b. Includes code complexity measures and project cost estimation models
- c. Is independent of software quality assurance techniques
- d. Ensures improvement of software development processes

Solution: Answers **a** and **c** are incorrect. Technology trends during the 1970s evolved into the current metrics and measurement practices (including code complexity measures, software project cost estimation models, software quality assurance techniques, and controlled software development processes). Answer **d** can also be incorrect. Measuring a process does not necessarily mean improvement.

Answer b is correct.

Reference: *CSQE Primer*, Section VI - 2/3, 6/8 and 20/26 (and logic).

6.8. When setting project performance thresholds, overtime is considered what type of threshold?

- a. Arbitrary judgment
- b. Management reserve
- c. Target feature
- d. Statistical limits

Solution: Management usually builds reserve into plans and schedules, which may include the unallocated resources such as overtime to use in case project thresholds or targets are not being met.

Answer b is correct.

References: *CSQE Primer*, Section VI - 36. McGarry, John, et. al. (2002). *Practical Software Measurement*.

SECTION VI

SOFTWARE METRICS & ANALYSIS - SAMPLE QUESTIONS

6.9. What will be the impact on results when only the best or easiest to collect data is taken?

- a. Data will be normalized
- b. Data will be biased
- c. Data will be skewed left or right
- d. Data will stratify

Solution: Selecting data based on the best or easiest to collect will lead to biased results. The results may be skewed left or right or could follow a normal distribution. Because best/easiest data has been selected, stratification may very well result, but these results will provide little value in terms of decision-making.

Answer b is correct.

Reference: *CSQE Primer*, Section VI - 50 and 52/53.

6.10. Using the data from the table below, what is the phase containment of the coding phase?

Phase	Number of Defects Introduced	Number of Defects Found & Removed
Requirements	12	9
Design	25	16
Code	47	42

- a. 89.4%
- b. 86.4%
- c. 75.0%
- d. 71.2%

Solution: According to Kan, the phase containment effectiveness is :

$$\frac{\text{Defects removed (at the step)} \times 100\%}{\text{Defects existing on step entry} + \text{Defects injected during the development step}}$$

$$\begin{aligned}\text{Coding removal effectiveness} &= \frac{42}{(12 + 25 - 9 - 16) + 47} \times 100\% \\ &= \frac{42}{(37 - 25) + 47} \times 100\% \\ &= \frac{42}{59} = 71.2\%\end{aligned}$$

Answer d is correct.

References: *CSQE Primer*, Section VI - 30/31. This question has been modified from an old CSQE brochure.

SECTION VI

SOFTWARE METRICS & ANALYSIS - SAMPLE QUESTIONS

6.11. Which of the following examples is a correct representation of the indicated measurement level?

- a. Nominal: SEI process maturity levels
- b. Ordinal: development processes - waterfall, spiral, iterative
- c. Ratio: the defect rate of software product A is twice that of product B
- d. Interval: the median defect rate of software product A is larger

Solution: Answers **a** and **b** are false as the definitions are reversed. Answer **d** is suspect because the detail indicates an ordinal scale. Answer **c** is a valid ratio example.

Answer c is correct.

Reference: *CSQE Primer*, Section VI - 10/11 (and logic).

6.12. Productivity metrics focus on the:

- a. Output of the software engineering process
- b. Output of the software engineers
- c. Program complexity
- d. Number of lines of code produced

Solution: Answer **b**, output of the software engineers, is incorrect because metrics should focus on products and processes, not people. Answers **c** and **d** are merely elements related to productivity. Productivity should be considered a significant output of the software engineering process. Therefore, answer **a** is correct.

Answer a is correct.

Reference: *CSQE Primer*, Section VI - 19/27 (and logic).

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6.13. From the table below, what is the approximate defect removal effectiveness at the design phase?

Phase	# of defects
Requirements	6
Design	8
Coding	10
Inspection	15
Testing	21

- a. 23%
- b. 13%
- c. 9%
- d. 15%

Solution: The solution, according to Capers Jones, is the number of defects removed at the design phase (8) divided by the defects removed at the design phase (8) plus defects found later (46) times 100 or:

$$DRE = \frac{8}{(8 + 46)} \times 100\% = 14.8\%$$

Answer d is correct.

Reference: *CSQE Primer*, Section VI - 30.

6.14. The primary difference between dashboards and scorecards is:

- a. Interactive programs versus static pictures
- b. Data exceptions versus graph alerts
- c. Different types of charts versus raw data
- d. Monitoring operations versus charting strategic goals

Solution: Dashboards and scorecards are visual display mechanisms within a performance management system. Many organizations use the terms interchangeably, but the primary difference is that dashboards are used to monitor the performance of operational processes while scorecards are used to chart the progress of tactical and strategic goals.

Answer d is correct.

Reference: *CSQE Primer*, Section VI - 44.

SECTION VI

SOFTWARE METRICS & ANALYSIS - SAMPLE QUESTIONS

- 6.15. Which of the following problem solving tools is used to group items together in a logical form or to show relationships?
- Affinity diagrams, matrix diagrams, root cause analysis
 - Root cause analysis, affinity diagrams, interrelationship digraphs
 - Matrix diagrams, root cause analysis, interrelationship digraphs
 - Interrelationship digraphs, matrix diagrams, affinity diagrams

Solution: This question requires an understanding of the use of the different quality management tools. Affinity diagrams, matrix diagrams, and interrelationship digraphs are all quality tools that provide methods for grouping items. Root cause analysis is off target for this question.

Answer d is correct.

Reference: *CSQE Primer*, Section VI - 70/71, 73/74, 76/77, and 80/81.

- 6.16. Software measures can be applied to which of the following classes of entities?
- Products, processes, and resources
 - Products, processes, and profit
 - Products, resources, and profit
 - Products, resources, and costs

Solution: Answers **b**, **c**, and **d** are incorrect. Products, processes, and resources are all entities whose attributes can be measured.

Answer a is correct.

Reference: *CSQE Primer*, Section VI - 27.

- 6.17. The predictive validity of reliability model estimates is NOT achieved by which of the following?
- Sample size
 - Data quality
 - Empirical comparisons
 - Defect rate

Solution: Note that a negative response is requested. The predictive validity of reliability model estimates is achieved through answers **a**, **b**, and **c**. Defect rate is an input to the model, but has no meaning unless the data is valid.

Answer d is the correct, incorrect, choice.

Reference: *CSQE Primer*, Section VI - 6/8, 28/31 and 39/40 (and logic).

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6.18. Functional verification test metrics (FVT) can be based on descriptions found in:

- a. Design documents
- b. Test strategy
- c. Use cases
- d. QFD analysis

Solution: The function of a system or component refers to “what it does”, which is typically described in a requirement specification, functional specification, or use case. Functional verification testing (FVT) is the process of testing to determine the functionality of a software product.

Answer c is correct.

References: *CSQE Primer*, Section VI - 29. Graham, D.; Van Veenendaal, E.; Evans, I.; & Black, R. (2007). *Foundations of Software Testing: ISTGB Certification*.

6.19. The major use of the Goal/Question/Metric (GQM) paradigm is to:

- a. Define metrics to support business
- b. Define software metrics
- c. Define corporate, organizational and project goals
- d. Transfer company goals to project goals

Solution: Answer **a** relates to the major use of the GQM which is to improve the business through continuous improvement against the organization's own goals and status rather than limiting the goals and status to just process areas. Answer **b** is partially true, but this is a more limited application than was intended by Basili. Answer **c** is only partially true, in that corporate, organizational, and project goals are a subset of the business goals. Answer **d** is an outcome of implementing the GQM .

Answer a is correct.

Reference: *CSQE Primer*, Section VI - 17/18 (and logic).

6.20. A software development team continues to miss project schedules. During a root cause analysis, it is discovered that the team is the youngest development team on the project. The next step is to:

- a. Note the observation and continue to look for other potential causes
- b. Report this as the root cause and recommend that the team be reorganized
- c. Consider this the root cause and prepare a report
- d. Ignore the observation, because age is not a quality factor

Solution: This question requires an understanding of the problem solving process. Answer **a** is correct. The effect of such a team is not clear. Is there an impact? The reason that such a team was created is unknown. This may only be a symptom and not the cause. Answers **b** and **c** concludes this to be the root cause without further investigation. Answer **d** is incorrect because age may impact a quality factor; therefore, it has to be considered.

Answer a is correct.

Reference: *CSQE Primer*, Section VI - 70/71 (and logic).

SECTION VI

SOFTWARE METRICS & ANALYSIS - SAMPLE QUESTIONS

6.21. From a software quality engineering perspective, what factor must always be taken into account in measurement programs?

- a. The spread of the data
- b. Mean values
- c. Human psychology
- d. Deviations from the mean

Solution: From a software quality engineering perspective, it must always be taken into account that measurement programs are ultimately dependent on humans. Some measures could be automatically computed and analyzed without human intervention, however, even these require people in their design and selection.

Crucial action decisions, based on the results of measurements, must be made by humans, and it is humans who will be affected by them. Therefore, in setting up a measurement program, one must be aware of potential human problems and how to overcome them. If one fails in this respect, the measurement program is doomed to failure.

Answer c is correct.

Reference: *CSQE Primer*, Section VI -15.

6.22. Defect containment (DC) metrics represent:

- a. Defects removed during a phase / total product defects at phase exit
- b. Defects removed during a phase / total product defects
- c. Defects removed during a phase / defects introduced during that phase
- d. Defects removed during a phase / defects found after that phase

Solution:

$$DRE = \frac{\text{Defects removed during a development phase} \times 100\%}{\text{Defects removed during a development phase} + \text{defects found later}}$$

Note that the denominator of the above equation equals the total product defects at phase end.

Answer a is correct.

Reference: *CSQE Primer*, Section VI - 30/31.