

INTERNATIONAL TEST AND EVALUATION ASSOCIATION (ITEA)



**Test & Evaluation Professional
Certification Examination**

ITEM DEVELOPMENT GUIDE

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PURPOSE OF THE ITEA ITEM DEVELOPMENT GUIDE

The purpose of the ITEA Item Development Guide (“Guide”) is to provide assistance to item writers in their efforts to develop items for the ITEA Test & Evaluation Professional Certification exam. This Guide explains the structure of ITEA Test & Evaluation Professional Certification exam questions and will assist item writers in becoming more skilled in writing items.

As you read through this Guide, please pay particular attention to the item writing principles. Applying these principles will greatly enhance the chances of your items being accepted.

EXAM STRUCTURE

The ITEA Board of Examiners developed the Test & Evaluation Professional Body of Knowledge (BOK). The purpose of the BOK is to identify the typical job tasks that a T&E professional performs and the knowledge that is required to competently perform those tasks. The BOK serves as the blueprint for the ITEA Test & Evaluation Professional Certification exam. Questions must be written to test a candidate’s knowledge of this content as defined by the BOK (see Appendix B, “Test & Evaluation Professional Body of Knowledge”).

WRITING QUALITY ITEMS

The first thing to consider when writing an item is its target audience—the Test & Evaluation Professional Certification exam candidate. An item must be developed to test the knowledge of a T&E professional with at least three (3) years of experience.

As critical it is for an item writer to understand the knowledge level of the Candidate for certification. It is equally critical for an item writer to remember that the T&E is a global profession. Individual perceptions and experiences might not reflect the more global position or circumstance. Since the examination and exam items will be developed for the international community, this will require you, the item writer, to be somewhat flexible when determining a globally accepted practice.

MULTIPLE-CHOICE ITEMS

The ITEA Test & Evaluation Professional Certification exam will consist of a variety of multiple-choice items. The multiple-choice item is the most commonly used type of test question in certification exams.

Multiple-choice items consist of a stem and four possible options.

Item Stem: The item stem is the introductory statement or question that describes a situation or circumstance related to the knowledge being assessed. Item stems can be written in the form of an incomplete statement as well as in question form.

Item Options: The options complete the introductory statement or answer the question and consist of one correct answer (key) and three incorrect answers or distractors.

Key: The key must reflect current practice. In some cases the key will be the only correct choice, while in other cases the key will be deemed to be the BEST choice when considered against the other choices provided.

Distractors: Distractors are the incorrect options but should be plausible or possible correct answers to candidates who are not knowledgeable enough to choose the key.

STEPS TO WRITING ITEMS

STEP 1 Select a single task from Appendix A “Test & Evaluation Professional Job Tasks” and a knowledge statement from Appendix B “Test & Evaluation Professional Body of Knowledge” that relates to the T&E professional’s ability to perform that task. Items should be written to test knowledge that is necessary to perform a specific task. Items should focus on a single task and its relevant knowledge statement. Items written from a single task and knowledge statement will most likely result in higher quality, practically-based questions.

Once a task and its relevant knowledge statement is chosen, follow the steps listed below. While writing your item, please refer to the Item Writing Principles for further guidance and review your item using the Item Development Checklist found in Appendix C.

STEP 2 Write the item stem and keyable answer (Answer A).

STEP 3 Develop plausible distractors. The distractors should not be made up words or phrases. Distractors should appear to be correct choices to an inexperienced professional. The development of quality distractors is usually the most difficult task for an item writer. If you have difficulty with this part of item development, consult with your colleagues. Also think about what an inexperienced T&E professional might think the correct answer would be. These incorrect experiences make for the best distractors.

STEP 4 Include a thorough explanation of why the keyable answer is correct as well as why each distractor is not a correct choice. It is not acceptable to simply state that the distractors are incorrect.

STEP 5 Include any and all reference sources.

STEP 6 Review the item using the Item Development Checklist found in Appendix C.

STEP 7 Have a peer or colleague review and critique the item.

GENERAL ITEM WRITING PRINCIPLES DOs:

1. Write the stem in the positive tone. Negatively written items will be automatically returned to the item writer for rewrite.
2. Test only one testing concept or knowledge statement per item. Knowledge statements were developed for this purpose. For a listing of knowledge statements, refer to Appendix B, “Test & Evaluation Professional Body of Knowledge”.
3. Ensure that the stem and all options are compatible with each other. For example, if your stem reads, “Which of the following controls will BEST... ”, then all options must be controls.
4. Keep the stem and options as short as possible by avoiding the use of unnecessary text or jargon. Do not attempt to teach the candidate a concept or theory by providing too much information before asking the question. Remember, this is an exam, not a classroom.
5. Include common words or phrases in the item stem rather than in the key and distractors.
6. Write all options the same approximate length and format. A good test taker with very little knowledge or experience in T&E will select the option that is either the shortest or the longest in length and will most likely choose the correct answer.
7. Write options that are grammatically consistent with the item stem and maintain a parallel grammatical format. For example if the key begins with a verb ending with “ing”, then all distractors must begin with a verb ending with “ing”.
8. Use only professionally acceptable or technical terminology in the item stem and options

GENERAL ITEM WRITING PRINCIPLES DON'Ts:

1. Avoid using a key word or phrase in the item key that appears in the stem. Experienced test takers will look for clues such as this that often identify the key.
2. The use of words such as “frequently”, “often”, “common”, or “rarely” introduce subjectivity into the item and will not be accepted. If an item is subjective, it can be argued that more than one option is keyable. Subjectivity is the most common reason why items are returned to the item writer and not tested on exams.
3. The use of terms in the stem such as “always”, “never”, or “all” are not acceptable since very little is absolute and thus it makes it easier for candidates to eliminate distractors.
4. Terms such as “least”, “not” or “except” are negative and require a candidate to choose an incorrect or least preferred choice, rather than a correct or preferred choice. Negatively phrased test questions do not test well and will not be accepted.
5. Avoid the use of gender pronouns such as he, she, him, his, or her.
6. Items with options “all of the above” or “none of the above” will be returned to the item writer. Good test takers know that these types of options are very rarely correct and do not make good distractors.
7. Items testing knowledge regarding vendor specific products will be returned to the item writer as ITEA does not endorse any vendor products.
8. Avoid testing subjective concepts such as the following:
 - a. Specific international or local laws and regulations.
 - b. Specific information regarding cultural or industry issues that do not apply globally and across all industries.
 - c. Specific roles and responsibilities within your organization. Remember that the ITEA Test & Evaluation Professional Certification exam is administered globally and across all industries and the concepts tested must be accepted and recognized practice globally and in all industries.

ITEM EXAMPLES

Items can either be direct questions, incomplete statements or scenario questions.

Direct question:

Stem: Which of the following would be included in a strategic plan?

Options:

- A. Analysis of future business objectives
- B. Specifications for planned purchases
- C. Target dates for projects
- D. Annual budgetary targets for the department

Note that the stem is in the form of a question.

Incomplete statement:

Stem: Governance ensures that an organization aligns its strategy with

Options:

- A. enterprise objectives.
- B. business objectives.
- C. audit objectives.
- D. control objectives.

Note that the responses for this item are followed by a period, as the response serves to complete the sentence started in the stem.

It is wise to draft an item first as a direct question, and then revise it to an incomplete sentence if this offers smoother, less repetitive wording.

SCENARIO QUESTIONS

There are a number of considerations when writing scenario questions. This type of item consists of introductory information (or the scenario) for the items to follow.

- There should be a set of two-to-five items that pertain to this introductory information.
- The introductory material must be related to a particular field, be relevant and practical, and it must contain all the information necessary for the candidate to draw the correct conclusion – do not force the candidate to make assumptions.
- The associated items should be in some sort of sequence and follow a logical progression.
- Each item should be independent of the other items so that missing one item does not cause missing another item of the set. Care should be taken to ensure that one item does not point to the key of another item.
- New information cannot be introduced in any of the associated items. All information necessary to answer the question must be in the scenario or introductory information. The best scenarios are written on real-life situations faced on the job. Also, the more subjective concepts such as regulations and roles and responsibilities are good to test within a scenario since you can explain the specifics requirements of the regulation or the organization's reporting structure in the introductory paragraph(s).

RUBRICING

All items must be assigned a rubric. The rubric indicates which ITEA task and knowledge statement the item most closely refers to.

Each rubric consists of a:

- 4-digit task statement number AND
- 4-digit knowledge statement number.

The rubrics are indicated before each task and knowledge statement. Please refer to **Appendix A—Test & Evaluation Professional Job Tasks** and **Appendix B—Test & Evaluation Professional Body of Knowledge** when rubricing an item.

ITEM SUBMISSION AND REVIEW PROCESS

All subject matter experts that have completed an ITEA Item Writing Workshop will receive periodic emails (item writing campaigns) communicating the task and knowledge statements within the Test & Evaluation Professional Body of Knowledge that are requested by the ITEA Board of Examiners. Item writing campaigns will also include deadlines as to when items are to be submitted for review.

Items must be submitted to certification@itea.org. All items **MUST** be submitted in English using the form located in Appendix D – Item Construction Form. All fields within the Item Construction Form must be complete. If fields are left blank, your item will be returned without review.

An initial review will be performed by an ITEA representative to ensure completeness and compliance with the item writing principles. Items that are judged to be flawed in any significant way will be sent back to the item writer with appropriate and constructive feedback. Items accepted by the ITEA representative will be forwarded to either the ITEA Board of Examiners (BOE) to be considered for inclusion in the exam item pool or for possible inclusion in the Exam review materials.

Once reviewed by the BOE, the item will be accepted or returned. If returned by the BOE, the item will be returned to the writer, including appropriate and constructive feedback. If accepted, the item will become the property of ITEA and the item writer will receive the appropriate credit.

APPENDIX A - TEST & EVALUATION PROFESSIONAL JOB TASKS

AREA 1: T&E SUPPORT FOR PROGRAM/SYSTEM REQUIREMENTS DEVELOPMENT

Task Statements:

1001. Review program/system design specifications/requirements.
1002. Identify critical operation issues.
1003. Review, analyze, and provide input to acquisition strategies (i.e. acquisition plans, system engineering plans).

AREA 2: DEVELOPING AND DOCUMENTING A T&E STRATEGY

Task Statements:

2001. Analyze requirements for testability.
2002. Develop T&E requirements.
2003. Lead/coordinate/participate in T&E working groups.
2004. Identify appropriate validation and verification methodologies (e.g. test, analysis, demonstration, inspection).
2005. Identify appropriate T&E capabilities and resources (e.g. hardware in the loop, open air ranges, live fire).
2006. Prepare and present T&E strategy for approval.
2007. Develop a T&E Master Plan.
2008. Understand and evaluate applicability of candidate tools and processes to support T&E planning (e.g. requirements trace matrix).
2009. Analyze and review the T&E acquisition strategy.
2010. Develop T&E elements of contractual documents (e.g. Request for Proposal (RFP), proposals, Statement of Work (SOW), contracts).

AREA 3: T&E PLANNING***Task Statements:***

3001. Develop test procedures.
3002. Identify/refine test objectives.
3003. Ensure T&E plans comply with applicable policies and procedures.
3004. Develop data requirements.
3005. Determine data requirements (e.g. types, quantity, trails, and confidence level).
3006. Ensure compliance with T&E strategy.
3007. Conduct test support planning.
3008. Develop evaluation methodology.
3009. Identify and select test resources, activities, and events.
3010. Analyze technical risk, limitations, and interdependencies of selected tests.
3011. Develop prioritized list of measures and criteria (e.g. MOE, MOS, MOP).
3012. Analyze requirements, capacity, and cost and need to determine feasibility of the test.
3013. Evaluate and select data collection tools, technologies, techniques, and methods, and levy accreditation/certification requirements as applicable.
3014. Analyze, identify, and include safety risks relating to system test and system environment including personnel (e.g. Occupational Health and Safety (OH&S)).
3015. Build optimum test design.
3016. Evaluate and select test capabilities (e.g. simulators and stimulators), and levy accreditation/certification requirements as applicable.
3017. Develop innovative data collection tools, techniques, and methods, as required.
3018. Develop documentation for selected resources as required (e.g. ranges, facilities).

AREA 4: TEST EXECUTION***Task Statements:***

4001. Verify quality of data as it is being collected.
4002. Monitor and manage test operations.
4003. Generate and submit test status reports as required.
4004. Coordinate and conduct pretest briefings and post-test debrief.
4005. Manage data collection.
4006. Conduct a readiness review including dry runs.
4007. Develop detailed test information sheets (e.g. data cards, test scripts, participant logs).
4008. Ensure compliance to contractual requirements as applicable.
4009. Manage, set-up, and calibrate test resources.

AREA 5: EVALUATE AND ANALYZE TEST DATA***Task Statements:***

- 5001. Check quality of collected data.
- 5002. Participate and/or conduct test results discussions as required.
- 5003. Evaluate test data according to T&E strategy and plan.
- 5004. Analyze data.
- 5005. Conduct raw data reduction.

AREA 6: T&E REPORTING***Task Statements:***

- 6001. Prepare a final report as required.
- 6002. Prepare a final test result report as required.
- 6003. Prepare and/or conduct a T&E briefing as required.
- 6004. Prepare, review, maintain, and archive test documents, reports, and/or charts as required.
- 6005. Prepare deficiency and incidence reports.
- 6006. Prepare interim and quick look T&E reports as required.
- 6007. Prepare a lessons learned report.

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APPENDIX B - TEST & EVALUATION PROFESSIONAL BODY OF KNOWLEDGE

KNOWLEDGE STATEMENTS

- 0001. Knowledge of Acquisition Design: Milestone Reviews and Phases
- 0002. Knowledge of Agile Testing
- 0003. Knowledge of Automated Testing
- 0004. Knowledge of Capabilities Assessment
- 0005. Knowledge of Commercial Off-the-shelf (COTS) Testing
- 0006. Knowledge of Common human factors considerations
- 0007. Knowledge of Common T&E contractual elements and terms
- 0008. Knowledge of Compliance Testing
- 0009. Knowledge of Computer operating systems and software
- 0010. Knowledge of Concurrence and approval hierarchies/stakeholders
- 0011. Knowledge of Configuration management
- 0012. Knowledge of Data collection methodologies
- 0013. Knowledge of Design for Testability
- 0014. Knowledge of Design Readiness Review
- 0015. Knowledge of Developing and mapping requirements to measures, metrics, and test objectives.
- 0016. Knowledge of Development and T&E life cycle
- 0017. Knowledge of Distributed Testing
- 0018. Knowledge of Diverse requirements traceability tools
- 0019. Knowledge of End-to-End Testing
- 0020. Knowledge of Environmental Testing
- 0021. Knowledge of Ethical Issues
- 0022. Knowledge of Human and team dynamics/behaviors
- 0023. Knowledge of Independent Data Verification, Validation, and Accreditation
- 0024. Knowledge of Instrumentations
- 0025. Knowledge of Integrated System Design
- 0026. Knowledge of International/national/local regulations as applicable
- 0027. Knowledge of Interoperability Testing
- 0028. Knowledge of Key Steps and Major Activities in T&E Process
- 0029. Knowledge of Mathematics and statistics
- 0030. Knowledge of Measurement accuracy and precision
- 0031. Knowledge of Measurement process
- 0032. Knowledge of Modeling, Simulation, Stimulation, and Prototyping
- 0033. Knowledge of Non-Destructive (NDI) testing techniques
- 0034. Knowledge of Operations research and other types of analysis
- 0035. Knowledge of Presentation methods/tools
- 0036. Knowledge of Program/System T&E Development Process
- 0037. Knowledge of Project management
- 0038. Knowledge of Relevant emerging technologies and methods
- 0039. Knowledge of Requirements decomposition process

- 0040. Knowledge of Risk assessment and management
- 0041. Knowledge of Root cause analysis
- 0042. Knowledge of Safety standards
- 0043. Knowledge of Safety Tools Management
- 0044. Knowledge of Scheduling and Project Milestones
- 0045. Knowledge of Scientific methods
- 0046. Knowledge of Software Testing
- 0047. Knowledge of Statistics principles and tools (e.g. DOE)
- 0048. Knowledge of Subsystems Testing
- 0049. Knowledge of System under test
- 0050. Knowledge of System-of-Systems Testing
- 0051. Knowledge of Systems architectures
- 0052. Knowledge of Systems engineering principles and practices
- 0053. Knowledge of T&E best practices
- 0054. Knowledge of T&E methodologies, methods, and practices
- 0055. Knowledge of T&E organizational structure
- 0056. Knowledge of T&E resources and capabilities
- 0057. Knowledge of Teamwork and Collaboration
- 0058. Knowledge of Test and Evaluation Master Plan (TEMP)
- 0059. Knowledge of Test Automation: Strategies and Architectures
- 0060. Knowledge of Test Data Management
- 0061. Knowledge of Test methodology development (verification matrix)
- 0062. Knowledge of Test Planning and Strategy Development
- 0063. Knowledge of Test readiness
- 0064. Knowledge of Test Requirements Generation and Analysis Process
- 0065. Knowledge of Test scenario development
- 0066. Knowledge of Test Tool Evaluation and Selection
- 0067. Knowledge of Types of testing (e.g. component, integrated, developmental, operational)
- 0068. Knowledge of Typical relevant program/system documentation
- 0069. Knowledge of Writing Good Program/System T&E Requirements

APPENDIX C - ITEM DEVELOPMENT CHECKLIST

Before submitting an item, you must be able to answer YES to all of the following questions.

- Does the item test an T&E concept at the appropriate experience level of the test candidate?
- Does the item test only one T&E concept?
- Is the item clear, concise and free of unnecessary or ambiguous terms?
- Is there enough information in the stem to allow for only one correct answer? A candidate must not be able to interpret a distractor as correct based on assumptions due to a lack of information in the stem!
- Is there only one possible or best answer in any situation, organization or culture? Many items are returned because there is more than one possible key based on situations not addressed in the stem.
- Are the stem and all options compatible with each other? For example: “Which of the following controls...?” All options must be controls.
- Does the item have plausible distractors but only one correct answer?
- Does the item avoid words or phrases in the key that already appear in the stem?
- Does the item avoid subjective terms such as “frequently”, “often”, “common”... in the stem and options?
- Does the item avoid absolute terms such as “all”, “never”, “always”... in the stem and options?
- Does the item avoid such terms as “least”, “not”, “except”...?
- Is the item applicable to the broad T&E professional (i.e. can be applied to any product regardless of the “widget” being tested) and NOT specific to one industry or area (e.g. Department of Defense)?

Options:

A. (Always make A the correct answer) _____

B. _____

C. _____

D. _____

Key: A

Justification:

A. (Why is A the correct answer) _____

B. (Why is B incorrect) _____

C. (Why is C incorrect) _____

D. (Why is D incorrect) _____

Reference(s): *(Provide references to enable independent review. Include the publication title, publication year, author and page.)*
