

Developing Certification Test Items EXAM DEVELOPMENT TRAINING





Participant's Guide

Developing Certification Test Items

EXAM DEVELOPMENT TRAINING

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Certification Exam Development

Purpose of a Certification Exam

The key to making the Certification Business Model work is identifying candidates who are at least minimally acceptable in a domain of knowledge—that is, the specific area of specialized knowledge, skill, or ability. (See "Glossary of Common Exam Development Terms" on page 3 for more definitions and terminology. A certification exam is used to identify candidates who are qualified at no less than the targeted pre-determined level of expertise. As such, a certification exam is a pass/fail instrument. There is no extra credit awarded for correctly answering an exam item that requires more knowledge or experience than the Minimally Acceptable Candidate (MAC) would be expected to possess. Therefore, when creating this kind of exam, you write the exam to assess at the level of the MAC.

Terms and Definitions

See "Glossary of Common Exam Development Terms" on page 3 for definitions of the common testing terms used in this book.

Validity





Validity is like shooting at a target. When the exam measures things you want to know when making a certification decision, it is like hitting the bull's-eye. An exam that measures something else misses the target completely.

Validity measures the accuracy of the inferences made from an exam's results. It answers the question, "are we measuring the knowledge, skills, or abilities that a candidate must possess to be truly qualified at our pre-established minimum level of competency?" In simple terms, it asks, "Are we certifying the right people?"

The analogy that best describes the concept of validity is archery and shooting at a target. A truly valid measurement hits the target dead center on the bull's-eye. For example, if a goal of an exam is to measure knowledge of permissible cable types in a given networking situation, does the exam ask about which cable types may be used in that very situation? If yes, then a high degree of validity has been achieved—you hit the bull's-eye. If the exam asks only which cable types may be used in general, a lesser degree of validity may have been achieved—you may have hit an outer ring on the target—close, but no bull's-eye. If the exam asks about something other than cable types, then the quality of validity will be lacking—you will have missed the target altogether.

Reliability

Reliability refers to the accuracy and consistency of exam scores and pass/fail decisions based upon them. Reliability is "repeatability." It measures how close the same person would get to their first score the next time the exam is taken provided

that no further studying took place. It answers the questions, "How accurate and consistent is this score?" "How much does this score vary from what this person should have scored were this exam perfectly reliable?" and "How much can we trust this score?" In general terms, it asks, "How *consistently* are we certifying the right people?"

Like validity, reliability is a quality of an exam score. A reliable exam score is one that lets the examinee's true abilities show through and thus is consistent from one sitting to the next. A less reliable exam is influenced by factors that have nothing to do with the topics being measured. As a result, less reliable exams produce scores that are less precise and that can vary widely for the same examinee from one sitting to the next. An unreliable exam reduces everyone's confidence in the certification decision.

The quality of reliability is like target practice. When practicing archery, the goal is consistency. The archer practices aiming each arrow at the same place each time, pulling back on the bow the same way each time, and releasing with the same motion each time. If successful, each arrow will strike the target at the same place each time. The tighter the grouping of arrows, the more consistent and *reliable* the result, the more confident you can be that the arrow landed where it was aimed. The valid use of an exam score is one where you can be confident that the bull's-eye was where you want to aim. A reliable exam score is one that allows you to be confident that when you hit the bull's-eye, that was where you were aiming.





Reliability is like target practice. It measures "repeatability." When an exam is reliable, it is like being sure you will hit the target where you aimed. When an exam is not reliable, you can't be sure where you will hit the target, no matter where you aim.

Validity

Are we certifying the **right** people?

Reliability

Are we **consistently** certifying the right people?

Expectations—Why Are We Here?

We are here to create an exam from which valid, reliable—therefore, fair—certification decisions can be made.

An exam is composed of one or more exam items. Any exam is only as reliable or applicable as the items from which it is built. So, in order to create an exam that will yield reliable scores valid to our purpose, we must write effective, well-crafted, applicable exam items. Our purpose is first to learn how and then to actually write the "effective," "well-crafted," "applicable" exam items from which our exam will be built.

Conclusion

All of the instructions and item writing guidelines in this book are designed to produce items that will perform well—that is, generate good statistics—so they will survive the exam development process, so they can be used on a final form of the exam. Closely adhering to the principles in this book will allow more of your questions to survive the reviews, beta exam, and item analysis process and contribute to an effective exam whose results are reliable and valid for use in the certification program.

Glossary of Common Exam Development Terms

Term	Definition
answer cue (unintended answer cue)	a hint that gives away the answer
answer option (option)	a selection the exam taker may choose as a response to the stem
attachment	exhibits, tasks, etc. accessible from, but not part of, the main item presentation
bias	wording, phrasing or some other attribute of an item that advantages or disadvantages one subgroup of the population over another
borderline candidate	a candidate who is qualified, but just barely qualified; a Minimally Acceptable Candidate (MAC)
candidate (certification candidate)	person attempting to obtain a certification; an exam taker
congruence	a measure of how well an item conforms to an objective
cut score	the minimum passing score
differentiation	the quality of separating those who can from those who cannot
distractor	an incorrect answer option
domain	a content area; a defined topic; the subject matter of the exam
examinee	person taking the exam; exam taker
exhibit	additional material needed to respond correctly to the stem that is too big or awkward to fit in the stem
item (exam item)	a question, problem, or task which is part of an exam
item type	a particular style of item, such as multiple choice, matching, fill in the blank, story problem, point and click, etc.
key (keyed response)	a correct answer option
MAC	a candidate whose ability levels meet but do not exceed any of the minimum standards set for the exam; a borderline candidate
objective	the description/definition of a specific, limited area and level of knowledge, skill, or ability
psychometrician	one who applies the principles of psychometrics; a testing expert
psychometrics	the science of measuring human behavior (in exam situations)
relevance	the importance or value of the content tested in an item
response	an exam taker's answer; result of an exam taker's interaction with the exam item
stem	the question or prompting portion of an exam item
task	an interaction which the exam taker is instructed to perform
exam blueprint (blueprint)	the plan defining the number and content of items on an exam
exam form	one version of an exam with multiple, but equal versions

Exhibit 1.2

Exam Item Classical Statistics Report

Item Count	Item ID	Item Type*	Form	Tried	Right	P-Value	Point Biserial	90.0% Sig.	Reliability Index	Average Time
1	Demo.1.1.a.1	m3	beta	62	20	0.32	0.157	0.210	0.07	42.6
2	Demo.1.1.b.1	m4	beta	62	34	0.55	0.405	0.210	0.30	53.2
3	Demo.1.2.a.1	m2	beta	62	55	0.88	0.308	0.210	0.22	41.2
4	Demo.1.2.b.1	f	beta	62	14	0.23	-0.137	0.210	-0.06	47.3
5	Demo.1.2.c.1	f	beta	61	12	0.19	0.190	0.212	0.08	51.0
6	Demo.1.2.d.1	m5	beta	62	44	0.71	0.497	0.210	0.36	34.0
7	Demo.1.2.e.1	m1	beta	62	54	0.87	0.453	0.210	0.15	34.9
8	Demo.1.2.f.1	m1	beta	62	58	0.94	0.387	0.210	0.10	19.4
9	Demo.1.3.a.1	m1	beta	62	62	1.00	0.000	0.210	0.00	21.9
10	Demo.1.3.c.1	m1	beta	62	38	0.61	0.207	0.210	0.10	43.2

^{*} Item Types:

tf = true/false, f = free response, m1 = multiple choice, one option correct, m2 = multiple choice, two options correct, m3 = multiple choice, three options correct, m4 = multiple choice, four options correct, m5 = multiple choice, five options correct, dd = drag and drop, pc = point and click, cg = complex graphical

n-va	lue

The proportion of candidates who answered correctly

0.50 = 50% answered correctly

1.00 = 100% answered correctly

0.61 = 61% answered correctly

Point Biserial Correlation Coefficient

An indication of which candidates answered correctly

1.000 = Perfect correlation (only knowledgeable candidates answered correctly)

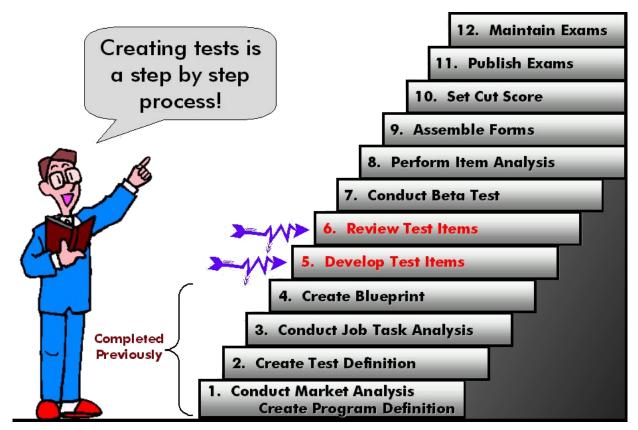
 $0.500 = Knowledgeable \ candidates \ answered \ correctly \ in higher proportions \ than \ unknowledgeable \ candidates$

0.000 = No correlation (knowledgeable and unknowledgeable candidates answered in equal proportions

 $\hbox{-0.500} = Unknowledgeable \ candidates \ answered \\ correctly \ in \ higher \ proportions \ than \ knowledgeable \ candidates \\$

-1.000 = Perfect inverse correlation (only unknowledgeable candidates answered correctly)

Exercise 1.2 **Looking at the Statistics: Reviewing Beta Reports (the statistics we use)** Using the data in Exhibit 1.2, Exam Item Classified Statistics Report, answer the following questions: 1. Which item tells us the least about each candidate? Would you want this item on your final exam? Why? ____ 2. Which item was missed more often by candidates of higher ability than candidates of lower ability? Would you want this item on your final exam? Why? 3. Which item would you rather have on your final exam, Demo.1.1.a.1 or Demo.1.1.b.1? Why? _____



The Test Development Process.

Working with Objectives



An objective is what we aim at when writing exam items. An objective describes the knowledge, skill, or ability we are trying to measure in the item.

What is an Objective?

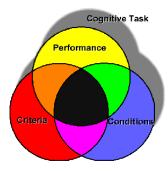
An objective is a statement describing a demonstration, knowledge, or skill. Objectives make up the bulk of the exam blueprint document (the plan for how to build the exam). Each exam objective defines a particular portion of the content, subject matter, or domain that is to be covered by the entire exam. Exam blueprints list each objective to be covered and how many items should be assigned to testing the content specified in each objective. Collectively, all the objectives in an exam blueprint define the overall exam content or domain. Indeed, the objectives and the blueprint tell us what and at what level to test with the items we write.

Where do Objectives Come From?

Exam objectives are generally created by subject matter experts (SMEs) during a Job/Task Analysis (JTA) or some other content matching process. A validation process where additional SMEs check the work done in the JTA conference is often used to verify the appropriateness of the objectives produced in the JTA. The objectives are then reviewed and weighted by yet other SMEs as part of the blueprinting operation. The weighting procedure allows SMEs to indicate how important each objective is to the overall certification decision, including which objectives would best be used to differentiate between qualified and unqualified individuals. The combined weight assigned to each objective is used to determine the number of items to write for that objective. This allows the exam to place emphasis on each objective according to the level of importance assigned to it by the blueprint SMEs.

The process of creation, validation, and weighting of objectives provides evidence that the scope of the exam is consistent with the expectations one would have for a candidate certified in the overall exam domain. This, then, becomes evidence that certification decisions based upon scores obtained from this exam are valid. It is the process we use to ensure that what our exam covers and the proportions in which it is covered are fair.

Writing to Objectives



A complete objective contains a performance, conditions, and criteria. Also implied in the background is a cognitive task.

In order to write items that will conform to the specifications of the exam blueprint, you will have to know how to work with objectives. In order to write items that are fair—that test the material specified in the objectives—you will need to be able to analyze and interpret objectives for certain information.

The Parts of an Objective

A complete exam objective is one that includes *a performance*, *conditions*, and *completion criteria*. From these a *cognitive task* may be inferred. When writing items for an exam to be administered in a computerized testing center, there is an additional requirement: it must be possible to *present*, *perform*, and *score* the item in a testing center environment.

Analyzing an Objective

Writing items that test the content specified in their objectives, at the specified level of difficulty, is the goal of item writing. That is how you create items that differentiate at the proper level. That is how you make exams that are fair. To meet this goal, item writers must be able to analyze and interpret what each objective is specifying.

There are three steps to analyzing an objective:

- 1. Identify the various parts of the objective
- 2. Deduce and clarify the cognitive task
- 3. Determine the level of thinking required

Table 1:

Cognitive Task	Example				
Recall (declarative knowl	Recall (declarative knowledge)				
2. Specify parameters	 Specify names, dates, values, rules, formulas, policies, etc. List the dir command arguments that deal with file attributes. Name the seven layers of the OSI mode. 				
3. Define terms	 Define various WAN terms. Define common Personal Computer terms, including RAM, ROM, CPU, Bus, I/O, hard drive, and SIMM 				
4. Recognize things	 Visually recognize objects, locations, and displays. Recognize events, situations, meaning, characteristics and capabilities. Classify objects by category. Identify the major families of CPU chips by sight. Know where the CPU chip is installed on the model 4750 100 Mbit ISA bus motherboard. 				

Table 1: (Continued)

Cognitive Task	Example
5. Describe things	 Describe the purpose, features, and function of a particular thing in a particular context. Describe the relationship between similar or related things.
	things.Identify examples of a specific thing.
	Locate specific things within a picture or context.
	Distinguish between specific kinds of things.
6. Explain actions and events	Explain when and how to perform a particular procedure.
	Know how and when to take a specific action or set of actions.
	Explain why it is important to perform a particular procedure.
	Explain issues that must be considered when performing a specific procedure.
	Explain how a system works.
	Explain the relationship between related things.
	Explain the principle of
	Explain why an event takes place.
	Explain why something is important.
Reasoning (procedural kn	owledge)
7. Analyze situations	Given a problem situation, analyze the situation and infer the most likely cause of the problem.
	Given a problem situation, analyze the situation and explain what happened.
	Given a problem situation, analyze the situation and identify issues to consider when deciding what course of action to take.
8. Select appropriate actions	Given a scenario, select the appropriate course of action.
	Given a scenario, select the appropriate tool, utility, file, or command.
	Given a scenario, select the appropriate resource, method, algorithm, configuration, or design.
Decide what to do next	Given a problem solving scenario, decide what to do next.
	Given a critical fault on a switch somewhere on your WAN, decide on the appropriate next step to resolve the fault.
10. Order steps	Given a list of installation steps for an ACME switching product, place the steps in order.
	Given a problem solving scenario and a list of diagnostic steps, place the steps in order.

Table 1: (Continued)

Cognitive Task	Example
11. Predict results	Given a general scenario, predict what will happen if a specific scenario occurs.
	Given a general scenario, predict what will happen if a specific course of action is taken.
12.Calculate	 Given a scenario, calculate the appropriate value. Calculate the effective egress rate ranges for various ATM connection profiles.
13.Evaluate results	Given a problem-solving scenario, evaluate the results of a decision.
	Given a problem-solving scenario, evaluate the results of a course of action.
14. Justify decisions	Given a problem-solving scenario, justify a decision.
	Given a problem-solving scenario, justify a course of action.

Place a check (\checkmark) in the appropriate boxes to indicate if the following objectives include performance, conditions, or criteria. Write in the number of the fundamental cognitive task that best matches the objective's cognitive task (see the table below or Figure 2.4) or "0" if no cognitive task matches. Place a check (\checkmark) in the last column to indicate whether the objective can be tested in a computerized testing environment.

Objectives	Performance	Conditions	Criteria Cognitive Task (0-13)	Works in computerized testing environment
1. OS/2 Warp Clients.				
2. Explain and perform the login procedure.				
3. Discuss the default User object types and their rights.				
4. Given an out-of order list of steps for copying text in MS Word, put them in order within 30 seconds.				
5. Fully appreciate the importance of User object property values.				
6. Create a User object and enter user identification property values.				
7. Describe common printer languages and the differences between them.				

Fundamental Cognitive Tasks	
1. Specify Parameters	7. Select Appropriate Actions
2. Define Terms	8. Decide What to do Next
3. Recognize Things	9. Order Steps
4. Describe Things	10. Predict Results
5. Explain Actions and Events	11. Calculate
6. Analyze Situation	12. Evaluate Results
	13. Justify Decisions

Working with Complete but Unmeasurable Objectives

Sometimes objectives have all the necessary parts and convey clearly what to measure, yet specify some performance, condition(s), completion criteria, or cognitive task that cannot be directly measured in the testing center. These kinds of objectives generally require the examinee to perform some physical task or take on a certain mind set or state of mind (e.g., know, understand, consider, or appreciate).

Examples:

- Configure an ACME-3 ATM switch for use in the specified network.
- Access the central product database.
- Understand and appreciate the need for network security
- Given the necessary hardware equipment, cables, and connectors, connect the equipment to be able to create a network that works the first time.

Suggestions for Working with Unmeasurable Objectives

Although we cannot test physical tasks or mind sets directly, we can create exam items that come close. The following are some suggestions for ways to work with objectives that are complete, but not measurable in a computerized testing center environment. Many more methods are possible.

- Instead of trying to test the actual task or skill specified in the objective, test several critical underlying tasks, skills, or facts that are testable in a computerized testing environment and that are contained within, and integral to, the parent objective. Care must be taken to achieve the same level of complexity and the same level of thinking required by the original parent objective.
- Test for the ability to predict outcomes based on the task or skill specified in the unmeasurable objective. This usually involves constructing a situation or scenario describing various inputs and actions taken, up to a specific point. The examinee is then asked what is required to complete tasks or predict outcomes based on the scenario.

In these cases it is sometimes helpful to think to yourself, "If a person could carry out this objective, could they answer the question I am about to write?"

Working with Incomplete Objectives

Some objectives do not clearly convey what to measure. They are generally missing some critical parts of the objective, like a performance, a cognitive task, condition(s), or completion criteria. If you are unsure whether an objective is complete, ask: "How will I know if the performance is done *wrong*?" If you are unable to answer the question, the objective may not be complete.

Incomplete objectives are impossible to work with "as is." Additional information must be obtained, or assumptions made to fill in the missing parts before items can be written.

Examples:

- Configure an ACME-3 ATM switch.
- · Assess a network.
- User profiles

Suggestions for Working with Incomplete Objectives

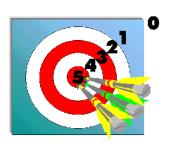
Although it is not possible to work with incomplete objectives the way they are worded on the blueprint, it is generally possible to find or otherwise supply the missing information from the blueprint or other documents produced as part of the Job-Task Analysis process.

Here are some suggestions for how to find the information missing from incomplete objectives.

- Ask the stakeholder (the person authorizing work on the exam) for clarification.
- Ask Subject Matter Experts (SMEs) who worked on writing and validating the objectives for clarification.
- Study the levels of competence specified in the Description of the MAC (often included in the Blueprint), then reconstruct the information you need as best you can. This usually works best when reconstructing missing conditions and completion criteria.
- Study the information provided in the Exam Definition or Description documents, then reconstruct the missing information as best you can. This is the method of last resort, as information in these documents is usually more general.

Item Performance Standards

There are several performance standards or constructs that help us determine how well an item measures the knowledge, task, or skill described in an objective. They are congruence, differentiation, and relevance. Congruence measures how well an item matches the objective. Differentiation refers to identifying who can and who cannot complete the task specified in an item at the pre-defined proper level of difficulty. Relevance is a measure of how applicable the item is to real life experience. These standards are important for achieving fairness and validity when using scores from an exam in certification decisions. It is fair to use scores from an exam when items test relevant material at the defined level of difficulty. It would be unfair to use scores from items that do not.



Congruence in like archery competition. The closer an item comes to meeting all the requirements of the objective, the more congruent the item. Meeting minimum acceptable level of congruence (such as a score of 3 or better in archery) means the item stays.

Congruence

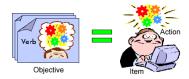
An item is fully congruent with an objective if the item tests the knowledge, skill, or ability identified in the objective at the level specified by the objective. That is, an item is congruent when the content and complexity of the item *match* the content and complexity specified in its objective. Clearly, the more congruent the item is to its objective, the more valid scores from the item will be in determining who should be and who should not be certified. In short, the more congruent an item, the more fair it is to use its score. Consequently, the more congruent each item, the fairer it is to use the entire exam score.

Congruence is like an archery competition where items are like arrows and objectives are like targets. Points are awarded based on how close arrows (items) come to the center of their target (the objective). Five points are awarded for a bull's eye, four points for the first ring, and so forth, with no points awarded when the target is missed altogether. In competition, only high scoring competitors are allowed to continue beyond the qualifying rounds into the final competition. Likewise, items that do not score enough congruence points are not allowed to continue as part of that item bank. These items must be modified so as to become more congruent, be reassigned to objectives to which they are naturally more congruent, or be removed from the exam item bank.





In domain congruence, objectives are like clouds. Their boundaries define the edge of the subject matter in the objective. Items can cover a lot or a little of the cloud, but as long as they are inside, they are domain congruent. Items that fall closer to the center or core of the cloud are more domain congruent than those closer to the edge.



The way to achieve cognitive congruence in an item is to make sure the action requested of the examinee matches the verb used in the objective. Congruence is composed of two distinct elements, domain (technical) congruence and cognitive congruence. Here the metaphor is Olympic Ice Skating. When an ice skater finishes a program, judges give the skater two scores, one for technical ability, the other for artistic merit. The skater's final score is a combination of these two subscores. Likewise, domain congruence and cognitive congruence are each evaluated on their own, then merged to determine overall congruence.

Domain (Technical) Congruence

Domain (Technical) Congruence is an estimate of how well the technical knowledge or skill measured by the exam item matches the technical skill or knowledge described by the objective. Items may test only a small portion of the domain covered by the objective, the entire objective domain, or any portion of the domain in between. As long as the item covers only subject matter specified by the objective it is highly domain congruent. Items do not need to cover all aspects of the objective domain to be domain congruent; they only need to cover some portion of it.

So, in short, the topic the item is testing must fit within the objective.

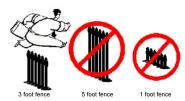
Cognitive Congruence

The second aspect of congruence is cognitive congruence. Cognitive congruence is an estimate of how well an exam item measures the proficiency with which the examinee can complete the cognitive task specified by the objective. Exam items should require the examinee to demonstrate the same level of thinking, mental skill or mental performance specified in the objective. The closer an item comes to directly testing the cognitive task of the objective, the more cognitively congruent the item is.

Overall Congruence

The combination of both domain or technical congruence and cognitive congruence yield the overall congruence rating of an item. Items that are highly domain congruent, but have a moderate degree of cognitive congruence are still only moderately congruent overall. Likewise, items with a high degree of cognitive congruence and a moderate level of domain congruence are still only moderately congruent overall. *An item is only as congruent as its weakest component of congruence.*

Appropriate Level of Difficulty (Differentiation)



Items should be written to an appropriate level of difficulty. We should only allow three-foot items on our three-foot exam. One-foot and five-foot items should not be included because they are not fair and do not tell us what we need to know.

An item should be appropriately difficult for and written to the MAC. It should be a "three-foot" item—not a one foot or a five foot item—a three foot item on our three foot exam. If an item is highly congruent, it will likely already differentiate appropriately. However, it is more than possible to create relatively congruent items that do not differentiate at the proper level, and so, item writers and reviewers must be vigilant to make sure all items differentiate at the proper level.

It is often tempting to believe that harder items make a better exam. Nothing could be further from the truth.

Relevance

In addition to congruence and differentiation, an exam item should also be relevant. A relevant item covers relevant and important content that applies directly to the objective, the domain, and the end certification. The item should be crucial enough that should the examinee miss the item, you would question whether the examinee should be awarded certification.

There are some questions we can ask ourselves about items we are evaluating for the property of relevance. Some of these questions are:

- Does it really matter if the examinee can answer this question (item)?
- If an examinee can answer this question (item) will I be more inclined to certify them?
- If an examinee can't answer this question (item) would I still certify them?

Conclusion

Congruent, relevant exam items that differentiate at an appropriate level of difficulty will:

- Produce scores valid for use in making certification decisions
- Produce scores that are reliable
- Differentiate between a candidate who knows and can do and a candidate who doesn't know and can't do.
- Not surprise a candidate who has read the certification requirements and knows the material specified in the objectives.

.

Estimate the level of congruence, difficulty, and relevance each exam item demonstrates by writing a number in the appropriate cell.

Objective 2.2: In Microsoft Word, delete a table or delete items from a table.

Exam Item	Technical Congruence (0-5)	Cognitive Congruence (0-5)	Appropri- ate Diffi- culty (1-5 feet)	Relevance (Y/N)
Item 1: How do you delete a table and its contents? (Choose three.)				
 A. select the table, press the Backspace key. B. select the table, click Cut on the tool bar or Edit menu. C. select the table, press the Delete key. D. select the table, press the Return key. E. select all columns, under the Table menu select Delete Columns. F. select all rows, under the Table menu select Delete Rows. 				
Item 2: Which two tasks can be done using the Edit menu? (Choose two.) A. changing the color of text B. finding and replacing text C. deleting a table and all of its contents D. inserting a Page Break into a document E. running a spelling check on a document				
Item 3: Using Microsoft Word, delete Table 3, titled Frogs of South America, from the open document Science Project.				

Estimate the level of congruence, difficulty, and relevance item 2.3 demonstrates with each objective by writing a number in the appropriate cell.

Exam Item 2.3:

You are assembling your SCUBA unit on shore prior to boarding the dive boat. You have just taken the dust cap off the regulator yoke, placed the yoke over the tank valve, and tightened the yoke finger tight. According to the SSI standard assembly procedure, what should you do next?

- A. Check the pressure gauge to make sure the tank is filled.
- B. Attach the power inflator hose to the buoyancy compensator.
- C. Put the second stage in your mouth, exhale through it, and gently attempt to inhale.
- D. Hold the pressure gauge face down away from you and others and slowly open the tank valve all the way.

Exam Objectives	Technical Congruence (0-5)	Cognitive Congruence (0-5)	Appropriate Difficulty (1-5 feet)	Rele- vance (Y/N)
Identify the steps in the SSI standard assembly procedure.				
2. Define the term "SCUBA unit."				
3. Describe the process of assembling the SCUBA unit.				
Given a SCUBA assembly situation, tell what to do next in order to put together the SCUBA unit correctly.				
5. Describe the interrelationships between the parts of the SCUBA unit.				
6. Tell how the parts of the SCUBA unit work together.				
7. Differentiate between the power inflator hose and the second stage.				
8. Given a description of a SCUBA assembly, predict how that assembly is likely to function.				

Write an objective that matches item 2.4.

Objective:

<u>Item 2.4:</u>

What is one way to select all the text and graphics in a Microsoft Word document?

- A. Alt-A
- B. Ctrl-A
- C. Shift-A
- D. Shift-Enter

The Exam Item Writing Process

Steps to Successful, Focused Item Development

Good item developers will tell you that item development is often more of an art than a science. In truth, good item writing consists of some "science," some "art" and a lot of just plain work! There is no special formula that can be developed and programmed into a computer to produce good exam items. Item writing is a very "human oriented" function and may seem subjective at times. Our goal in this chapter is to train the prospective item writer to write items that will be congruent to exam objective(s). Well developed items will greatly enhance the probability that the exam will have high validity and reliability. Let's look at one psychometrically sound procedure for developing good exam items.

In this procedure item development (or item writing) can be distilled into eight key steps:

- 1. Interpret the objective
- 2. Plan the item
- 3. Produce the item
- 4. Verify item functionality
- 5. Document the item
- 6. Re-evaluate and revise the item
- 7. Elicit peer feedback and revise the item
- 8. Submit the item for formal review

Write an item for the objective: "Identify small electric kitchen appliances by sight."

Produce the Item

(You can use the worksheet on the next page to help with the first three steps of the process.)

Objective:	Identify small electric kitchen appliances by sight.
Step 1: Interpret the objective	
Find the center or core of the objective (the Cognitive Task):	
Establish proper level of difficulty	
Step 2: Plan the item	
Select a cognitive strategy 1. Specify parameters 2. Define terms 3. Recognize things 4. Describe things 5. Explain actions and events 6. Analyze situations 7. Select appropriate actions 8. Decide what to do next 9. Order steps 10. Predict results 11. Calculate 12. Evaluate results 13. Justify decisions	
Select the response mode (exam item type):	
Stem (first draft):	
Distractors, exhibits, materials:	
Кеу:	
Scoring:	
Step 3: Produce the Item	
First draft (put the pieces together):	

Item Writing Rules

Item Writing Checklist

Clear communication is one of our highest priorities when writing test items. Items that are direct, concise, and easily understood provide scores that are more reliable than items that meander, obfuscate, and confuse. The following is a list of rules for writing effective test items. These rules have been proven to help in constructing understandable items that discriminate between qualified and unqualified candidates.

Below is a list of the rules. The remainder of "Chapter 4: Item Writing Rules" provides you with additional explanations and examples of how the rules apply to writing test items.

1.	Match the item to the objective
2.	Create answer options that are clear, distinct, and plausible
3.	Include all information needed to respond to the item
4.	Keep items independent
5.	Verify items technically
6.	Write appropriately difficult (three-foot) items
7.	Make items relevant
8.	Test specified knowledge, not test-taking skills
9.	Don't give clues to the correct answer within the item
10.	The guessing factor should be p=0.25 or less
11.	Focus on one thought, problem, or idea
12.	Include the criteria when items call for a judgment
13.	Avoid words that are overly complex or have multiple meanings 26
14.	Avoid using "NOT" in the stem
15.	Avoid absolute and imprecise modifiers
16.	Keep stems complete and options specific
17.	Separate enemy items
18.	Separate item variants
19.	Use item isomorphs
20.	Convey stem intent precisely and effectively
21.	Eliminate localization and sensitivity issues
22.	Obey the rules of grammar and usage
23.	Format items for readability
24.	Use graphics effectively
25.	Use text exhibits effectively

Item Writing Rules

1. Match the item to the objective

Make certain that the item closely relates to the objective it is intended to measure (congruence).

2. Create answer options that are clear, distinct, and plausible

Nothing should get in the way of an examinee selecting a correct answer. That means answer options must offer clear-cut, distinct, unambiguous choices for examinees to evaluate. In addition, all distractors should look, feel, and sound like they could be the correct answer.

Don't use combination-style Multiple-Choice answer options (i.e., A and B). They often provide unintended clues about the correct answer and reduce the number of plausible distractors for the item.

3. Include all information needed to respond to the item

Any information or exhibits that the candidate would need to correctly respond to the item should be included in the item.

4. Keep items independent

Do not refer to any part of any other item. Because each item may appear in a different order each time a test is administered, each item must be complete and stand by itself.

5. Verify items technically

Items must be verified as correct and should be correct as long as the test is available to candidates.

6. Write appropriately difficult (three-foot) items

Items that are too easy or too hard do not differentiate between those who have the knowledge, skills, and abilities the test addresses and those who do not.

7. Make items relevant

Items must be relevant if they are to help distinguish between those who will pass and those who will not.

8. Test specified knowledge, not test-taking skills

Don't trick the examinee. Hiding meaning in complex or over-precise wording makes reading comprehension more of a determinant in whether candidates answer correctly than whether they know the content.

9. Don't give clues to the correct answer within the item

It is possible to inadvertently give clues to the correct response within the item itself. These come in many forms. One way is using the same or closely related key words in the stem and only one of the answer options.

10. The guessing factor should be p=0.25 or less

The Information Technology industry has adopted a minimum standard of a p=0.25 probability of guessing correctly. What this means is:

- items should have four or more answer options, but no more than eight.
 Eight is a limitation of some test delivery drivers. In addition, large numbers of options are often confusing.
- the probability of guessing correctly can be calculated for complex items. However, if the number of options are four or more, the guessing probability is less than *p*=0.25.
- the probability of guessing correctly on a four option multiple-choice item is:
 - •1 correct of 4=0.25
 - •2 correct of 4=0.167
 - •3 correct of 4=0.25
- each item should have at least one correct and one incorrect option.

11. Focus on one thought, problem, or idea

Often an objective will cover a complex concept or range of concepts that should be broken down into single, simple concepts for the purpose of creating items. When possible, limit items to a single thought per item.

12. Include the criteria when items call for a judgment

When asking examinees to choose between multiple correct options, you must specify the criteria by which they are to choose.

13. Avoid words that are overly complex or have multiple meanings

Multiple uses of words with more than one meaning can confuse candidates and cause otherwise qualified candidates to miss the item. Write to a 6th-grade reading level.

14. Avoid using "NOT" in the stem

Write the stem in a positive form. The use of "NOT" is NOT encouraged. It is often overlooked by candidates and can confuse them, especially when English is not their first language. It leads otherwise qualified candidates to select a an incorrect answer. It is better to ask, "Which three are correct?" than to ask, "Which one is NOT correct?"

15. Avoid absolute and imprecise modifiers

Absolute ("always," "never") and imprecise ("best," "recommended") words can confuse candidates and/or give away answers.

16. Keep stems complete and options specific

The examinee should be able to read the stem and know what the correct answer is before viewing the options.

17. Separate enemy items

When an item gives away or cues the answer to another item, the items are called enemy items. Both items may be OK to use on the test, but they should never be placed on the same test form.

18. Separate item variants

Two or more items are called item variants when they address the same content. Variants are usually the same item asking for the same response in a slightly

different response mode.

19. Use item isomorphs

Isomorphs are items that are nearly identical but are different in some important way. Differences between isomorphs usually result in different correct responses. A well thought out, complex scenario-based item is an excellent candidate for creating isomorphs by changing one or two details in the stem, scenario, instructions, or prompts which result in a different correct answer.

20. Convey stem intent precisely and effectively

Item stems are the stimuli and prompts that elicit responses from examines. Stems need to convey clearly, completely and precisely how you want the examinee to indicate a correct response. In multiple-answer, multiple-choice items, it is important to let the candidate know the number of responses. Whenever possible, double-cue within the stem.

21. Eliminate localization and sensitivity issues

Exam items should not offend candidates nor give an advantage or disadvantage to any gender, ethnic, or cultural group. Items should be neutral, designed so that qualified examinees will be able to select correct answers, no matter what ethnic or geographic background they come from.

22. Obey the rules of grammar and usage

Rules of grammar, punctuation, and spelling are established standards that examinees expect. Deviations from a standard confuse the examinees and may lead them to believe they are being tricked.

23. Format items for readability.

The way an item is laid out on the screen has a significant effect on how quickly and easily examinees can find and decode the various elements of the item. Choice of font type, point size, style, placement of text, buttons and so forth all contribute to the way an item is perceived by examinees.

24. Use graphics effectively

Graphics may be used with items in several different ways. They may be included as standard exhibits accessible via the Exhibit Button, exhibits activated by other on-screen buttons, placed directly (embedded) in the stem rich text (RTF) field, embedded in multiple choice option RTF fields, or be included as part of a Drag and Drop, Point and Click, or Complex Graphic (GGI) item. No matter where a graphic is used, it must have certain simple, but important attributes in order to work with test delivery drivers.

25. Use text exhibits effectively

Text exhibits are displays of interpretive material too long or detailed to be included directly as part of the stem. A text exhibit is usually an attached text file in Microsoft Rich Text file format, containing narrative, tables, listings, program output, or some other text-based presentation. These exhibits are accessed by clicking an on-screen button located either on the bar at the bottom of the test delivery driver window or along the top to the item window. When clicked, a window containing the exhibit is displayed within the main window containing the test item

Which test item is clearest?

<u>Item 1:</u>

Which three technological innovations had the greatest impact on the size and power of modern computers? (Choose three.)

- A. transistors
- B. integrated circuits
- C. tubes and switches
- D. printed circuit boards

Item 2:

Which invention(s) had a large impact on modern computers?

- A. transistors
- B. integrated circuits
- C. tubes and switches
- D. printed circuit boards

Which rules apply to this exercise?

Items 1 and 2 appear on the same test, as do items 3 and 4. Which pair of items (1 and 2 or 3 and 4) best demonstrates the principle of item independence?

Item 1:

In Microsoft Excel, which tool is used to manipulate existing worksheet data into a more understandable viewing format?

- A. Pivot table
- B. Merge and Center
- C. Format Painter
- D. Print Preview
- E. Solver

Item 2:

Into which three formats can a Microsoft Excel spreadsheet be exported? (Choose three.)

- A. wpg
- B. dat
- C. wk1
- D. xls
- E. dbf

Item 3:

A data analyst is using Microsoft Excel to analyze marketing research data. Two worksheets are open, but each time the analyst tries to access the 2nd worksheet by clicking on the tab at the bottom, an error occurs and the computer stops responding.

Which keystroke command will bring up the 2nd worksheet?

- A. <F12>
- B. <CTRL T>
- C. <ALT TAB>
- D. <SHIFT F10>

Item 4:

Given the scenario in the previous question, whom should the analyst contact to report the software problem?

- A. any Microsoft retail store
- B. Microsoft University Hotline
- C. Microsoft Customer Support
- D. the person or company from whom Excel was purchased

Which rules apply to this exercise?

Exercise 4.3

Which test item attempts to trick the examinee?

<u>Item 1</u>:

Which four are valid classes of service for ATM? (Choose four.)

- A. ABR
- B. CBR
- C. NBR
- D. UBR
- E. VBR
- F. XBR

Item 2:

Which five are valid classes of service for ATM? (Choose five.)

- A. ABR
- B. CBR
- C. nrt-VBR
- D. rt-VBR
- E. UBR
- F. VBR-nrt
- G. VBR-rt
- H. XBR

Which rules apply to this exercise?

Which test item is more effective and why?

Item 1:

You need to connect an office with five lightly used workstations to your 10 Mbs LAN. Which device would best link them to the LAN?

- A. Hub
- B. Bridge
- C. Router
- D. Switch

Item 2:

You need to connect an office with five lightly used workstations to your 10 Mbs LAN. Which device would most inexpensively link them to the LAN?

- A. Hub
- B. Bridge
- C. Router
- D. Switch

Which rules apply to this exercise?

Exercise 4.5

Which test item is more effective?

Item 1:

Which three bones are located in the middle ear? (Choose three.)

- A. anvil
- B. stirrup
- C. concha
- D. hammer

Item 2:

Which bone is not located in the middle ear?

- A. anvil
- B. stirrup
- C. concha
- D. hammer

Which rules apply to this exercise?		

Which test item is more effective and why?

<u>Item 1:</u>

Which written instrument is used to convey an interest in real property?

- A. lien
- B. deed

<u>Item 2:</u>

Which written instrument is used to convey an interest in real property?

- A. title
- B. lien
- C. note
- D. deed
- E. escrow

Which items are isomorphs and which items are variants of item 1?

Item 1:

You must design a converged network for a company. Fifteen workstations exist in a building with a complex telephone system. Two mainframes are in remote geographic areas.

Which topology should you choose, considering relative cost and versatility?

- A. bus
- B. ring
- C. mesh
- D. hybrid

Item 2:

You must design a converged network for a company. Fifteen workstations exist in a building with a complex telephone system. Two mainframes are in the same building.

Which topology should you choose, considering relative cost and versatility?

- A. bus
- B. ring
- C. mesh
- D. hybrid

Item 3:

You must design a converged network for a company. Fifteen workstations exist in a building with a complex telephone system. Two mainframes are in remote geographic areas.

Which topology should you choose if cost is not an issue?

- A. bus
- B. ring
- C. mesh
- D. hybrid

Item 4:

You have been asked to build a converged network for your company's customer support center. Eighteen workstations currently exist in an office building with a complex telephone system. Two mainframes are located off-site in geographically remote areas.

Which network topology should you choose if cost and versatility are paramount concerns?

- A. bus
- B. star
- C. ring
- D. mesh
- E. hybrid
- F. multidrop

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Looking at the two stems, which is more effective and why?

Item 1:

Object permanence means _____

- A. understanding that objects that are permanent can be used as landmarks.
- B. understanding that objects exist even if they cannot be seen, heard or otherwise perceived.
- C. learning the difference in clues and landmarks and how they can be used during independent travel.
- D. learning about the environment through structured learning experiences

Item 2:

With respect to someone who has always been blind, what does object permanence mean?

- A. Understanding that objects that are permanent can be used as landmarks.
- B. Understanding that objects exist even if they cannot be seen, heard or otherwise perceived.
- C. Learning the difference in clues and landmarks and how they can be used during independent travel.
- D. Learning about the environment through structured learning experiences

Which item is free of localization problems?

<u>Item 1:</u>

Which statement describes a loan that should be classified as a loss?

- A. The obligor is incurring substantial deficits in the operation of other business ventures.
- B. Management is of the opinion that the obligor may be dishonest, however collateral values appear adequate.
- C. The loan is severely past due, collateral has ample value, but management is unable to locate the collateral of the obligor.
- D. The statutory period in which legal action can be taken against the obligor has expired, although the bank can sell the loan.
- E. The loan is past due more than six months and tangible collateral is inadequate, but the guarantor has supported the loan in the past.

Item 2:

Which financial agency is responsible for monitoring banking regulations in the United States?

- A. FDIC
- B. OCC
- C. NASD
- D. NUCUA

Which item is more effective?

Item 1:

How does one utilize a vacillating pendulum in an inverted, metallic, resonant cup?

- A. palpate the inverted, metallic, resonant cup with a sheet of webbed fabric
- B. retain the inverted, metallic, resonant cup in the vertebrate grasping appendage and rotate the radius bone briskly
- C. pitch the inverted, metallic, resonant cup into solidified, granulated oxygenated hydrogen.
- D. position directly and accurately the metallic resonant cup onto an elevated wooden plane.

Item 2:

How do you ring a bell?

- A. touch the bell with a cloth
- B. shake the bell with your hand
- C. drop the bell in the snow
- D. set the bell on a table

Of the two stems shown, which is more effective and why?

Item 1

Which of the following is required in order to connect to a 10 Mbs LAN network?

Item 2

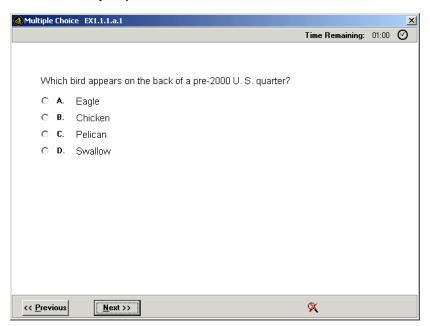
What is required to connect to a 10 Mbs LAN?

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BenchMark 4.0 Exercises

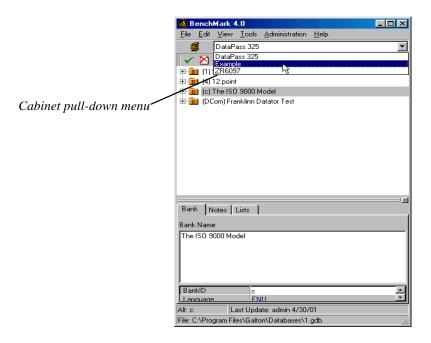
Exercise 1: Creating a Multiple-Choice Item

Multiple-choice is the most common item type. It is a question followed by four or more options. The steps in this section demonstrate how to create an item like the one shown below. To create your own item, simply substitute your content for the content that we specify in the directions.



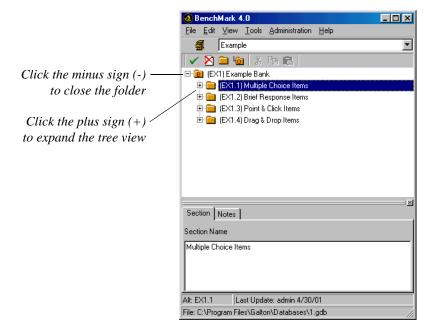
To navigate the TreeView window

1 Click the Cabinet pull-down menu, then select **Example**.



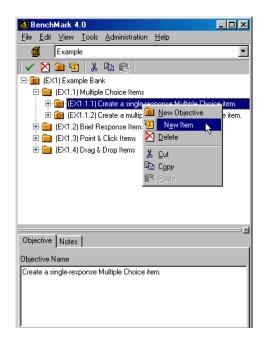
The Example cabinet opens. In it is a bank folder named (EX1)Example Bank

Click the plus sign (+) next to the (EX1) Example bank to expand its contents, then click the (+) to expand the (EX1.1) Multiple-Choice Items section.

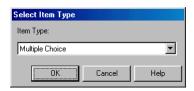


To create the multiple-choice item

1 Right-click the objective (EX1.1.1) Create a single-response Multiple-Choice item and then click New Item on the menu.

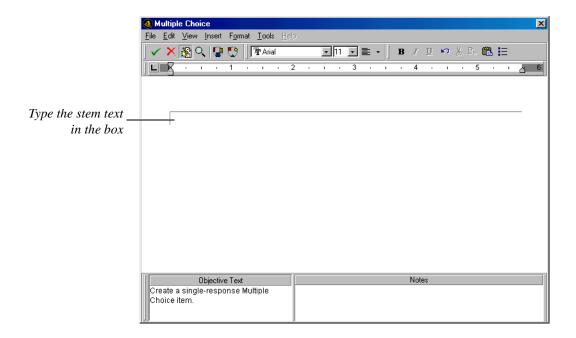


The Select Item Type dialog box opens.

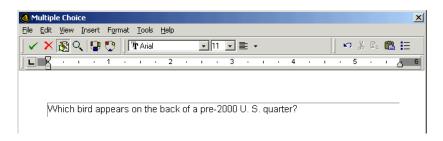


2 Click the **Item Type** menu, select **Multiple-Choice**, then click **OK**.

The Multiple-Choice item workspace window opens. In the workspace is a box in which you write the stem for the item.

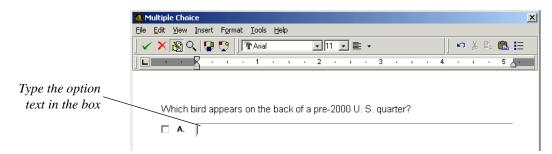


3 Type the stem as shown below.



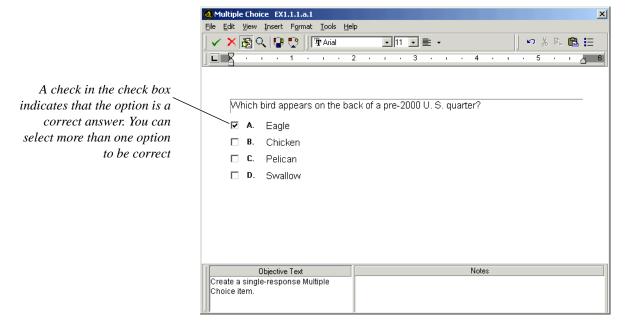
4 Right-click anywhere on the item screen and choose **Add Option** from the menu. (You can also press **Ctrl+O** to add an option.)

BenchMark inserts an empty check box, the letter "A" and a box for the option text.



- 5 Type **Eagle**.
- 6 Create three more options as you did in step 4, then type Chicken, Pelican, and Swallow in their respective text boxes.
- 7 Click the **Sort by Length** on the toolbar to arrange the options from shortest to longest.

8 Indicate the correct answer by clicking the check box next to option **A** (Eagle).

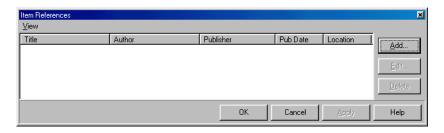


9 Click Save Changes

To add a reference

1 In the Property Inspector for the item click the **References** field > the settings button.

The Item References dialog box opens.

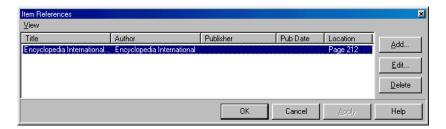


2 Click Add.

The Add Item Reference dialog box opens.

- 3 Select Encyclopedia International, Volume 3.
- 4 Type **Page 212** in the text field.

5 Click Finish.



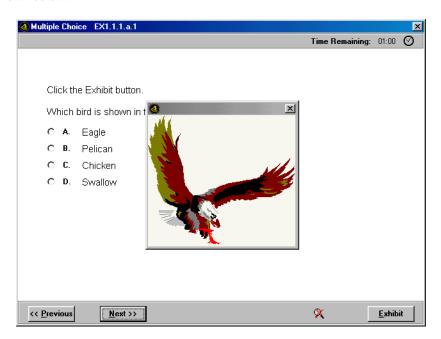
- 6 Click OK.
- In the Property Inspector, click the Audits tab.A list of audits appears. The first check box, Item Written, is empty, indicat-
- To indicate that the Item Written stage is complete, click the box next to **Item Written**.

An "X" appears, indicating that that step is complete.

ing that it is the current status of the item.

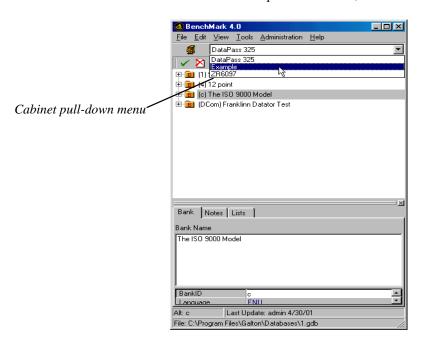
Exercise 2: Adding an Exhibit to a Multiple-Choice Item

Occasionally you will need to add an exhibit, either a graphic or text, to help the candidate understand the question and options in the multiple choice item. This section explains how to create a multiple choice item that includes an exhibit, as shown below.



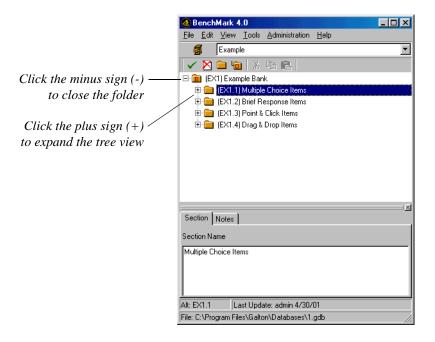
To navigate the Tree View window

1 Click the Cabinet pull-down menu, then select **Example**.



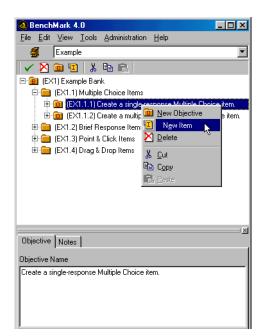
The Example cabinet opens. In it is a bank folder named (EX1)Example Bank.

2 Click the plus sign (+) next to the **(EX1) Example** bank to expand its contents, then click the (+) to expand the **(EX1.1) Multiple-Choice Items** section.

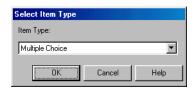


To create the multiple-choice item

1 Right-click the objective (EX1.1.2) Create a single-response Multiple-Choice item with a resource and then click New Item on the menu.

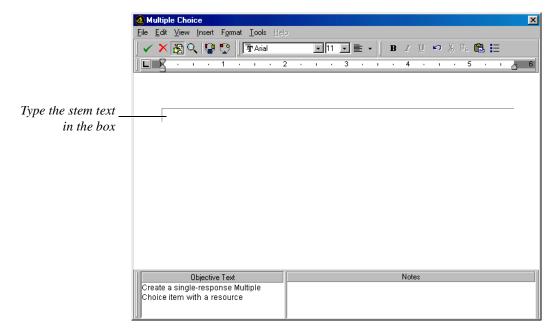


The Select Item Type dialog box opens.

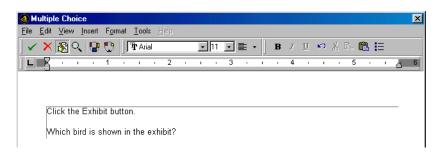


2 Click the **Item Type** menu, select **Multiple-Choice**, then click **OK**.

The Multiple-Choice item workspace window opens. In the workspace is a box in which you write the stem for the item.

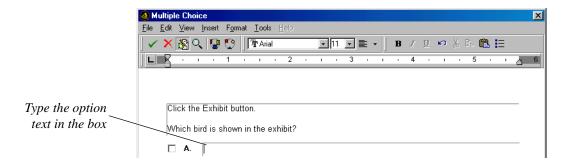


3 Type the stem as shown below.

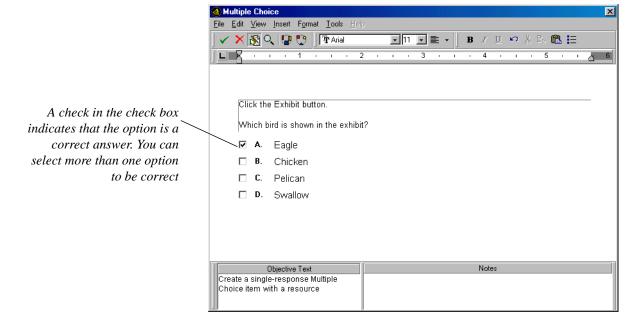


4 Right-click anywhere on the item screen and choose **Add Option** from the menu. (You can also press **Ctrl+O** to add an option.)

BenchMark inserts an empty check box, the letter "A" and a box for the option text.



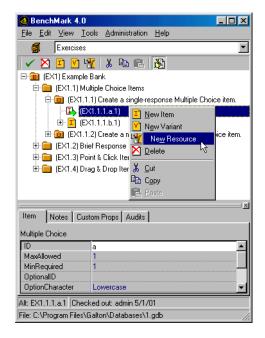
- 5 Type **Eagle**.
- 6 Create three more options as you did in step 4, then type Chicken, Pelican, and Swallow in their respective text boxes.
- 7 Click the **Sort by Length** on the toolbar to arrange the options from shortest to longest.
- Indicate the correct answer by clicking the check box next to option A (Eagle).



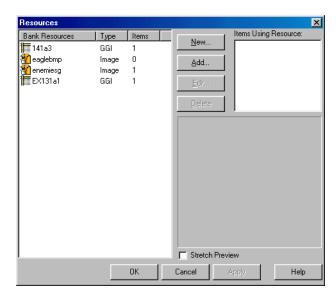
9 Click Save Changes

Adding an Exhibit

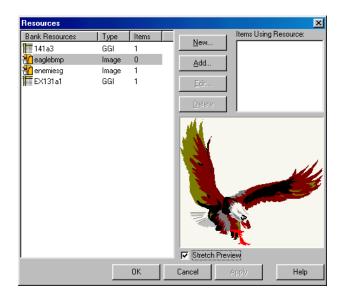
1 In the item edit window, click **File** > **New Resource**.



The Resource dialog box opens.



2 Click the eaglebmp file.



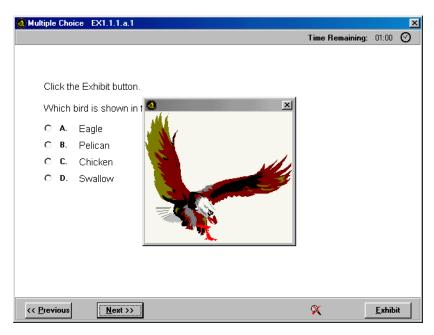
A thumbnail of the graphic opens in the preview window.

3 Click OK.

The image is attached to the item.

To preview the item

- 1 In the Item Edit window, click **Preview** A preview version of the item opens.
- 2 Click the **Exhibit** button to see the graphic. The eagle graphic opens.

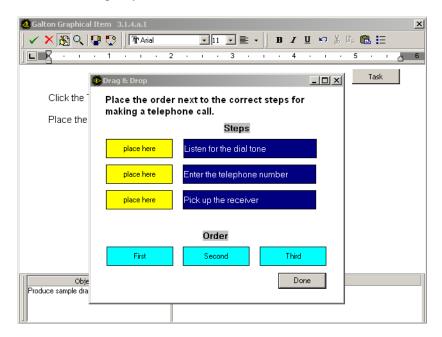


To verify the scoring

- 1 Click option **A**, Eagle, the correct answer, then right-click anywhere on the item and click **Score** (or press **Ctrl-S**).
 - The score box indicates that your answer was correct.
- 2 Close the Preview version of the item by clicking Close in the upperright corner of the item window.

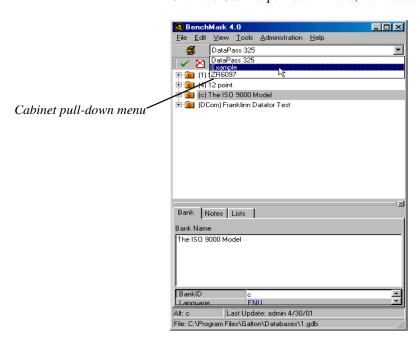
Exercise 3: Creating a Drag & Drop Item Using a GGI Template

Drag & drop items add interactivity to an item and allow for matching and sequencing. This section shows the benefits of having a GGI template for quickly creating drag & drop items. These steps demonstrate how to create an item like the one shown below. To create your own item, simply substitute your content for the content that we specify in the directions.

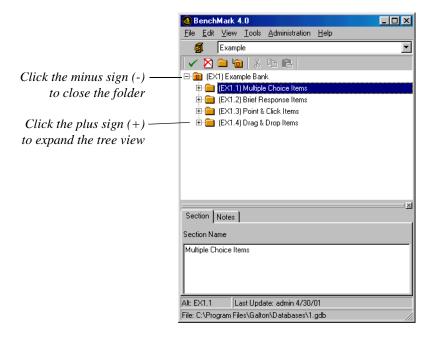


To navigate the TreeView

Click the Cabinet pull-down menu, then select **Example**.



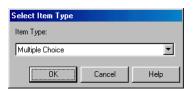
2 Click the plus (+) next to the **(EX1) Example** bank to expand its contents, then click the plus (+) to expand the **(EX1.4) Drag & Drop Items** section.



3 Select the objective (EX1.4.1) Create a Drag & Drop item.

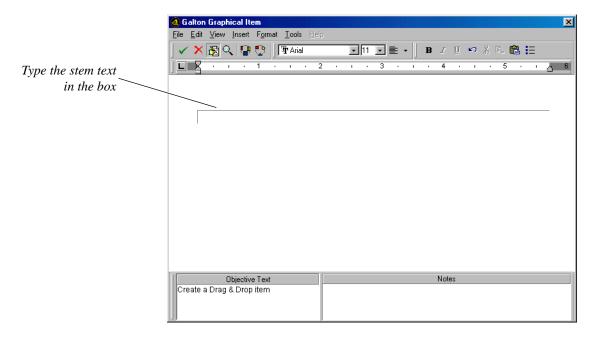
To create an item

Right-click the objective and click **New Item** on the menu.
 The Select Item Type dialog box opens.

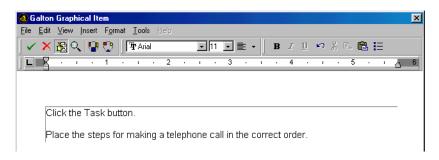


2 Click the **Item Type** menu > **Galton Graphical** > **OK**.

The Galton Graphical item window opens. In the item window is a text box in which you write the stem for the item.



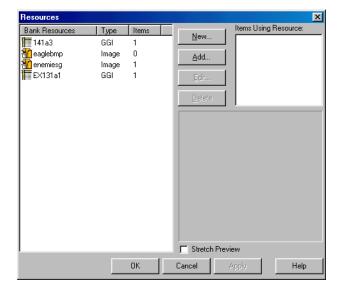
3 Type the text as shown in the following illustration.



4 Click Save

To add a Drag & Drop task

1 In the item edit window, click **File** > **New Resource**.



The Resources dialog box opens.

2 Click New.

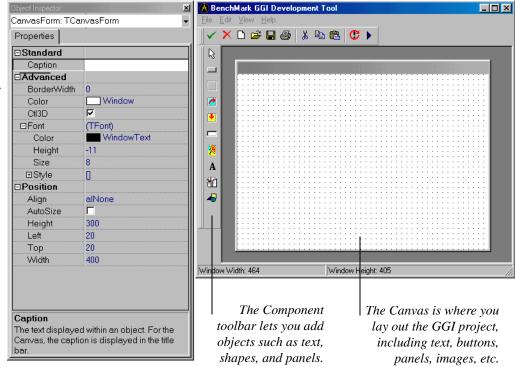
The Select Resource Type dialog box opens.



3 Click Galton Graphical > OK.

The BenchMark GGI Development Tool opens. These windows are used to create the Drag & Drop item.

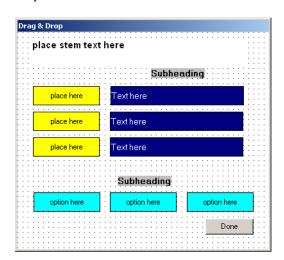




To load a template

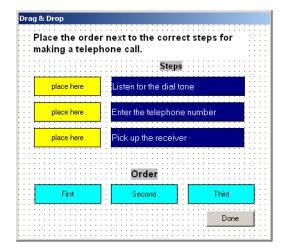
- 1 Click Open
- 2 Browse to the shared folder on the network that contains the Order Steps.ggi file.
- 3 Click the **Order Steps.ggi** file, then click **OK**.

A nearly complete drag & drop project opens. All of the objects have been created and positioned already. You only need to change the caption text of the panels.



4 Add text to a source panel or label by selecting it, then typing the text string in the **Caption** field of the Object Inspector.

The graphic below shows where to put each text string.

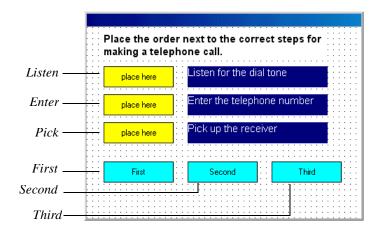


5 To add a caption to the GGI window, click an empty area of the canvas, then type the text in the **Caption** field.

To change the aliases of the panels

To help in scoring, the *Alias* parameter for each panel needs to be named.

1 Select a panel, then in the Object Inspector, type the alias names in the **Alias** field as indicated in the following illustration.



To Close the GGI Tool and return to the item

- 1 Click **OK** to save the image and close the GGI Tool.
 - The Resource Name dialog box opens.
- 2 Type a name for the resource.

Resource names must follow the 8.3 naming convention. A rule of thumb is to use the Item ID in the name. For example, type **BM131** if the item ID is BM.1.3.1.

- The GGI project opens on top of the original item screen.
- 3 Drag the source panels to the correct destination panels.

Click Done.

A Confirm dialog box opens.

Click **Yes** to accept the results as the correct answer for the item.

This adds an option containing the text string to your item just below the stem. Don't worry about interpreting or understanding the text string.

To preview the item

Click **Preview**



A preview version of the item opens.

- 2 Click the **Task** button.
- When the GGI project opens, drag the source panels to the correct destinations, then click Done.

The GGI project closes

Verify the Scoring

Right-click anywhere in the item and click **Score**.

The score box should indicate that your answer was correct. To ensure incorrect responses are scored correctly, place the source panels on incorrect destination panels.

- Click **OK** to close the score box. 2
- Click **End Preview** to exit preview mode.



To finish up

- 2 Click Add.
- Select Chapter 1: How to make a telephone call: Telemarketing 101.
- Type **page 17** in the text box.
- Click Finish.
- Click OK.
- Click the **Audits** tab.

A list of audits appears. The first check box, Item Written, is empty, indicating that it is the current status of the item.

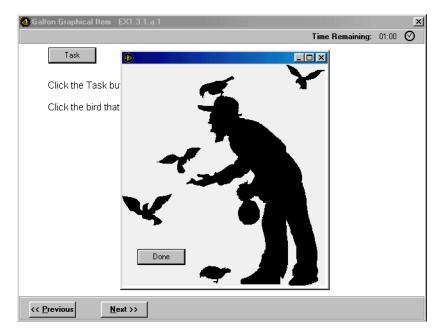
To indicate that the Item Written stage is complete, click the box next to Item Written.

An "X" appears, indicating that that step is complete.

Exercise 4: Creating a Point & Click Item

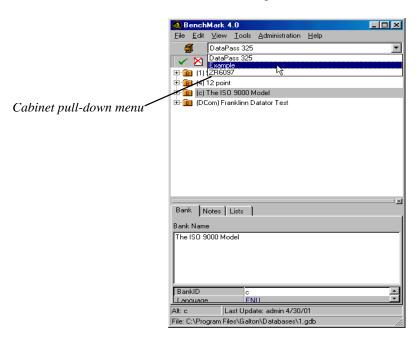
Point & click items add interactivity to an item where the candidate is required to identify one or more objects. These steps demonstrate how to create an item like the one shown below. To create your own item, simply substitute your content for the content that we specify in the directions.

It will look like this:

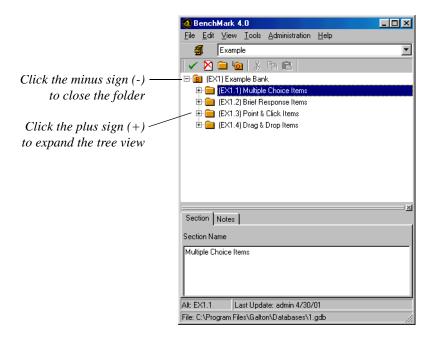


To navigate the TreeView

1 Click the Cabinet pull-down menu, then select **Example**.



Click the plus sign (+) next to the (EX1) Example bank to expand its contents, then click the (+) next to (EX1.3) Point & Click Items to expand the section.



3 Select the objective (EX1.3.1) Create a Point & Click item.

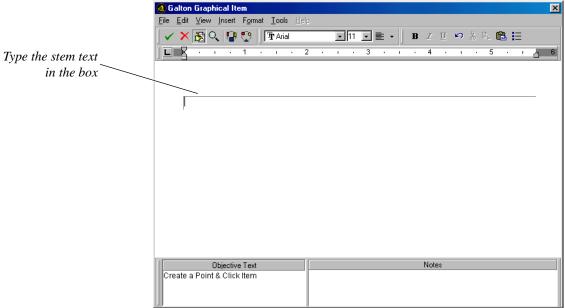
To create the item

1 Right-click the objective and click **New Item** on the menu. The Select Item Type dialog box opens.



2 Click the Item Type menu, click Galton Graphical, then click OK.

The Galton Graphical item workspace window opens. In the item window is a text box in which you write the stem for the item.

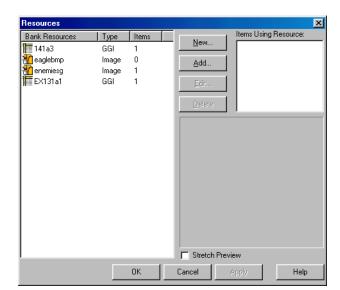


3 Enter the text as shown in the following illustration.



To add a Point & Click task

1 Right-click anywhere on the Item Edit screen, then select **New Resource**.



The Resources dialog box opens.

2 Click New.

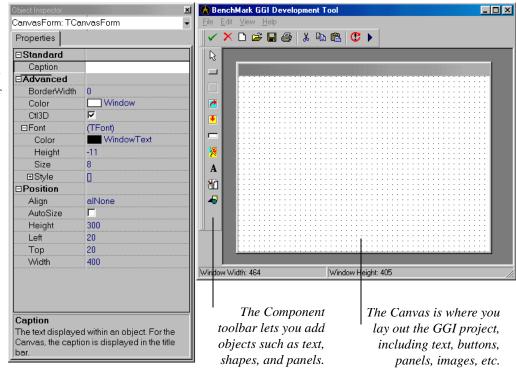
The Select Resource Type dialog box opens.



3 Click Galton Graphical > OK.

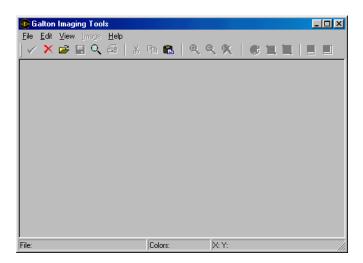
The BenchMark GGI Development Tool opens. These windows are used to create the Point & Click item.

The Object Inspector lets you view and change settings for the GGI project and any components of the project.



4 On the Components toolbar, click the **Hot Image** button, then click anywhere on the canvas.

The Galton Imaging Tools program opens.



5 Click **Open Image** on the toolbar.

The Open File dialog box opens.

- 6 Browse to the Resources shared folder then click **birdman.bmp**.
- 7 Click Open.

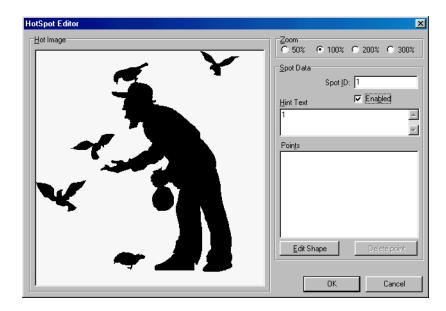
The image opens in the GI Tool.

8 Click Save Changes and Return to BenchMark to save the image and exit the GI Tool.

The HotSpots dialog box opens.



9 Click New to add a hot spot area to the picture. The HotSpot Editor opens.



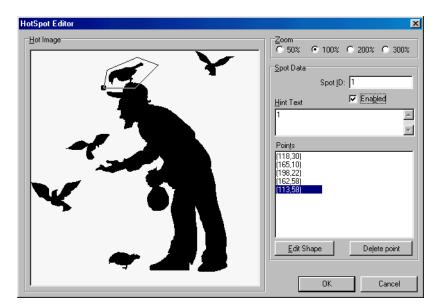
10 Click **Edit Shape** and move the cursor over the picture. The cursor will change to a crosshair.

11 To create the hot spot, click somewhere near the outline of the bird that is on top of the man's head. Then move the cursor around the outline of the bird, clicking at any necessary change of direction.



12 To complete the hot spot, right-click when near the first point of the hot spot area.

This completes the area and places the coordinates in the Points box.



- 13 Make sure **Enabled** is checked.
- 14 Click **Hint Text** box, then delete the number and type **Bird on hat**.
- 15 Click OK.



The HotSpot Editor closes. The hotspot you created is displayed in the HotSpots dialog box.

To create other hot spot areas, repeat steps 9–14 until you have added all the hot spots you need. You might want to define hot spots for the most plausible distractor areas as well as for any other correct responses.

16 Click OK.

The HotSpots dialog box closes. The Hot Graphic appears on the canvas.

- 17 Click the Hot Graphic and drag it to the center of the Canvas.
- 18 Use the handles around the image to stretch the frame surrounding the image to the proper size.

To add a done button to the Point & Click item

1 From the Components toolbar, click the **Button** tool, then click anywhere on the GGI canvas.

This adds a button to the canvas. The Object Inspector displays the settings for the button.

2 Drag the button to the bottom-left corner of the canvas.



To Close the GGI Tool and return to the item

Click **OK** to save the image and close the GGI Tool.

The Resource Name dialog box opens.

Type a name for the resource.

Resource names must follow the 8.3 naming convention. A rule of thumb is to use the Item ID in the name. For example, type **BM131** if the item ID is BM.1.3.1.

The GGI project opens on top of the original item screen.

Click the bird on the man's head.

When the pointer is over the correct area, the "Bird on hat" hint should appear.

4 Click Done.

A Confirm dialog box opens.

Click **Yes** to accept the results as the correct answer for the item.

This adds an option containing the text string to your item just below the stem. Don't worry about interpreting or understanding the text string.

To preview the item

Click **Preview**



A preview version of the item opens.

- 2 Click the **Task** button.
- When the GGI project opens, click the correct area of the image.

Verify the Scoring

Right-click anywhere in the item and click **Score**.

The score box should indicate that your answer was correct.

Click **OK** to close the score box.

To ensure incorrect responses are scored correctly, click outside the correct

Click **End Preview** to exit preview mode.

To finish up

- 2 Click Add.
- **Select Chapter 1: Relationships of Objects**.
- Type **page 4** in the text box.
- 5 Click Finish
- Click the Audits tab.

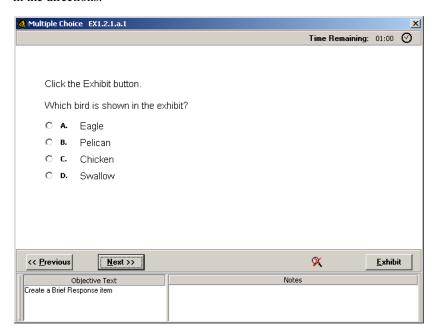
A list of audits appears. The first check box, Item Written, is empty, indicating that it is the current status of the item.

7 To indicate that the Item Written stage is complete, click the box next to **Item Written**.

A check mark appears, indicating that that step is complete.

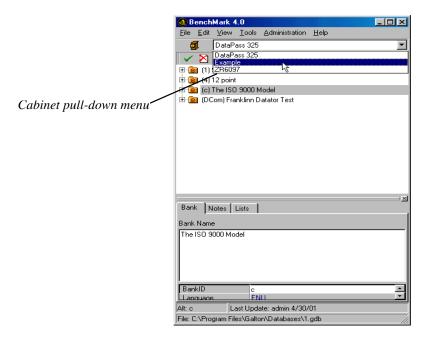
Exercise 5: Creating a Brief Free Response Item

Brief response items require the candidate draw the correct answer from memory. These steps demonstrate how to create an item like the one shown below. To create your own item, simply substitute your content for the content that we specify in the directions.

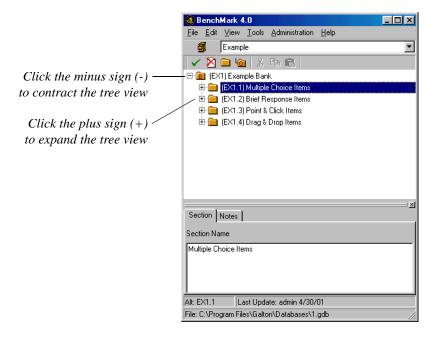


To navigate the TreeView

1 Click the Cabinet pull-down menu, then select **Example**.



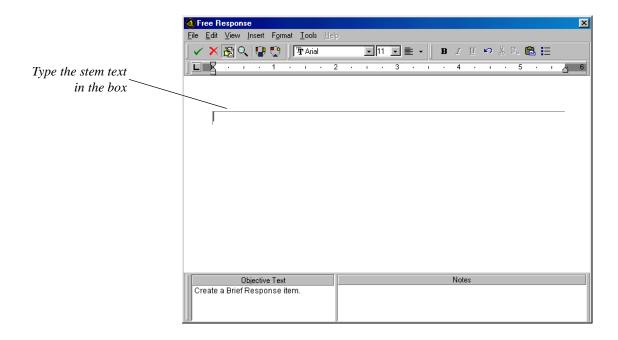
2 Click the plus sign (+) next to the (EX1) Example bank to expand its contents, then expand the (EX1.2) Brief Response Items section.



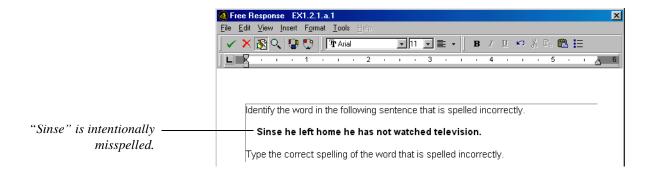
3 Select the objective (EX1.2.1) Create a Brief Response item.

To create the item

- 1 Right-click the objective and click **New Item** on the menu. The Select Item Type dialog box opens.
- 2 Click the Item Type menu > Free Response > OK.
 The Free Response item workspace window opens. In the item window is a text box in which you write the stem for the item.

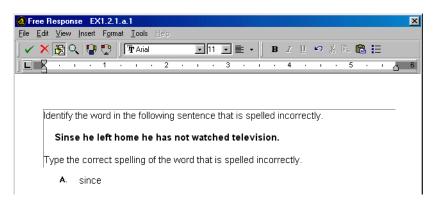


3 Enter the text as shown in the following illustration.



To enter the correct answer

- 1 Right-click anywhere on the item screen and choose **Add Option** from the menu. (You can also press **Ctrl-O** to add an option.)
 - You should see the letter "A" and a box for you to type the option.
- 2 Type the correct answer. In this exercise, the correct answer is **since**.

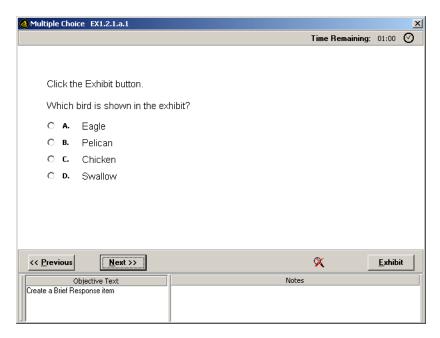


- In the Property Inspector, make sure that **IgnoreCase** is selected. This ensures that both **Since** and **since** are correct answers.
- 4 Click Save

To preview the item

1 Click **Preview** on the tool bar.

A preview version of the item opens. The option is replaced by a box where the candidate can type the answer.



To verify the scoring

- 1 In the answer box, type **since**.
- 2 Right-click anywhere on the item and choose **Score** from the menu. The score box indicates that your answer was correct.
- 3 Click **OK** to close the score box.

You can check to see if incorrect answers are scored correctly type in an incorrect answer.

4 Click **End Preview** to close the preview mode.

To finishing up

- 2 Click Add.
- 3 Select 100 Commonly Misspelled Words.
- 4 Type **page 37** in the text box.
- 5 Click Finish
- 6 Click the Audits tab.

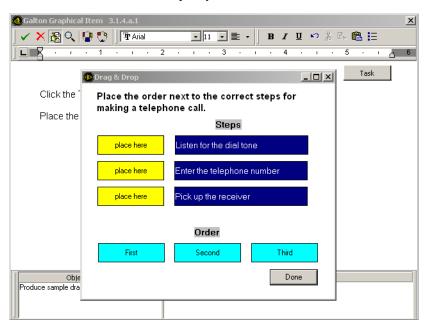
A list of audits appears. The first check box, Item Written, is empty, indicating that it is the current status of the item.

7 To indicate that the Item Written stage is complete, click the box next to **Item Written**.

A check mark appears, indicating that that step is complete.

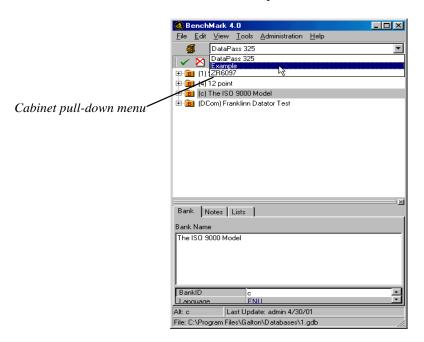
Exercise 6: Creating a Drag & Drop Item

Drag & drop items add interactivity to an item and allow for matching and sequencing. These steps demonstrate how to create a drag & drop item like the one shown below from scratch. To create your own item, simply substitute your content for the content that we specify in the directions.

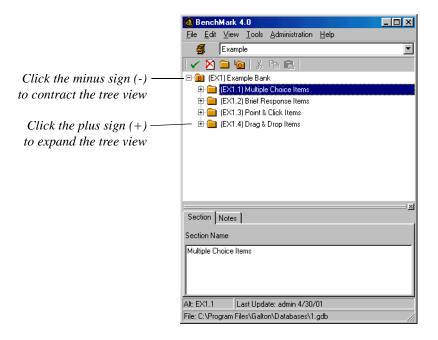


To navigate the Tree View

1 Click the Cabinet pull-down menu, then select **Example**.



Click the plus (+) next to the (EX1) Example bank to expand its contents, then click the (+) next to (EX1.4) Drag & Drop Items to expand the section.



3 Select the objective (EX1.4.1) Create a Drag & Drop item.

To create an item

1 Right-click the objective and click **New Item** on the menu. The Select Item Type dialog box opens.



2 Click the **Item Type** menu > **Galton Graphical** > **OK**.

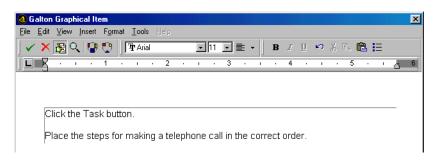
Type the stem text in the box

Objective Text

Notes

The Galton Graphical item window opens. In the item window is a dashed box in which you write the stem for the item.

3 Type the text as shown in the following illustration.

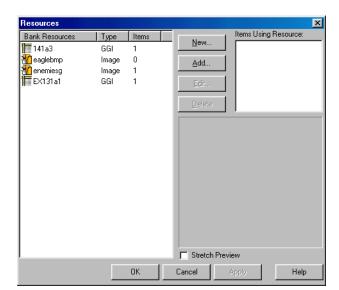


4 Click Save

Create a Drag & Drop item

To add a Drag & Drop task

1 In the item edit window, click **File** > **New Resource**.



The Resources dialog box opens.

2 Click New.

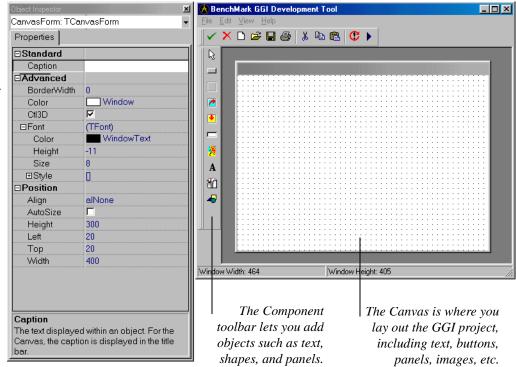
The Select Resource Type dialog box opens.



3 Click Galton Graphical > OK.

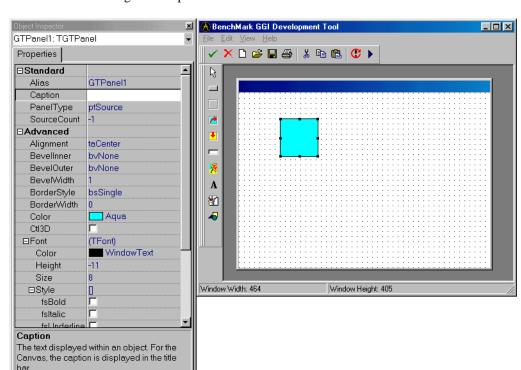
The BenchMark GGI Development Tool opens. These windows are used to create the Drag & Drop item.





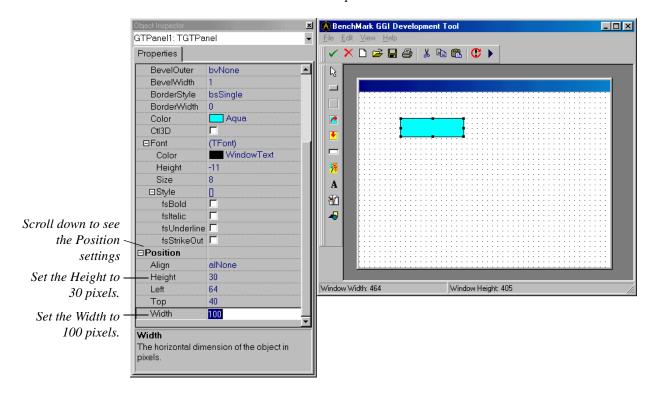
To make source panels

1 On the Components toolbar, click the **Source Panel** button, then click anywhere on the GGI canvas.



An aqua panel is placed on the canvas. The Object Inspector displays the settings for the panel.

- 2 In the Object Inspector, set the **Height** of the panel to 30
- 3 Set the **Width** of the panel to 100.



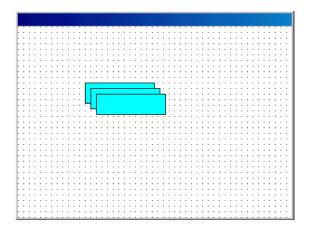
4 Click the panel to apply the new dimensions.

5 Set **SourceCount** to **1**.

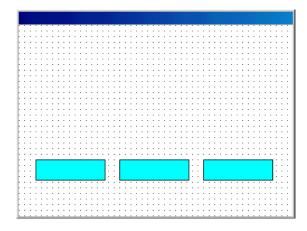
This allows only one copy of the source panel to be dragged to a destination panel, rather than an unlimited number of them.

- 6 Right-click the panel, then select **Copy**.
- 7 Click the canvas to deselect the panel.
 - If you paste the copied panel when the panel is selected, the new panel will be pasted within the original panel.
- 8 Right-click the canvas, then click **Paste** to create a copy of the source panel on the item canvas.
- 9 Click the canvas again to deselect the new panel, right-click, then select Paste.

You now have three identical source panels.

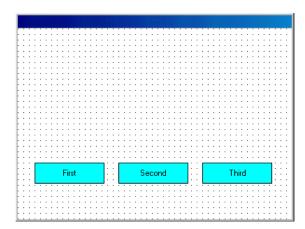


10 Drag the panels and align them, evenly spaced, along the bottom of the canvas, as shown below.



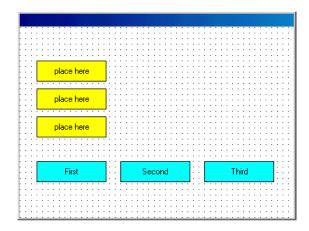
11 To add text to a source panel, select the panel, click **Caption** in the Object Inspector, and in the text box type the text.

Type the text as shown below



To make destination panels

- 1 Click **Destination Panel**, then click on the Canvas. The text, **place here**, is already written in the panel.
- 2 Change the **Width** to **100** and the **Height** to **30** as you did with the Source Panels.
- 3 Copy the destination panel twice, as you did the source panels.
- 4 Drag the destination panels so they are aligned and evenly spaced along the left side of the canvas, as shown below.



To add the text

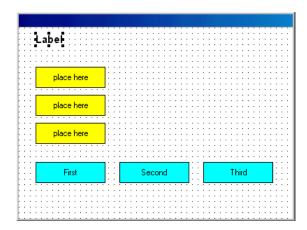
You will need 1 text box and 3 plain panels for this Drag & Drop GGI project. The text box is for the stem for the item. The three panels are for the options for the destination panels.

1 On the Components toolbar, click **Text** , then click the top, left corner of the canvas.

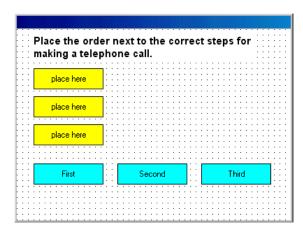
A text label is placed on the canvas.

2 In the Object Inspector, click **Font**, then click the settings button. The Font dialog box opens.

3 Change the font to Arial, bold, 11 point, then click OK. The typeface in the label changes.



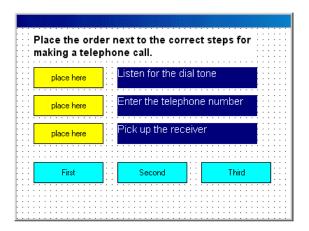
- 4 In the Object Inspector, click **WordWrap** so the check mark appears in the box.
- 5 Click **AutoSize** so the check mark is removed from the box.
- 6 Set the **Height** to **40** and the **Width** to **320**.
- 7 Click Caption, then type Place the correct order next to the steps for making a telephone call.



- 8 Click **Panel** on the Components toolbar, then click to the right of the top destination panel.
- 9 In the Object Inspector, click **Font**, then click the settings button.
- 10 Set the **Font** to **Arial**, **11 points**, **regular**, and the color to **white**, then click **OK**.
- 11 Set the **Height** to **30** and the **Width** to **200**.
- 12 Set the Color to Navy.
 - This is the background color. Make sure you select the color field above Font, not below it.
- 13 Set the **Alignment** to **taLeftJustify**.
- 14 Copy the panel two times as you did the source and destination panels.

You now have three panels.

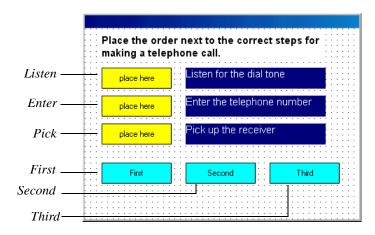
- 15 Drag the labels so they are aligned with the destination panels.
- 16 Type the **Caption** text for each panel as shown below.



To change the aliases of the panels

To help in scoring, the *Alias* parameter for each panel needs to be named.

1 Select a panel, then inside the Object Inspector, type the alias names in the **Alias** field as indicated in the following illustration.



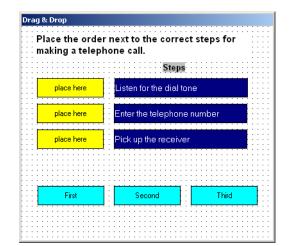
To add subheadings to the GGI

- 1 Click **Text** A on the toolbar.
- 2 Click above the "Listen for the dial tone" panel.

 The label will be placed at the leastion you clicked. You

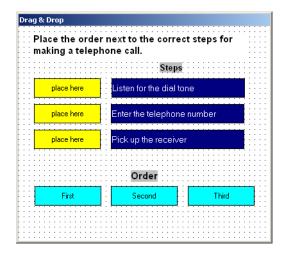
The label will be placed at the location you clicked. You may need to move panels to make room for the label.

- 3 In the Object Inspector, click **Caption**.
- 4 Delete the contents and type **Steps**.
- 5 Set the font to 10 pts, Arial, Bold.
- 6 In the Object Inspector, click Color (located under Alignment), then click Silver.



7 Center the label over the "Listen for the dial tone" panel.

- 8 Copy the Steps subheading and paste it centered above the "Second" panel.
- 9 Click Caption in the Object Inspector, delete Steps and type Order.



To add a Done button to the GGI

1 From the Components toolbar, click the **Button** tool, then click anywhere on the GGI canvas.

This adds a button to the canvas. The Object Inspector displays the settings for the button.

Place the order next to the correct steps for making a telephone call.

place here
Listen for the dial tone

place here
Enter the telephone number

place here
Pick up the receiver

First
Second
Third
Done

2 Drag the button to the bottom-right corner of the canvas.

To add a caption to the canvas

- 1 Click the canvas.
- 2 In the Object Inspector, click **Caption**, then in the text box type **Drag & Drop**.

The text appears in the title bar at the top of the canvas.

To size the GGI canvas

You can size the canvas by clicking and dragging the canvas border or by setting the Width and Height parameters in the Object Inspector. Size the canvas so that it is as small as possible, but not so small that any of the elements in the project are not fully within the window. You may need to reduce the space between panels, labels, and the Done button. Do not make the canvas larger than 560 pixels (width) by 400 pixels (height).

To Close the GGI Tool and return to the item

- 1 Click **OK** to save the image and close the GGI Tool. The Resource Name dialog box opens.
- 2 Type a name for the resource.

Resource names must follow the 8.3 naming convention. A rule of thumb is to use the Item ID in the name. For example, type **BM131** if the item ID is BM.1.3.1.

The GGI project opens on top of the original item screen.

- 3 Drag the source panels to the correct destination panels.
- 4 Click **Done**.
 - A Confirm dialog box opens.
- 5 Click **Yes** to accept the results as the correct answer for the item.

This adds an option containing the text string to your item just below the stem. Don't worry about interpreting or understanding the text string.

To preview the item

Click **Preview**



A preview version of the item opens.

- Click the **Task** button.
- When the GGI project opens, drag the source panels to the correct destinations.
- Click Done.

Verify the Scoring

Right-click anywhere in the item and click **Score**.

The score box should indicate that your answer was correct.

Click **OK** to close the score box.

To ensure incorrect responses are scored correctly, place the source panels on incorrect destination panels.

Click **End Preview** to exit preview mode.



To finish up

- Click Add.
- Select Chapter 1: How to make a telephone call: Telemarketing 101.
- Type page 17 in the text box.
- Click Finish
- Click the **Audits** tab.

A list of audits appears. The first check box, Item Written, is empty, indicating that it is the current status of the item.

7 To indicate that the Item Written stage is complete, click the box next to Item Written.

A check mark appears, indicating that that step is complete.

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Technical Review

When you have completed the item development for the examination, use the following list to determine if you have completed each aspect of each item.

Technical Review Criteria

- Congruence
 - Cognitive congruence
 - Technical congruence
- Difficulty level
 - ❖ 1 foot level vs. 5 foot level test
- Relevance
 - ❖ Does the test taker need to know this to be successful on the job?
- Are the keys truly correct?
- Are the distractors plausible?

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