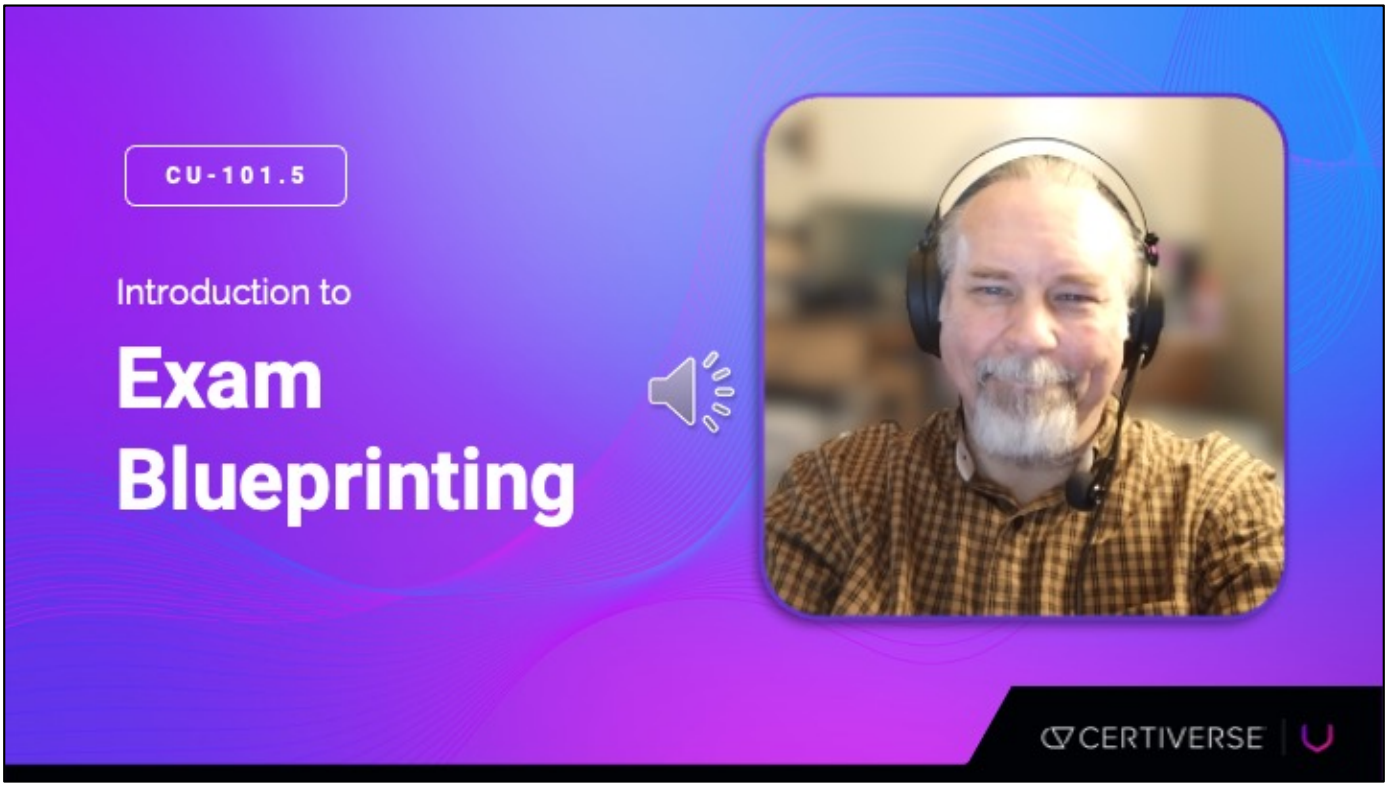
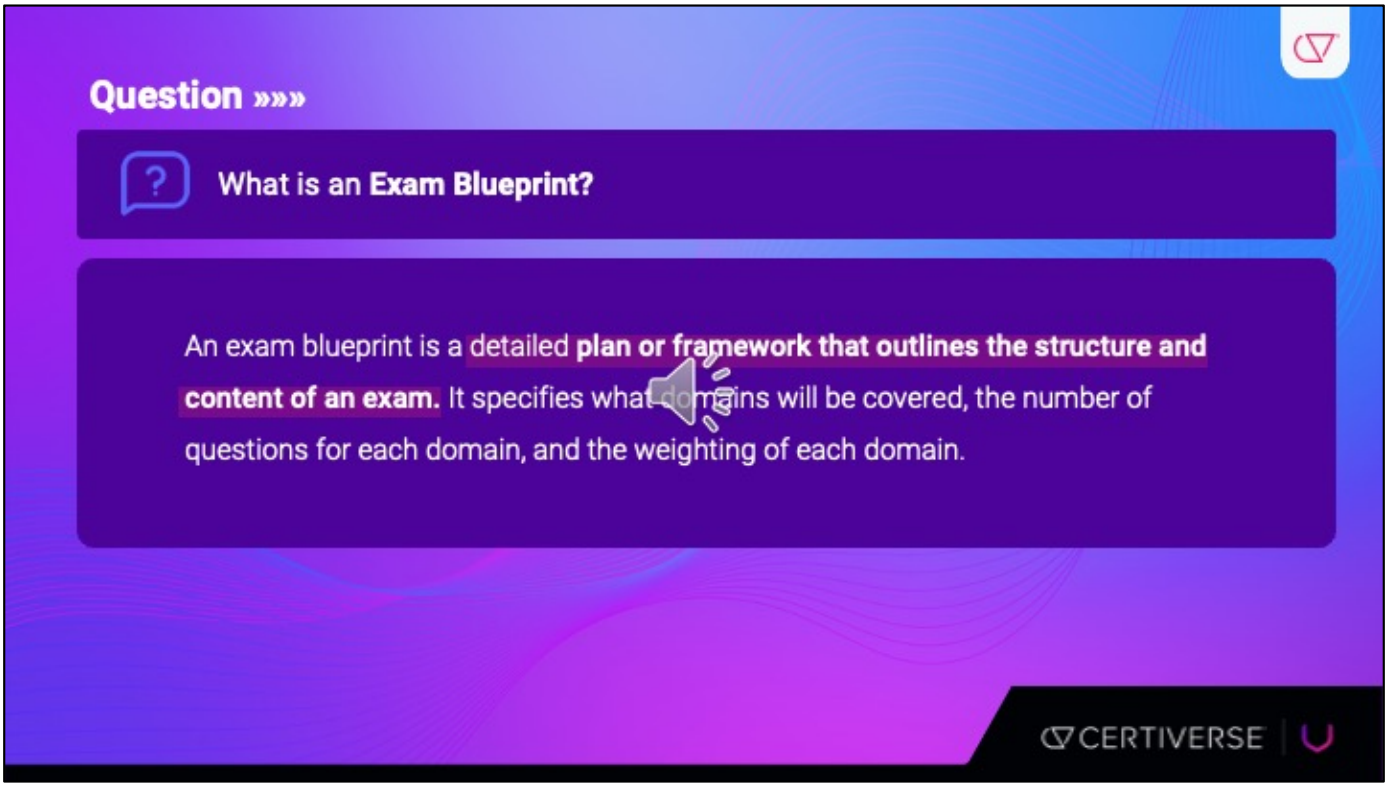
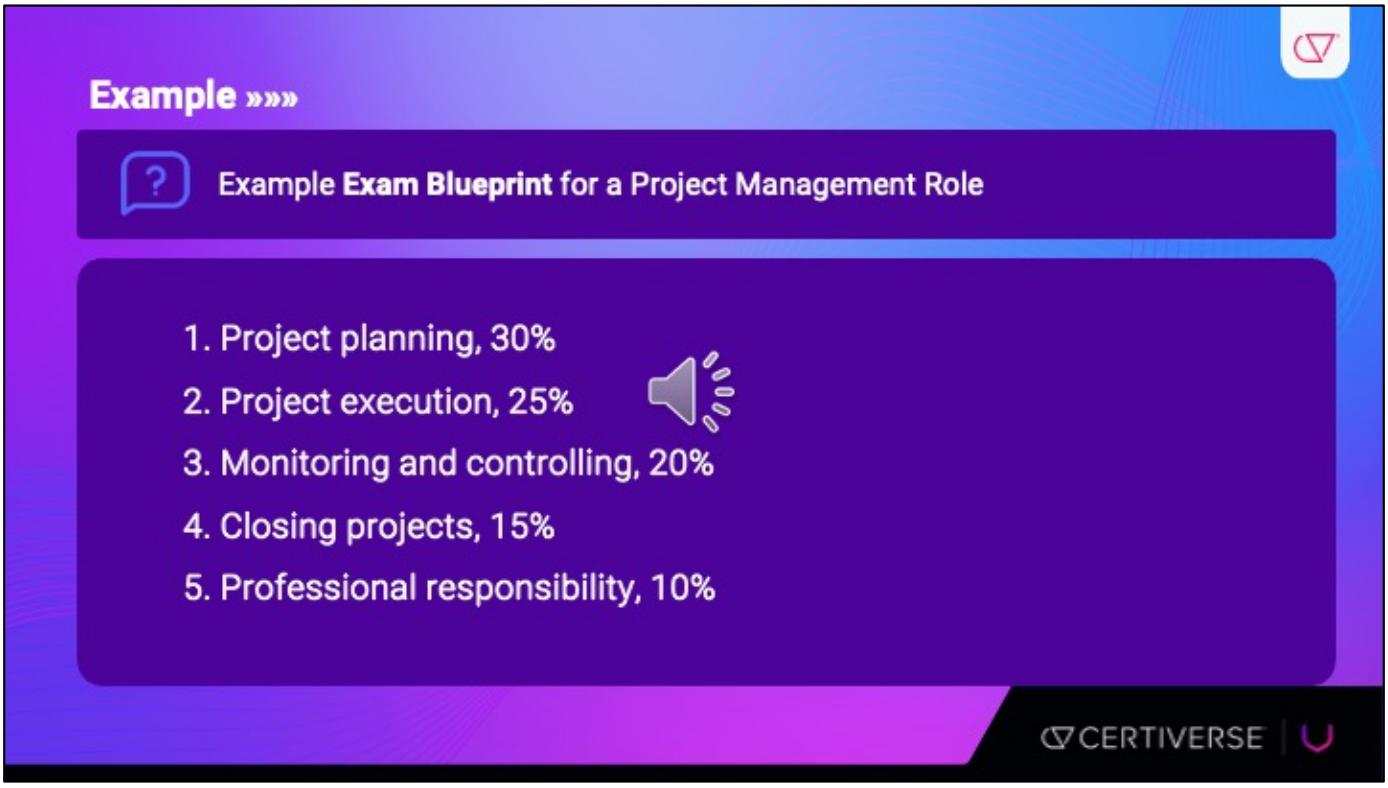


Welcome to Certiverse University and welcome to this video, “Introduction to Exam Blueprinting.” My name is Alan Mead, and I am the Chief Psychometrician for Certiverse. In this video, we’re going to dive into the essential components of creating an effective exam blueprint. By the end of this video, you’ll understand what an exam blueprint is, why it's important, where it fits into the exam development process, and how to create one. Let’s get started.



What is an exam blueprint (also called a test specification)?

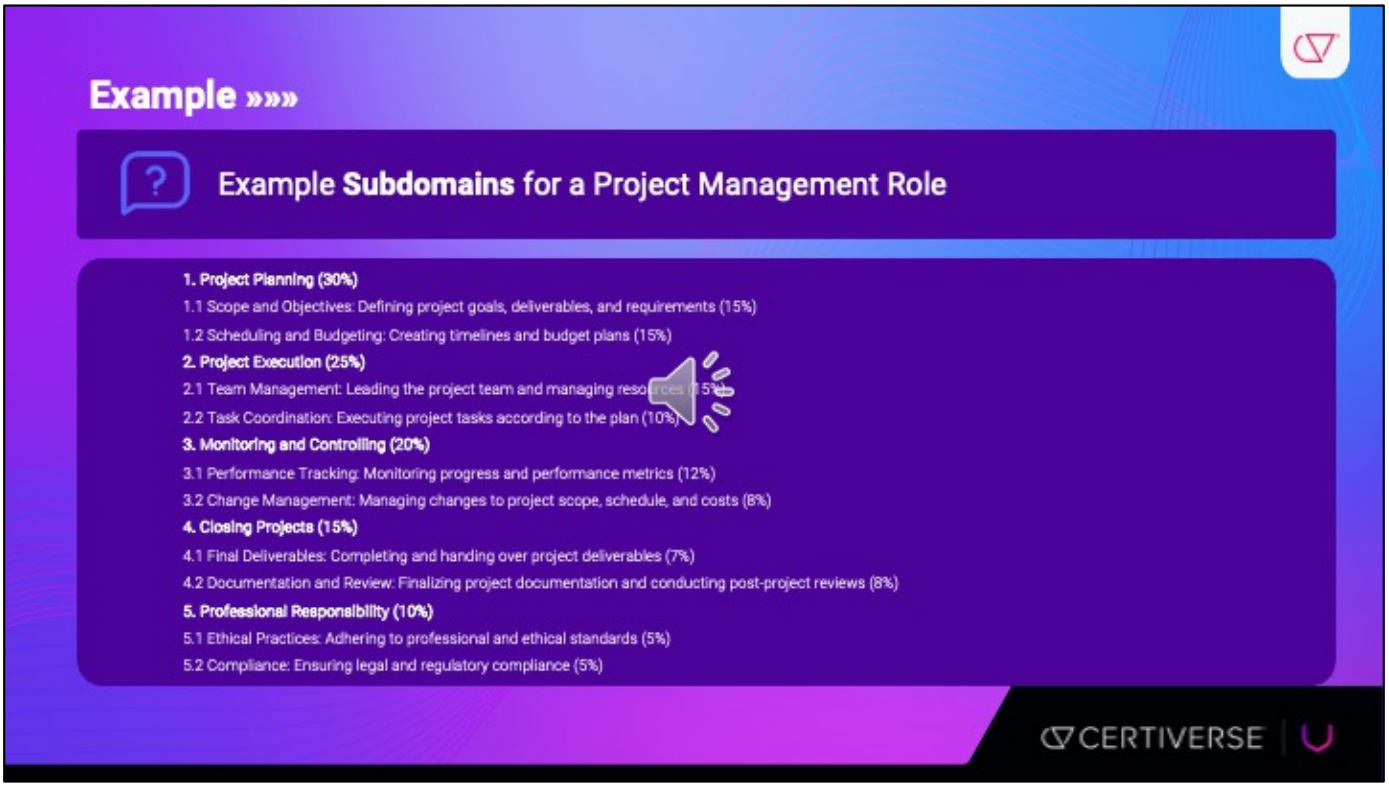


Here's an extremely hypothetical example of a content outline for a certification exam for a project management role.

There are five domains, and each domain has a weight.

For example, Domain 1 is "Project planning" and it has a weight of 30%. If the exam has 100 items, 30 of them would be about project planning.

Domain 1, "Project planning", is about three times more important than Domain 5, "Professional responsibility"


Example »»»
Example Subdomains for a Project Management Role
1. Project Planning (30%)
1.1 Scope and Objectives: Defining project goals, deliverables, and requirements (15%)
1.2 Scheduling and Budgeting: Creating timelines and budget plans (15%)
2. Project Execution (25%)
2.1 Team Management: Leading the project team and managing resources (15%)
2.2 Task Coordination: Executing project tasks according to the plan (10%)
3. Monitoring and Controlling (20%)
3.1 Performance Tracking: Monitoring progress and performance metrics (12%)
3.2 Change Management: Managing changes to project scope, schedule, and costs (8%)
4. Closing Projects (15%)
4.1 Final Deliverables: Completing and handing over project deliverables (7%)
4.2 Documentation and Review: Finalizing project documentation and conducting post-project reviews (8%)
5. Professional Responsibility (10%)
5.1 Ethical Practices: Adhering to professional and ethical standards (5%)
5.2 Compliance: Ensuring legal and regulatory compliance (5%)
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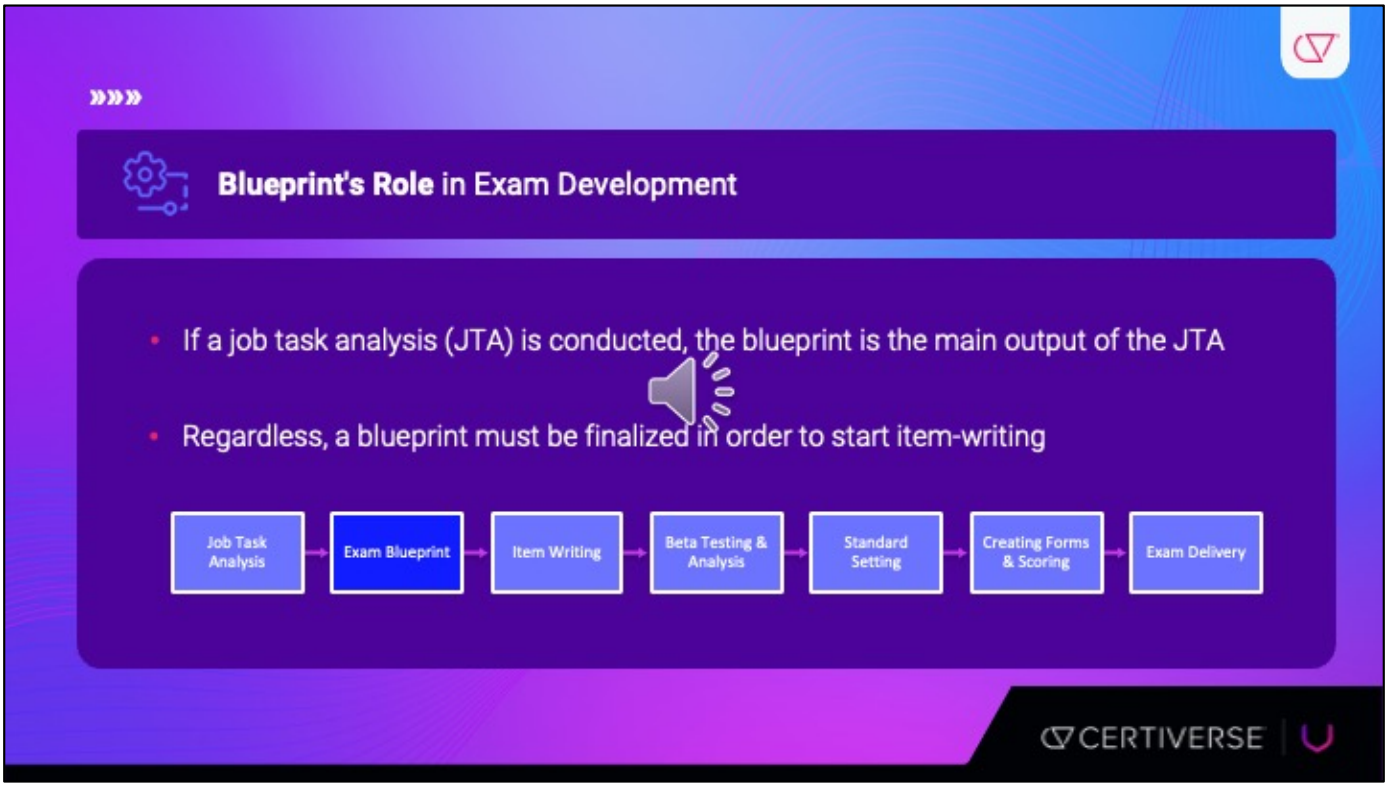
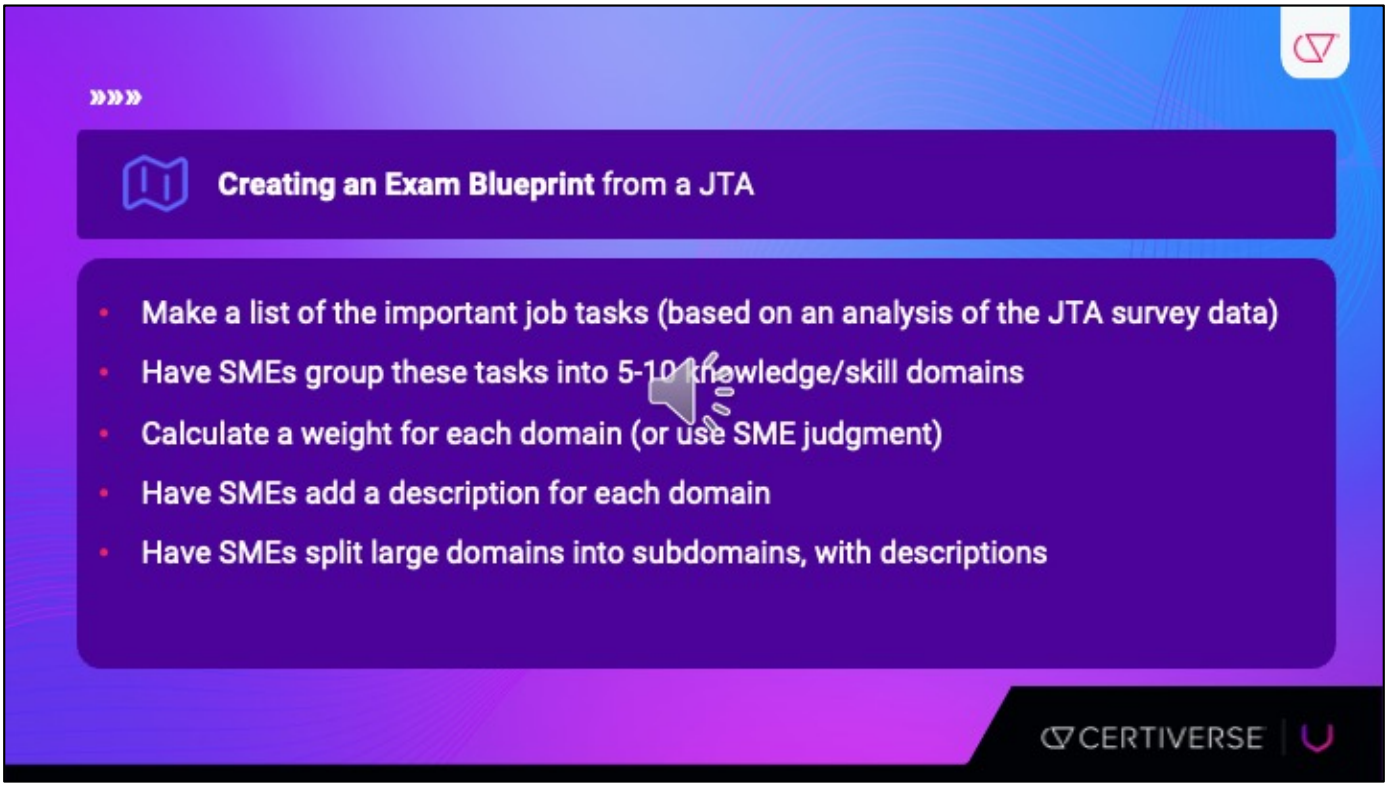


A blueprint is the primary output of a job analysis or JTA.

And just like a house's blueprint guides the building of a house…

…an exam blueprint guides the development of the exam content, structure, administration, and scoring.



Creating a blueprint from a JTA starts with the job task statements from the JTA survey. Analysis of the survey results tell you which are the important tasks.

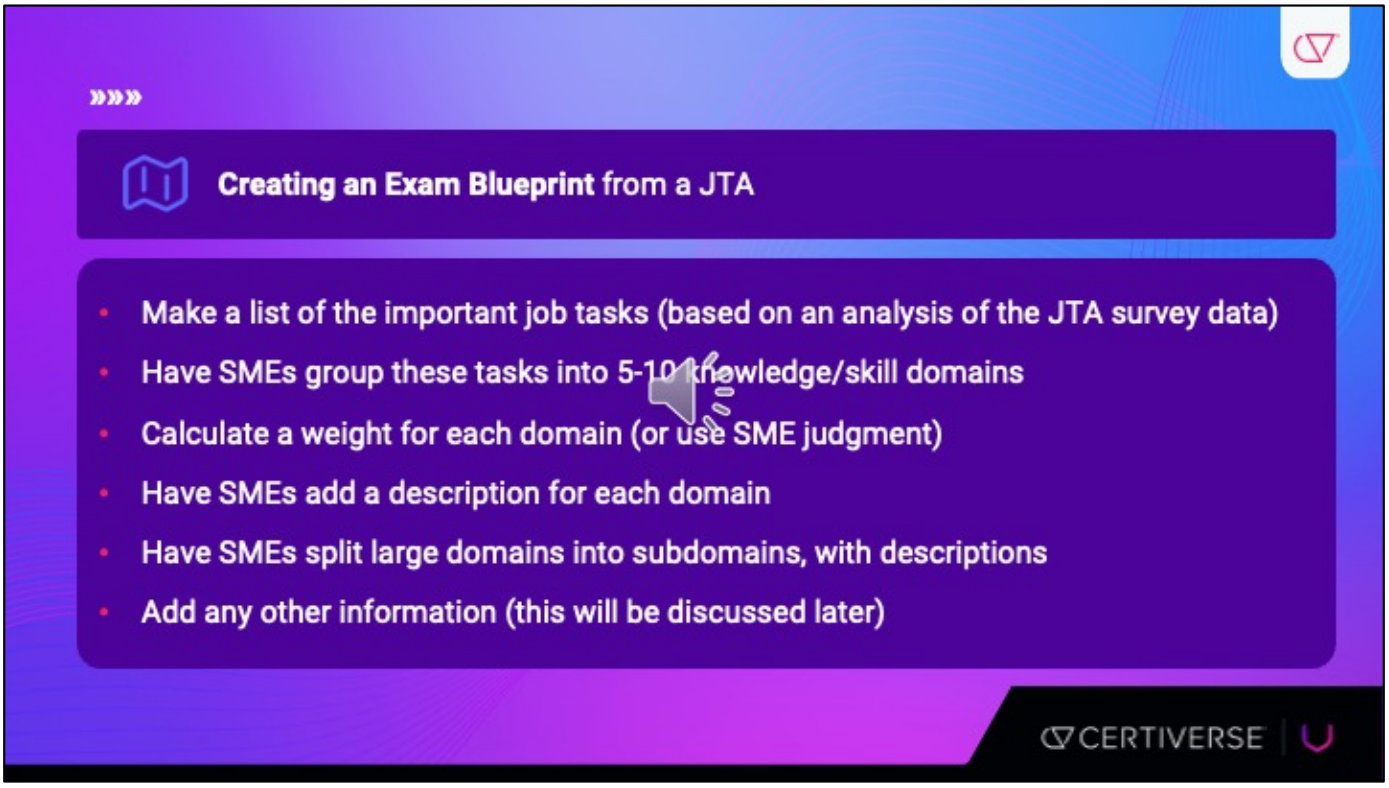
Ask your SMEs to group these important tasks into 5-10 knowledge/skill domains. On the Certiverse platform, we ask SMEs to do this when they author tasks, so this isn't an extra step.

Next, you must weight these domains. You can calculate a weight from the JTA results, and I'll show you an example. Or you can rely on SME judgment. In practice, it's usually mostly calculated with a little judgment.

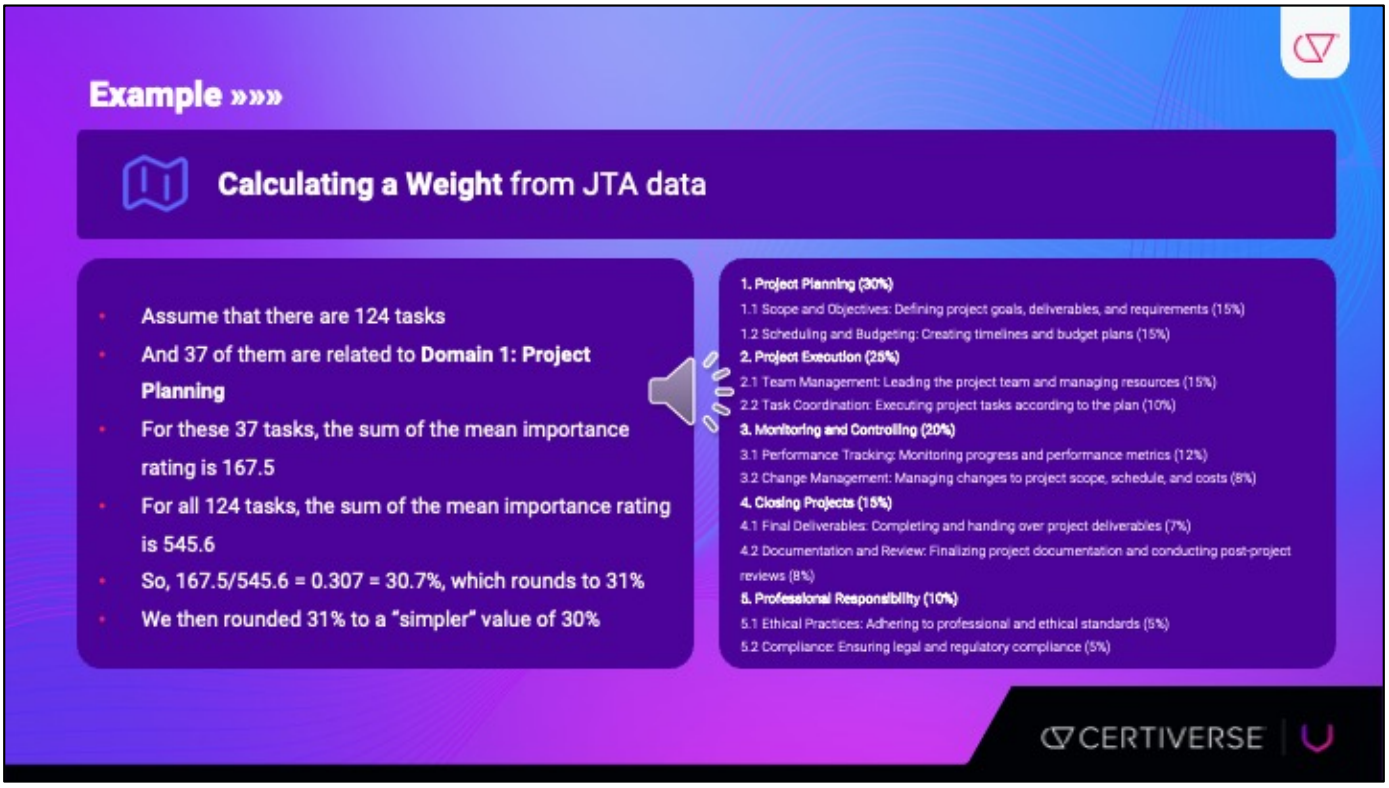
You also need to add descriptions for each domain that tell the item-writers what items to write.

But then you come to another judgment call. Broad domains

may need to be broken up into more specific subdomains. Each subdomain needs a description and a weight.



Finally, there is some additional information that you need to specify so that you can get started with next steps. We'll discuss those items later because they need a little explanation.



Here's an example of how the 30% weight for Domain 1 Project Planning may have occurred.

Assume that there are 124 tasks

And 37 of them are related to Domain 1: Project Planning

And for these 37 tasks, the sum of the mean importance rating is 167.5. So, if you add up the importance rating for each of these 37 tasks, you get 167.5.

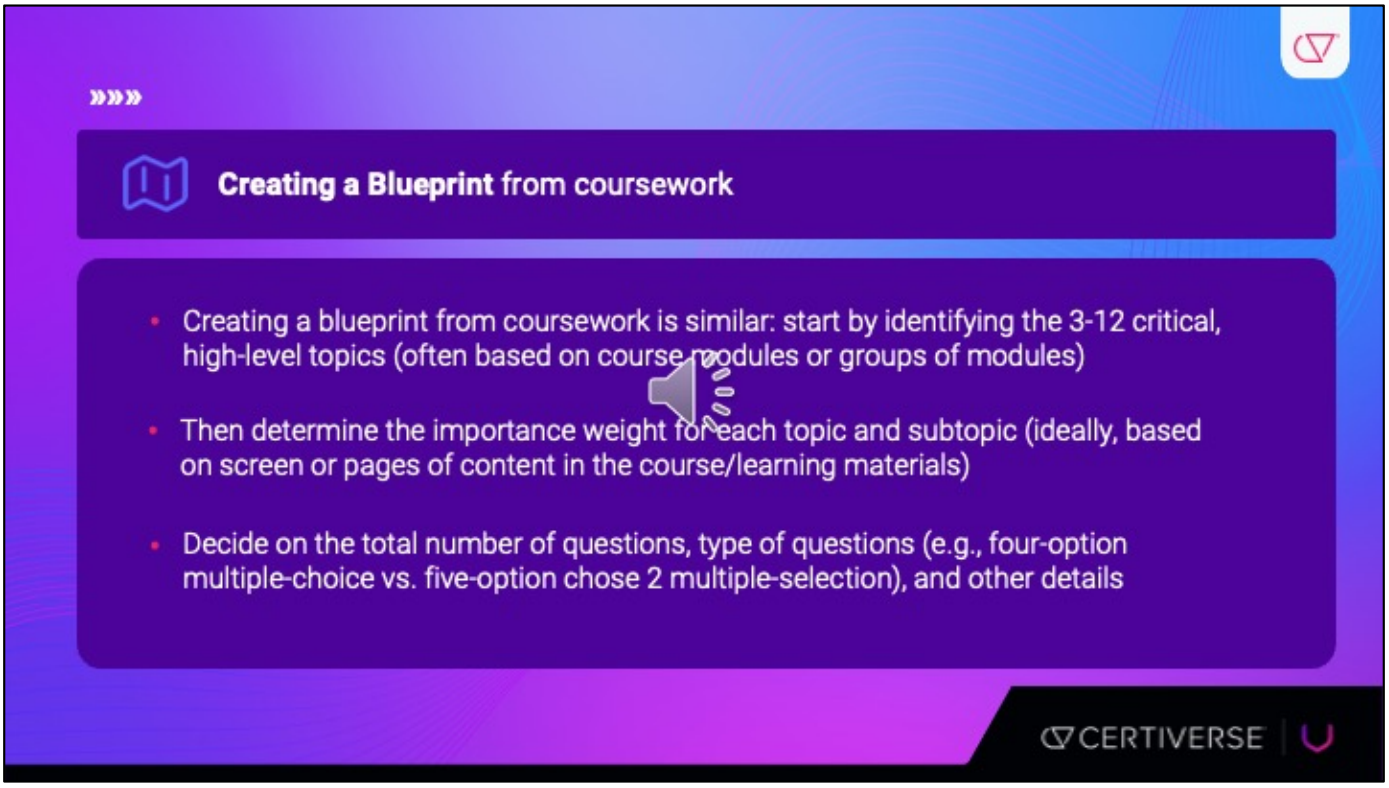
And for all 124 tasks, the sum of the mean importance rating is 545.6.

So, taking the ratio 167.5/545.6 gives you a proportion of 0.307, which is 30.7%, which rounds to 31%

We then rounded 31% to a "simpler" value of 30%. This is what I

meant when I said that it's mostly calculation and a little judgment.

As I said earlier, the 15% weights for subdomains 1.1 and 1.2 are based on SME judgment that those two topics are about equal weights out of a total of 30%.



If you are building an exam to certify learning the material in a specific course, then you should treat the learning materials like a JTA.

Have subject matter experts identify the critical high-level clusters of knowledge and skills which will be your domains and decide on relevant subdomains, as needed.

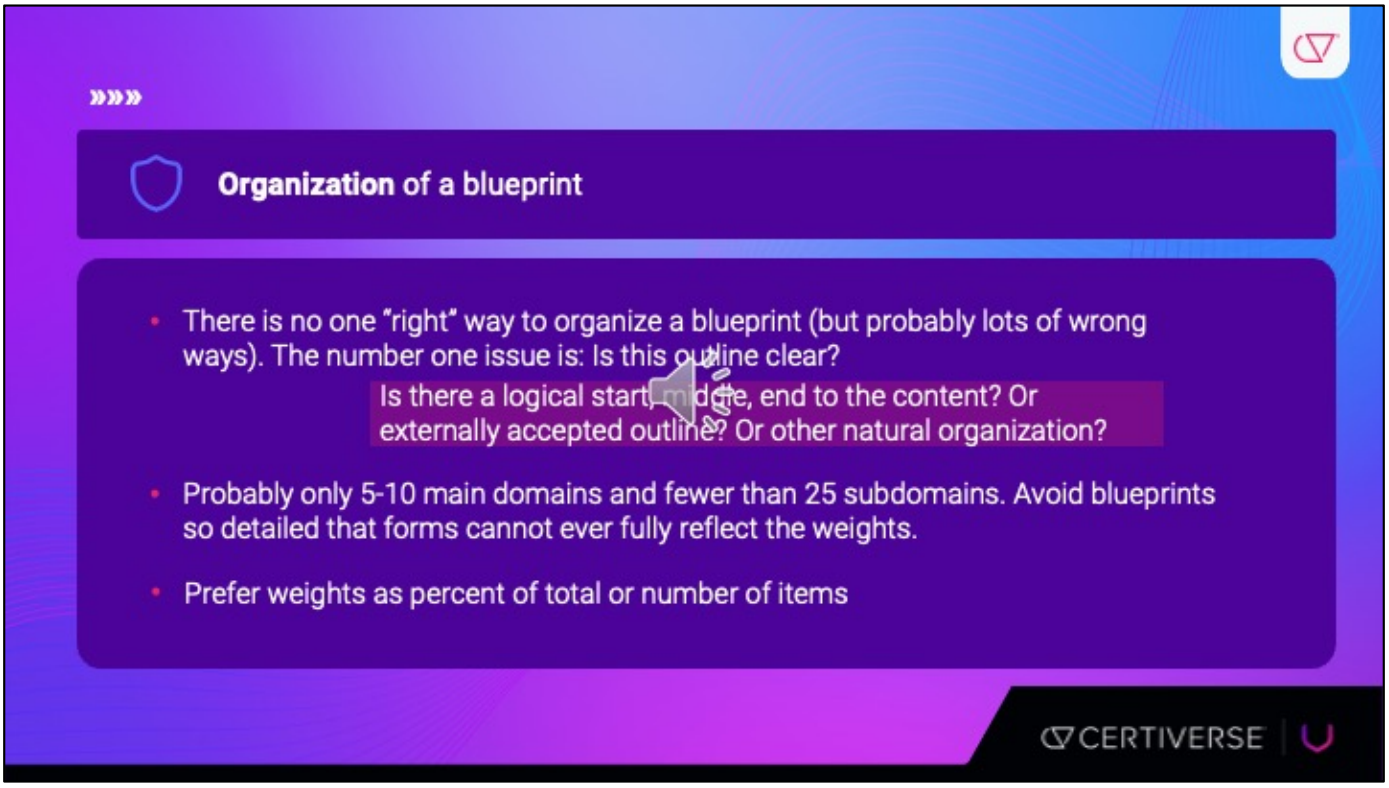
Bear in mind that course material typically needs to be compressed to fit on an exam. You might have 100 hours of instruction, but only a single hour of assessment. So clearly the exam outline (i.e., the blueprint) will be at a higher level than the course outline. And the exam blueprint must emphasize the most critical knowledge and skills.

Once you have all the domains and subdomains, you need to assign weights. I like to start with weights based on some objective evidence. If a 200-page textbook book has 6 pages on

a particular topic, the default is that should be 3% of the exam because 6/200 is 3%. This may then be adjusted by subject matter experts.

And then finally, you need to decide the details that will guide item-writing, in exactly the same manner as if you had used a JTA to produce the Blueprint.

One note about defensibility: It depends upon the linkage to the course materials. You should be able to show that the exam blueprint covers the course material. However, you are relying on the course materials covering the critical elements of the job or role. The defensibility of the exam ultimately relies on having a curriculum that is job-related.



One question that arises is how you should organize your content?

There is no “right way” although there are probably wrong ways.

The fundamental question is: “Is this outline of the exam content clear to all the stakeholders?” You want the answer to be “Yes”

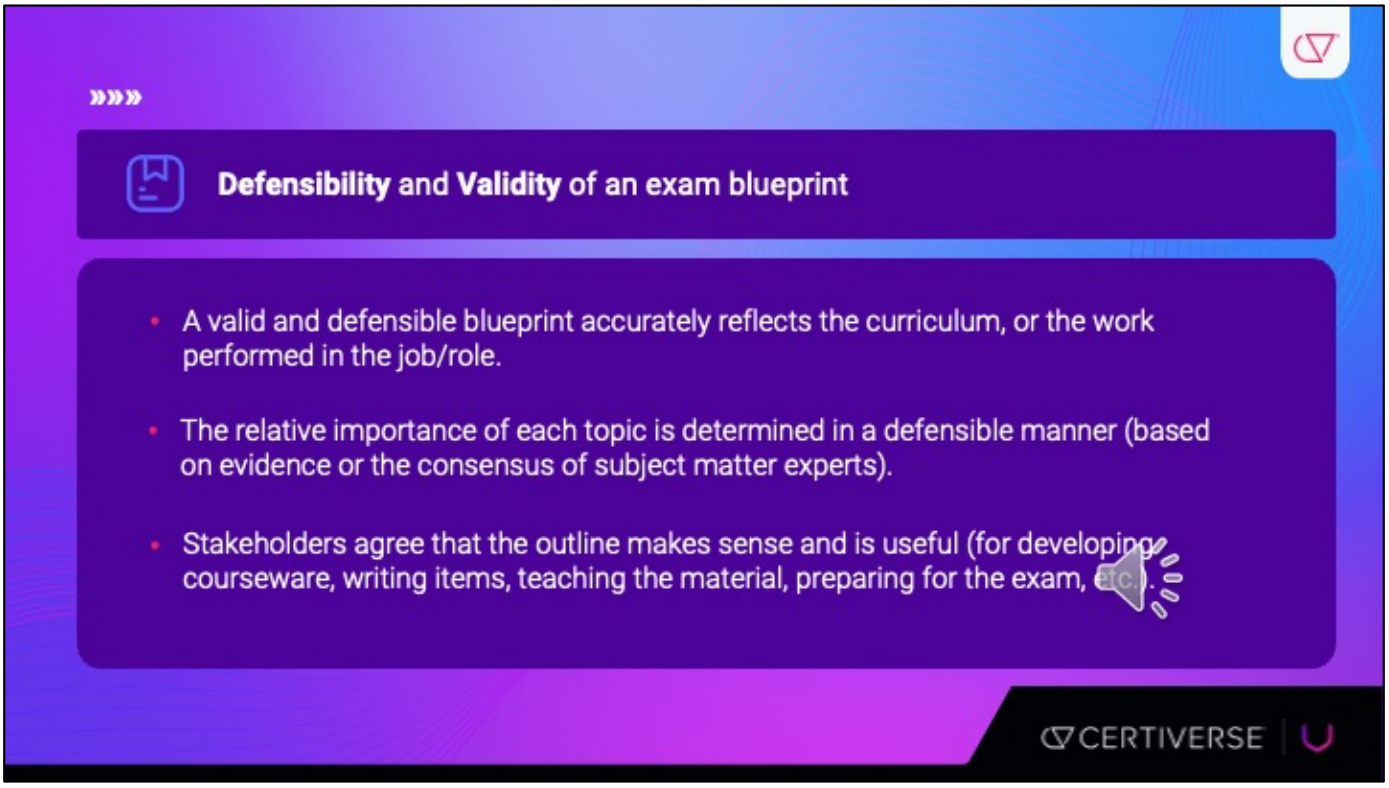
I’ve seen blueprints organized according to a typical workflow. For example: gathering requirements, building prototypes, coding, beta testing.

Or if you were building an exam to cover a standard, you’d probably organize the content according to the standard

Or else, arrange content in a logical way with simpler or more basic topics before more advanced or complex topics
--

Blueprint complexity varies dramatically, and my ideal blueprint has 5-10 domains and fewer than 25 subdomains. There are blueprints with so much detail that no exam form can actually exactly meet the blueprint, and that's probably excessive for most exams.
--
Your weights should naturally translate into number of items per topic, so I would avoid saying "Domain 1 is 10% and subdomain 1.1 is 10% **of that** and subdomain 1.1.1 is 10% **of that** because that's ,0.1% of the exam which isn't feasible.

Instead, **all weights** should be percent of the total items or just the number of items, and percent is more flexible for a new exam where the total number of items might be a guessimate. Percents are also more precise in some cases.

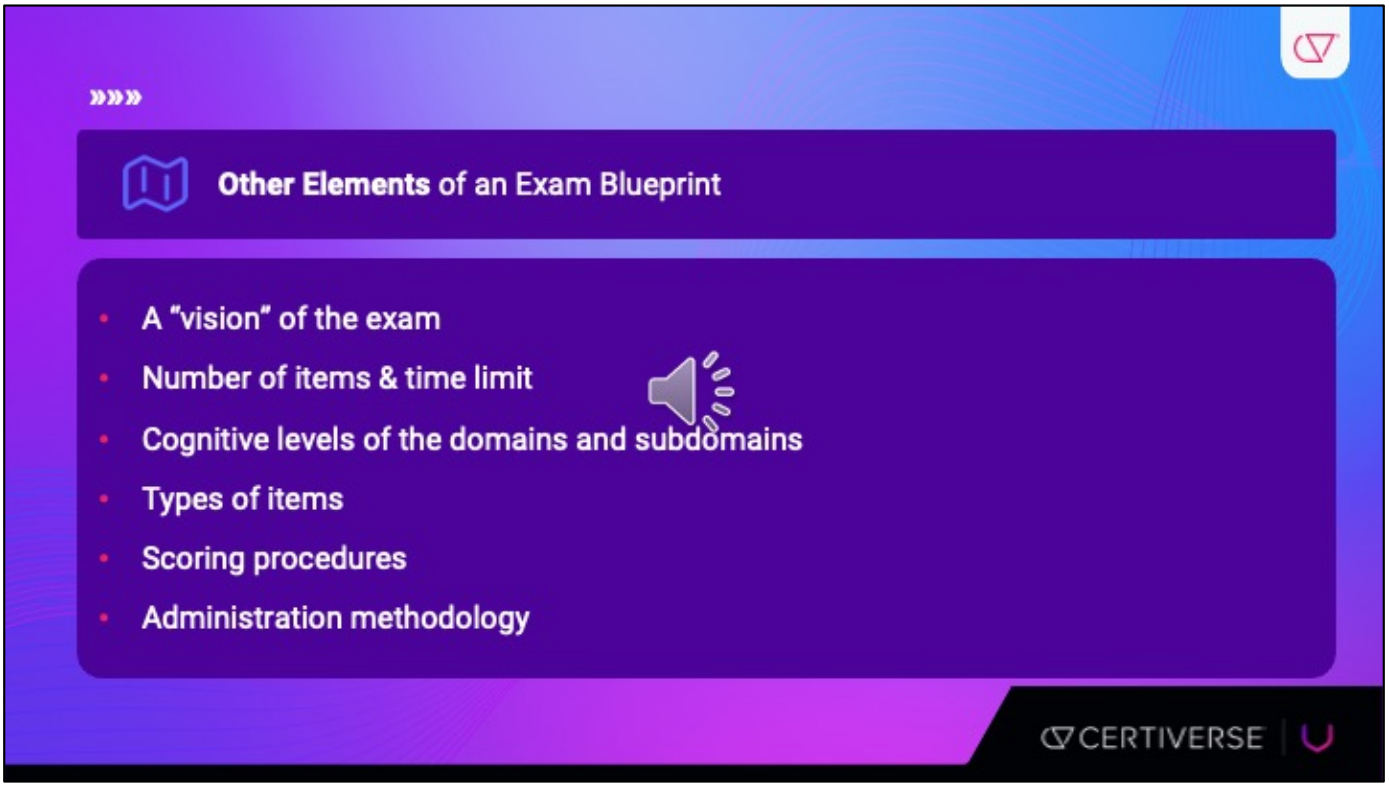


As we've discussed, the evidence that your exam blueprint is valid is based on having a clear linkage to the coursework or to a JTA. This enables you to assert that exams created from this blueprint will either cover the curriculum of the course or cover the knowledge and skills required by the job/role.

A good blueprint is well-organized with clear weights, and a good blueprint serves many purposes:

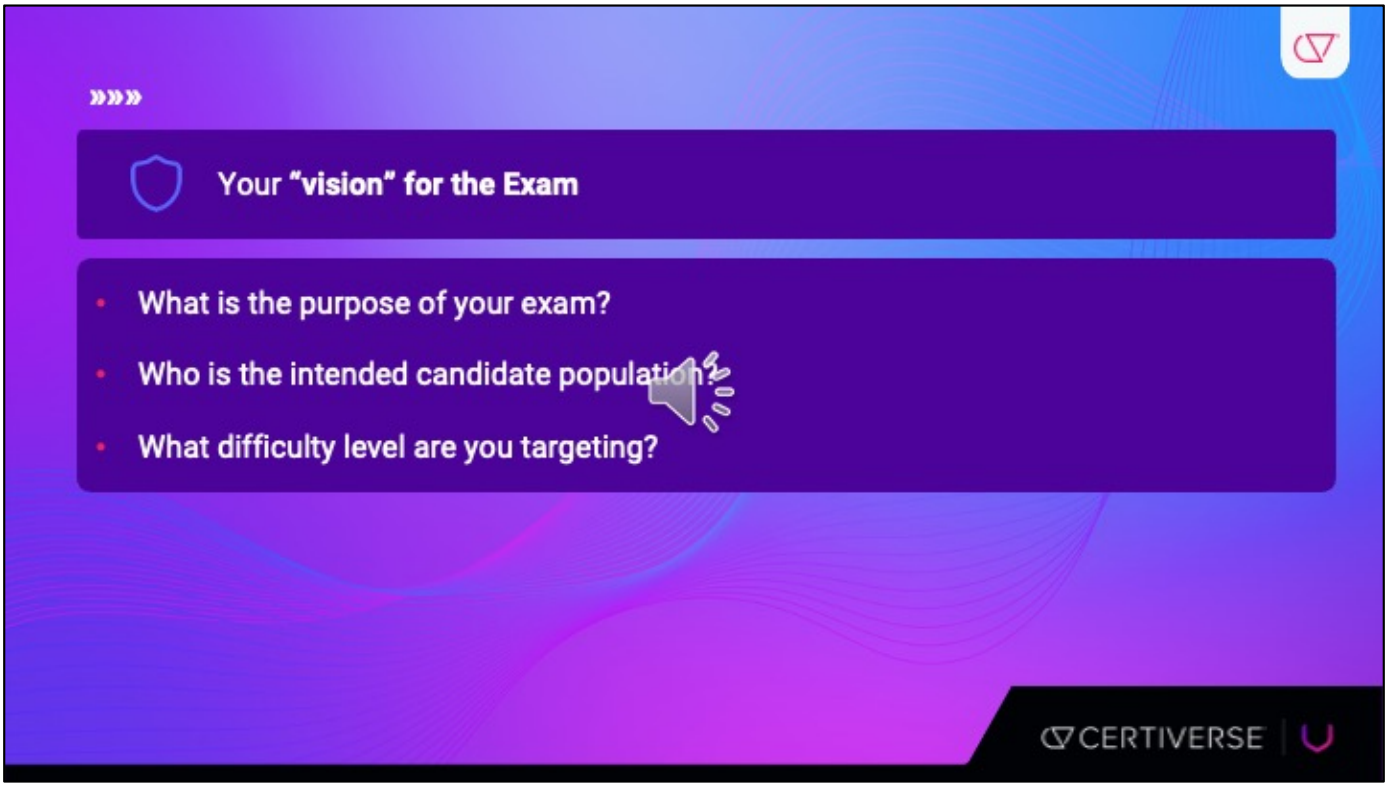
Item authors know how to write appropriate items
Item reviewers can determine whether an item is on topic, or not
Exam developers know how many items to include on a content-valid form
Candidates know how to study for the exam, and
Instructors know what content to include in each lesson

This is what I mean when I say that "a valid blueprint makes sense" to all the stakeholders of an exam.



We've been focused on the content outline part of an exam blueprint. There are some other elements that should be included. I'll discuss each one:

Your "vision" of the exam should clearly define the exam's purpose, target population, and difficulty level.
The number of items on the exam and the time limit (or that the exam is untimed).
Cognitive levels of the domains and subdomains
Types of items that should be used on the exam
Scoring procedures (where applicable)
The methodology for exam administration, proctoring, etc.

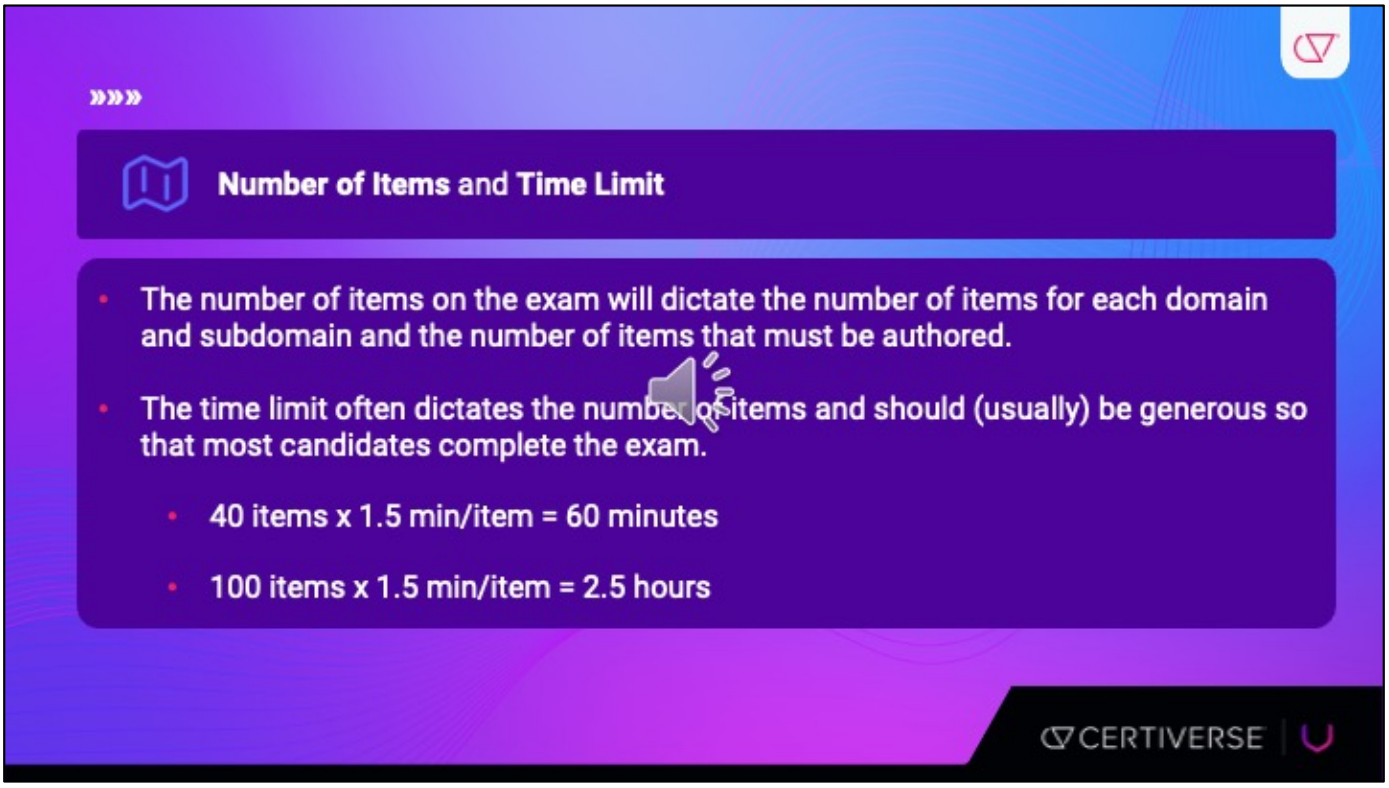


Your exam blueprint should communicate to all stakeholders what kind of exam it is. That includes at least three topics.

What is the purpose of your exam? This usually includes the job or role and maybe additional information.

What is the intended candidate population? Is this exam for anyone? Or only people who have five years of experience?

What difficulty level are you targeting? Most exams target about 70% correct for the average item in the target population.



Obviously, the number of items and administration time are important choices.

The total number of items on the exam will dictate the number of items for each domain and subdomain and the number of items that must be authored.

For example, if you have a 100-item exam and 15% should be for subdomain 1.1, then each exam form will have 15 items from this topic.

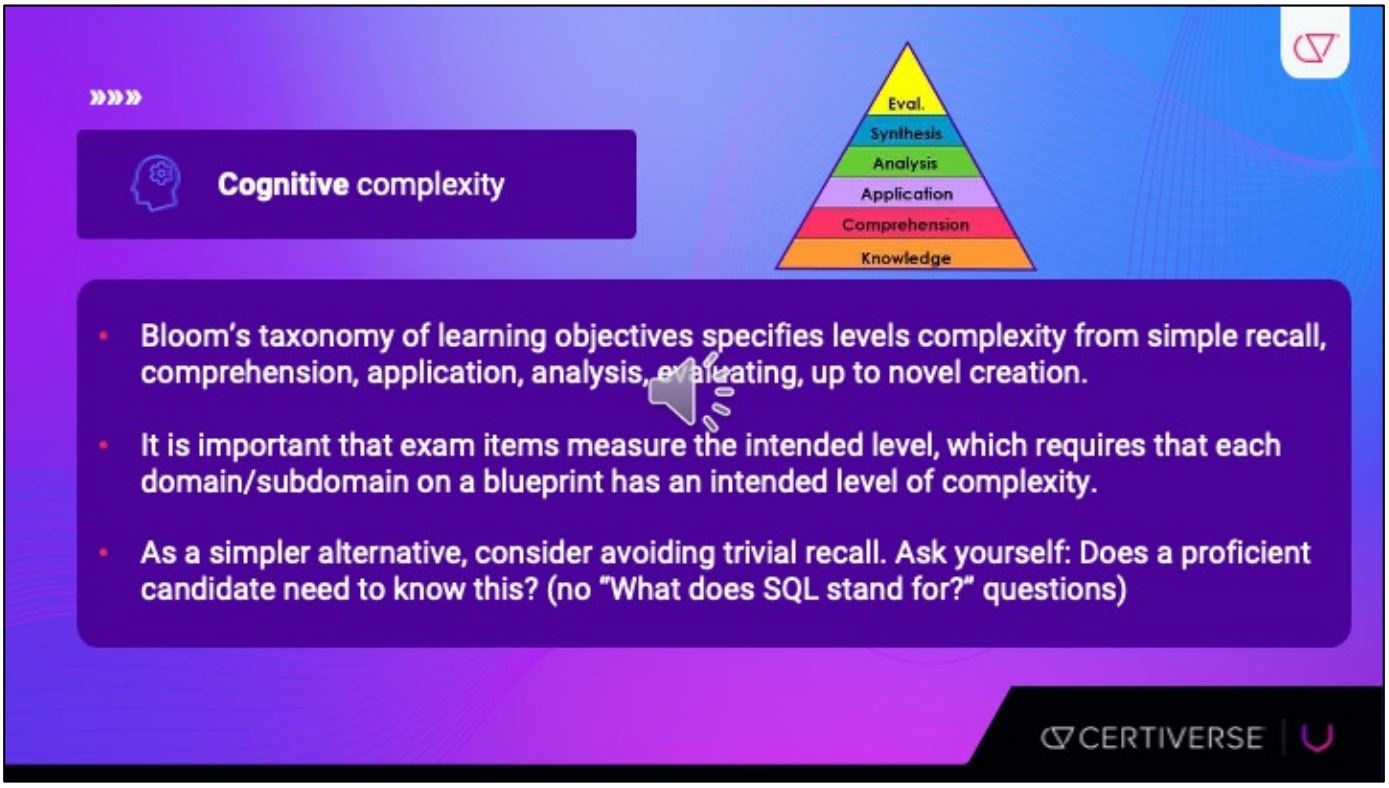
For most multiple-choice exams, a few dozen items are sufficient for reliable overall scoring. Sometimes more are needed to hit all the points on the content outline for the exam.

But often the time limit dictates the number of items. You want a reasonably generous time limit so that most candidates have the opportunity to complete the exam. The amount of time per

item varies across content areas and item types, but the industry average is about 1.5 minutes/item.

So, a one-hour exam can only have 40 items

And you may need over two hours for a 100-item exam.



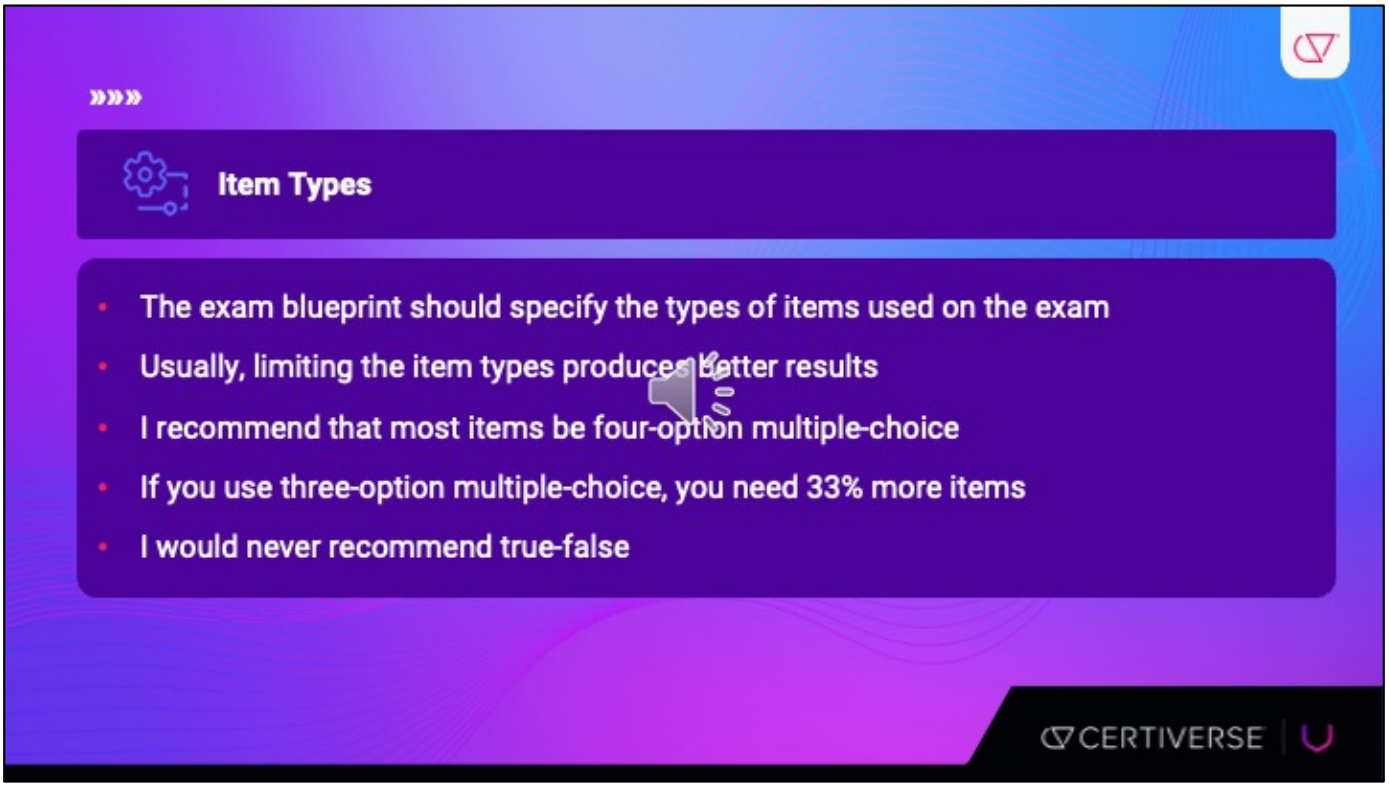
Another element that is commonly specified in the exam blueprint is the mix of cognitive complexity of the items.

Some variation of Bloom's Taxonomy of cognitive complexity is most common, frequently a modified taxonomy formed by collapsing some of these levels.

If it's important to target specific levels of cognitive complexity, then the blueprint should specify the correct level or mix of levels for each topic.

However, it can be hard to know what levels to include, so I often use a simpler alternative: I instruct the item writers and reviewers to ask themselves, "Does a proficient candidate need to know the answer to this question?" The answer should either be: "Yes, absolutely a proficient candidate MUST know this." or else that "Getting this item correct increases my confident that a candidate is proficient."

My example for item writers is NOT to write “What-does-SQL-stand-for?” questions. An expert SQL user may not know this and knowing this does not necessarily increase my confidence that the candidate can do anything useful with SQL.



Your exam blueprint should specify the types of items that will be used on the exam. This is particularly important if some items require more time. You would want to ensure that each form of the exam has the same mix so that the timing can be the same across forms.

Unless there are extenuating circumstances, I think it's a better candidate experience to have a single item type for all items. You don't want candidates to be confused about the type of item.

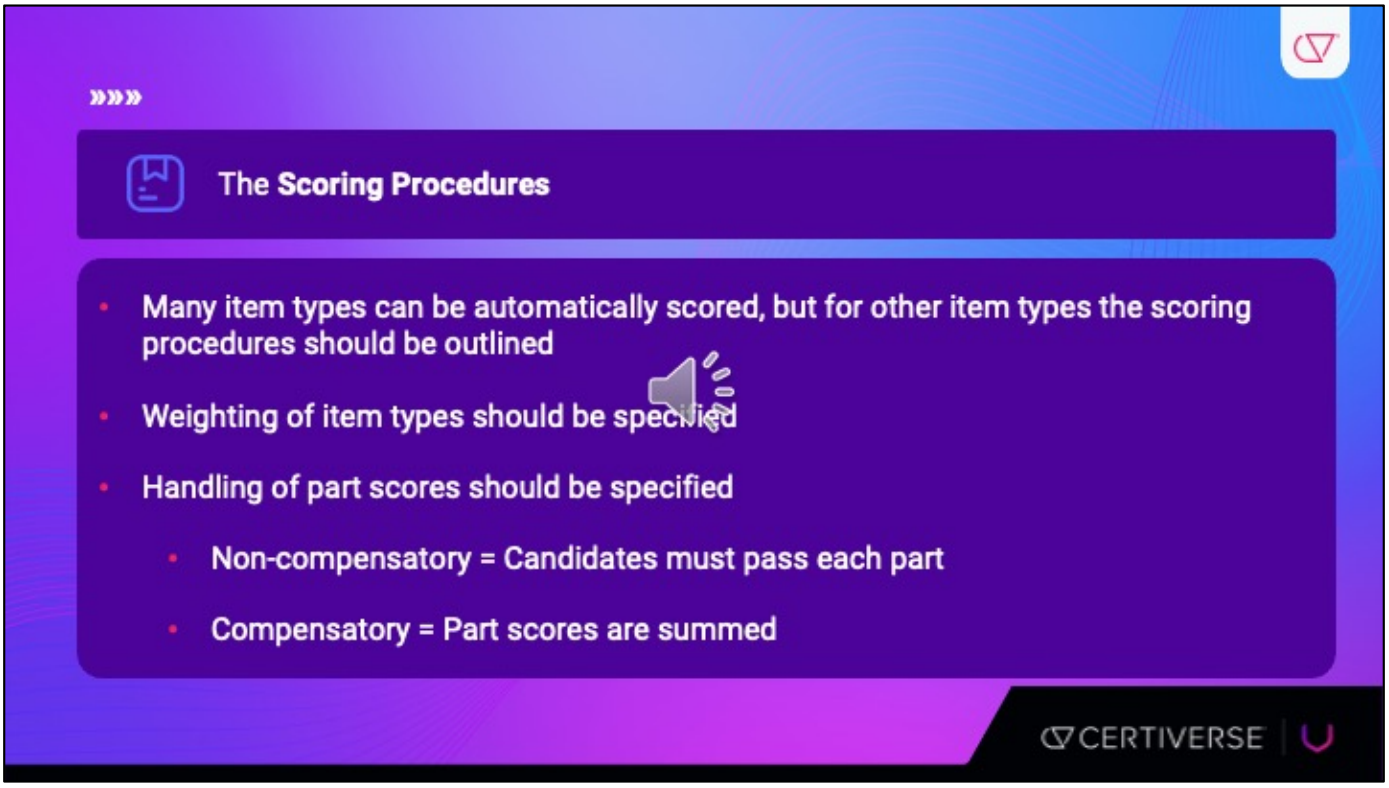
Again, unless there are extenuating circumstances, I think four-option multiple-choice with one correct answer and three distractors is the best format for most items.

Psychometricians have done quite a lot of research that shows that three-option multiple-choice are better PROVIDED that you

use more items. As a rough estimate, I'd say you need 33% more 3-option items.

If you simply replace four-option items with three-option items and DO NOT increase the number of items, then exam score reliability will be reduced.

I would never recommend using the true-false item type, because my dog has a 50% chance of getting the item correct. That means you need a lot of true-false items to get a reliable score.



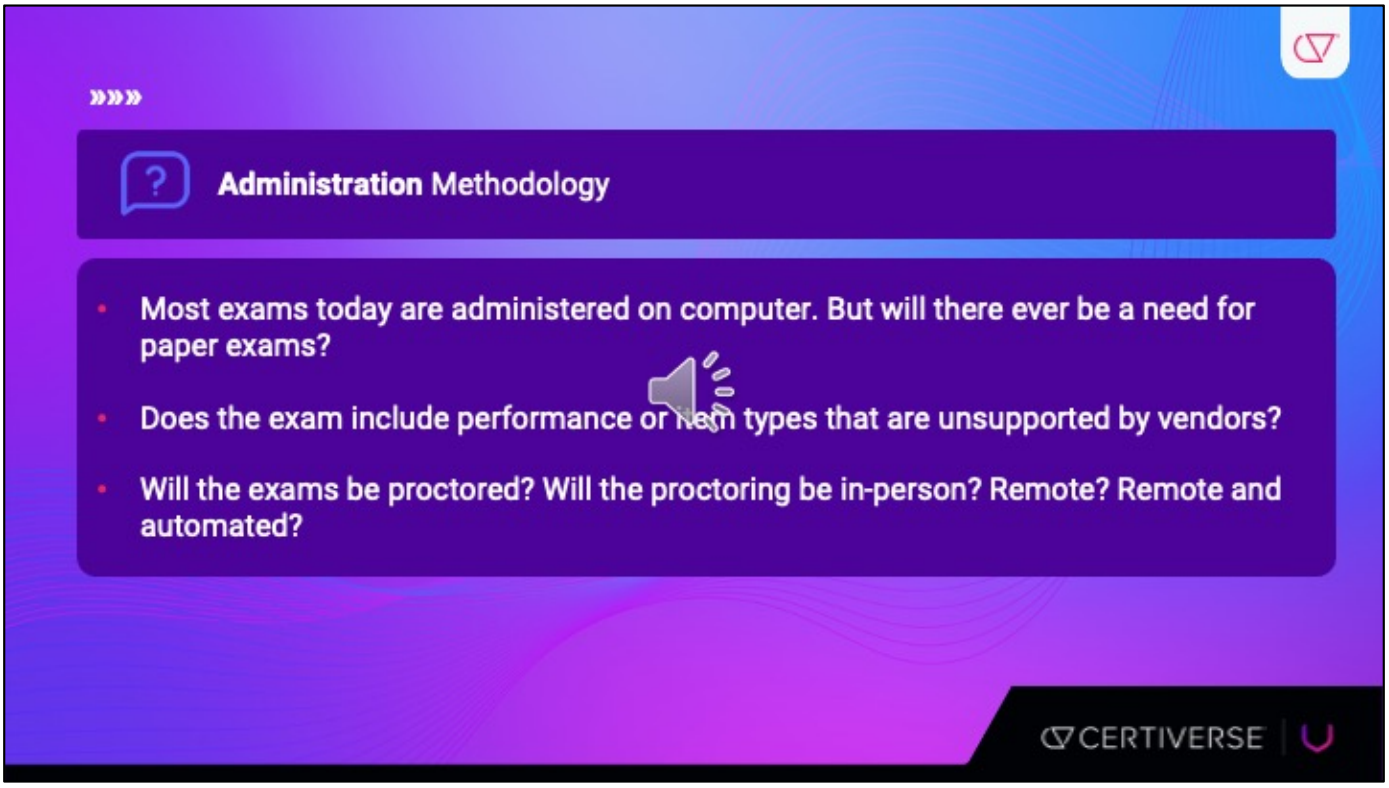
If you included item types that require more complex scoring, then the blueprint should specify the scoring mechanism, such as human graders, or a combination of a human grader and one machine grader.

Scoring also includes weighting of the items. Exams with all multiple-choice items usually give each question equal weight. But if there are other item types or sections, the weighting scheme should be specified.

Scoring procedures can also include how parts of an exam are handled. It's common, for example, for some regulatory exams to have general and state-specific parts and a candidate may be required to pass both parts in order to pass the overall exam. This is called a "noncompensatory" or "conjunctive" model. If you add up the score on both parts and it needs to meet a cutscore, that's a "compensatory" model because a person could compensate for a lower score on one part with a higher score

on another part.

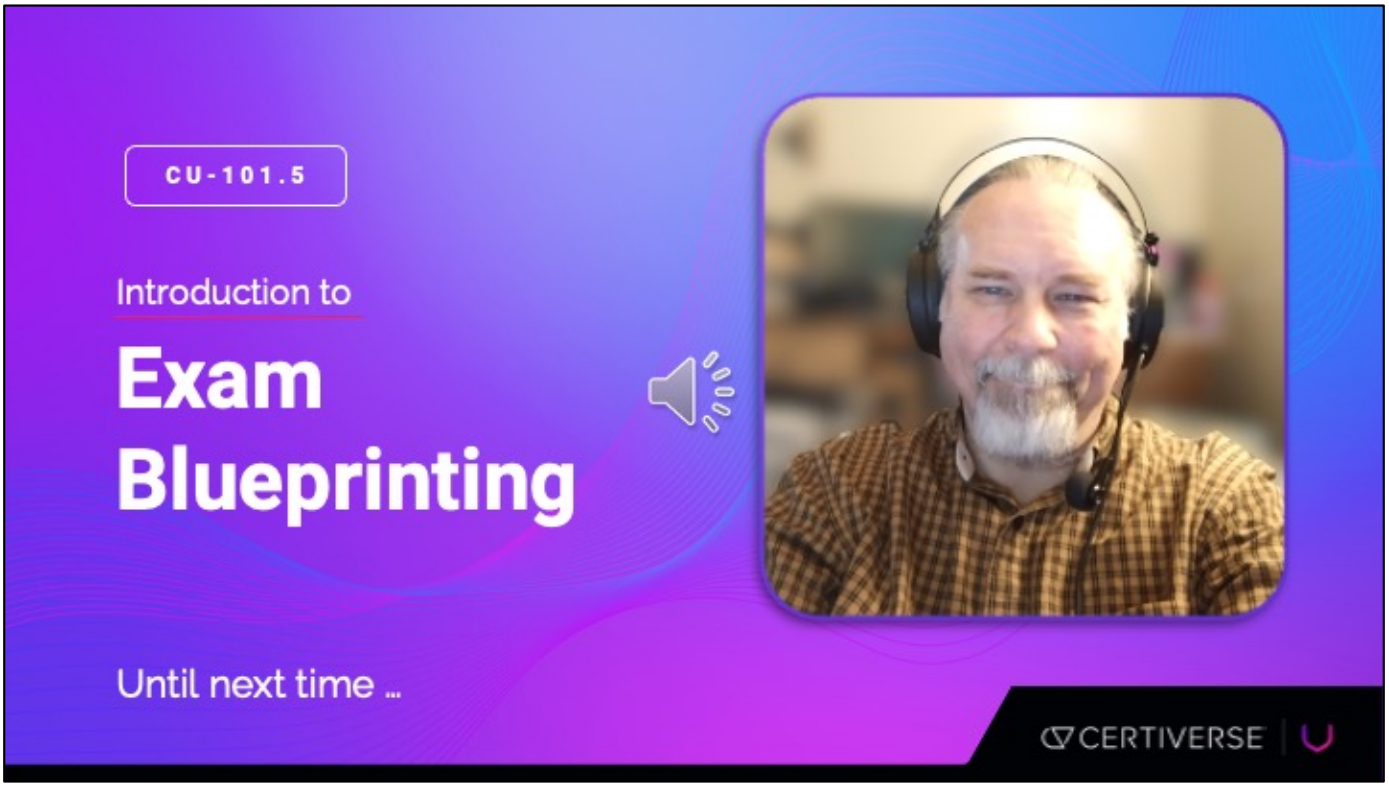
Although noncompensatory scoring is often the “obvious” way to score parts, it’s worth noting that compensatory is psychometrically better because it eliminates a subtle double-jeopardy issue that slightly damages the reliability of noncompensatory scores.



Today, the predominant method for administering exams is through computer-based systems. However, it's essential to consider the potential necessity for paper exams in certain scenarios such as testing in under-developed areas, as a fallback security measure, event testing, etc.

Additionally, assessing whether the exam includes performance tasks or item types not supported by vendors is crucial for determining the administration methodology.

And finally, Proctoring is a vital aspect ensuring integrity of the exam score; deciding whether it will be in-person, remote, or automated is a significant consideration in the administration process.



So, I hope you have enjoyed this video on Exam Blueprints, which are a foundation for developing fair, reliable, and valid exams! Hopefully, you can now see the path to creating a blueprint and you have a gasp of the steps involved and the judgment calls required.

In the next video we'll address the next step, item-writing.

That's it for this video! Thanks for watching … we'll see you in the next!