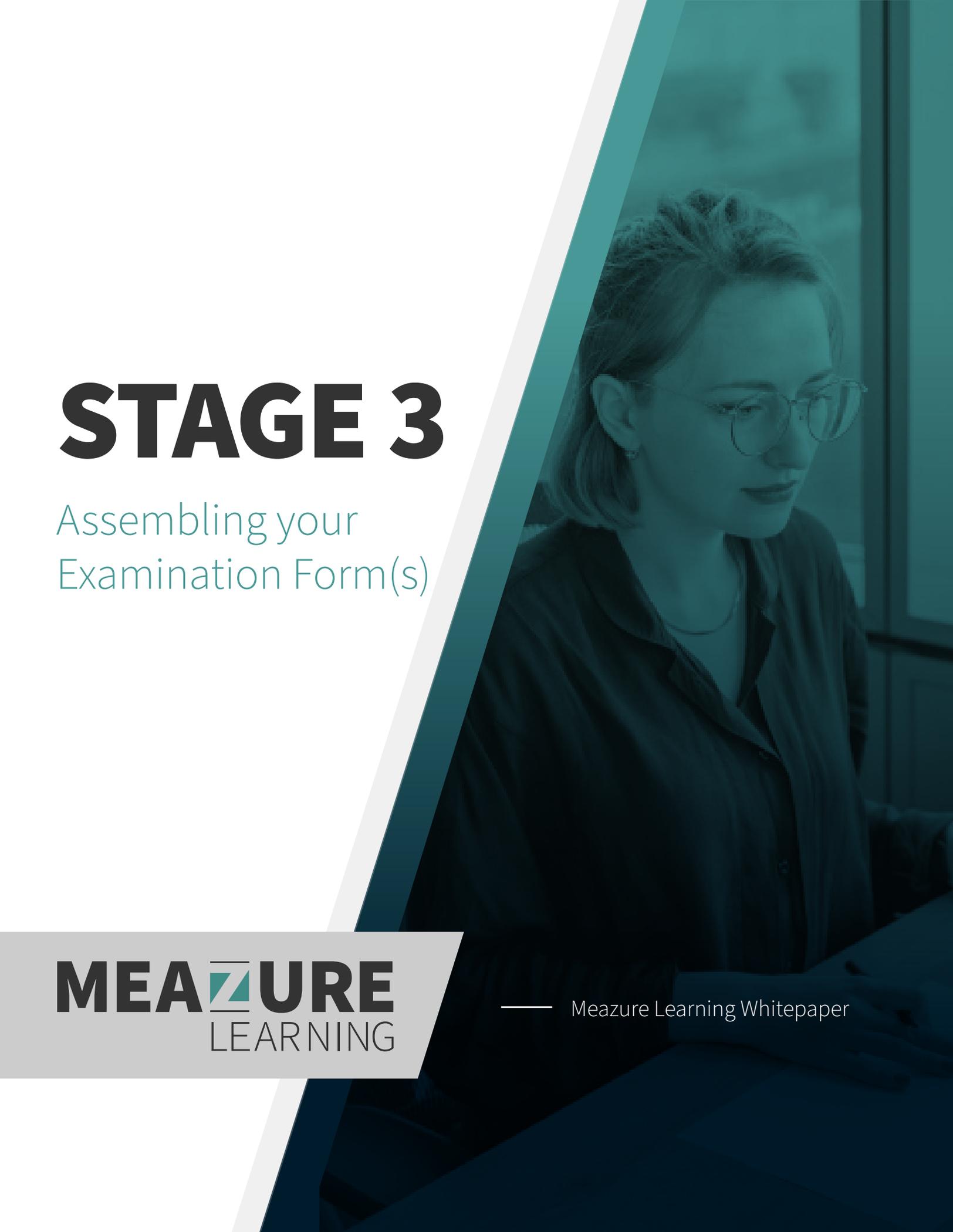


# STAGE 3

Assembling your  
Examination Form(s)

**MEASURE**  
LEARNING

— Meazure Learning Whitepaper





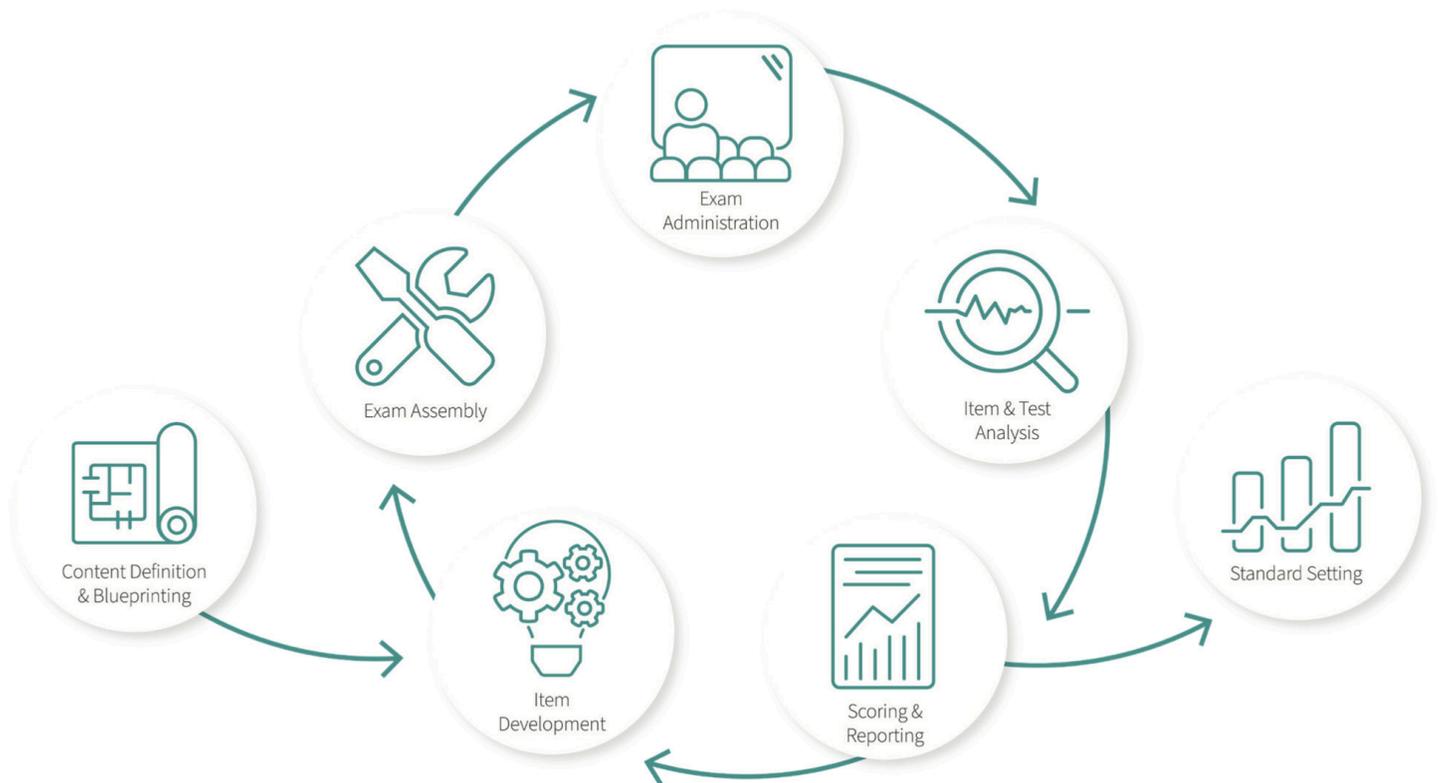
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# Introduction

The Assessment Life Cycle is a way of organizing the processes involved in creating valid assessments into a series of easy-to-understand, logical stages.

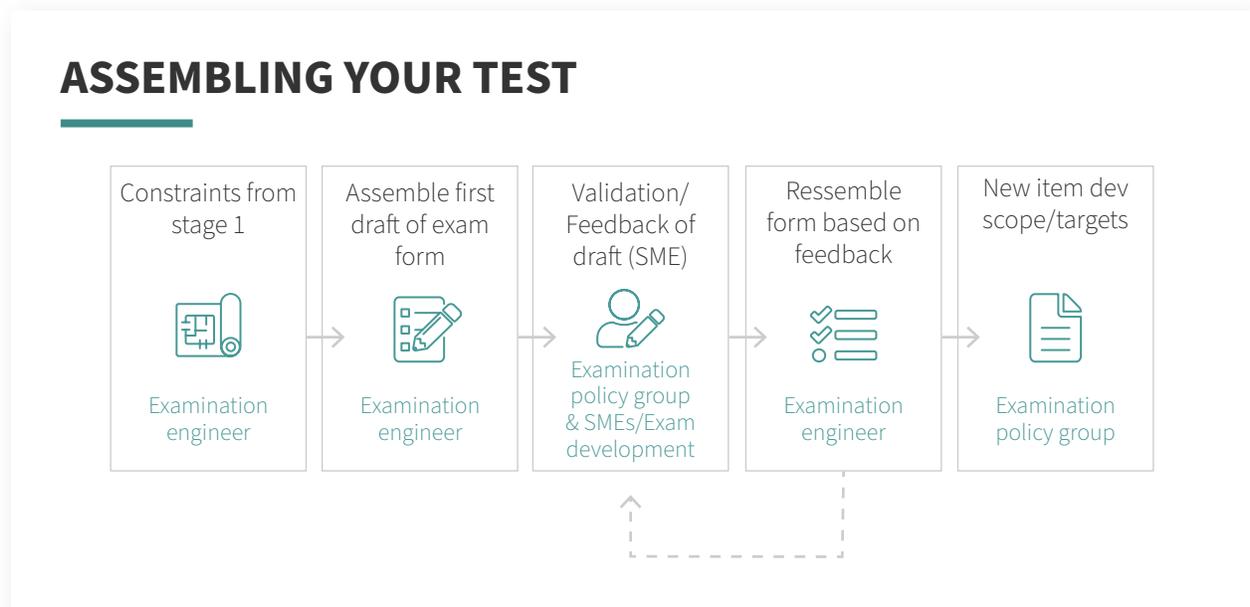


**Stage 3** of the Assessment Life Cycle is where we take the items that were written and banked in Stage 2, and compile them to into one (or more) examination forms. This may sound fairly easy; and indeed, sometimes examination assembly is just a matter of finding the right items to assess the required subject areas. However, in many cases, you'll find that assembling a valid and well-balanced examination form from your item bank is a careful process, one that requires meticulous effort. This is especially true when creating licensure or certification examinations, or other high-stakes assessments.

This white paper is meant to guide you through the examination assembly process; and focusses on Stage 3 in the Assessment Life Cycle (Assembling your Exam Forms). As you'll see, assembling an examination form is actually made up of several specific tasks, including:

- Using the test specifications created in Stage One to develop examination constraints
- Assembling a first draft of the examination form (or forms) from the items generated in Stage 2
- Reviewing the draft examination form (i.e., validation), and collecting feedback on it
- Reassembling the draft examination form forms based on feedback
- Setting new item development targets for filling in gaps in the examination form (or for future item bank development)

*Below you can see an overview of the specific task involved at Stage 3:*



# 1 | Using Test Specifications to Set Constraints

The first task in Stage 3 involves reviewing the constraints that were set in Stage One (remember the examination blueprint?); and assembling a first draft of the actual examination form (or forms) that will fit with these constraints. If you need a quick refresher, remember that examination constraints refer to various item and examination attributes that either must or must not be included on the final examination form. These might include constraints around the length of the examination; the breakdown of questions by each subject area being assessed; the breakdown of independent versus case-based questions; and many other things.

To help ground our understanding of constraints, let's consider a (somewhat silly) example. When you decide to purchase a vehicle, you will most likely have a set of requirements (or constraints) in your head that help guide your buying decision. That is, there are constraints that you set in your mind concerning what kind of vehicle would versus would not be acceptable to meet your needs. For example, a buyer might want a vehicle that meets the following criteria:

- **Vehicle type:** Not a truck or an SUV
- **Vehicle color:** Only red, blue, white, or black
- **Fuel economy:** Must get at least 30 MPG/ 7.8 L per 100km
- **Number of passengers:** Must be able to seat at least 4 people

This idea extends beyond buying a new automobile. In fact, almost every endeavour is built or selected based on a series of constraints (from building a new home, to finding a school for one's children, to choosing a vacation to go on). We all have preferences in these areas (that is, what would constitute the "perfect" home, school, or vacation).

Getting from these preferences (or constraints) to actually having the car, home, school, or vacation destination of your dreams requires that you have access to two things. First, you need a clear and valid idea of what it is you want (i.e., you need to select the right set of constraints to meet your needs). Second, you need to have a valid and adequately large pool of options (i.e., vehicles, houses, schools, or destinations) to choose from. If either of these is lacking, you are not guaranteed to have the outcome you want. For example, you can have a very clear idea of the kind of car you want; but if there are no cars available that meet those particular constraints, then you'll walk away empty-handed (or be forced to compromise).

This logic is also true when designing an examination form. To be a valid and defensible assessment of any given subject area, an examination form needs to meet the right set of constraints. Therefore, in order to construct the “perfect” examination, a test developer must invoke a valid set of examination constraints, and also have a sufficiently large and valid item bank to draw items from.

Here is a list of some of the example constraints that may be placed on an examination form:

- Number of parallel forms: 3 forms
- Test length: 100 items
- Item difficulty: Items should have p-values of between .40 and .90
- Item discrimination: Items should have point biserial indices of greater than .15
- Blueprint coverage: Number of questions per blueprint category
- Cognitive level coverage: Number of questions that assess ‘knowledge’ vs. ‘skills’
- Item images: Items with images must be balanced within blueprint category
- Passages: Number of passages balanced overall on the examination
- Number of questions associated with passages: 4-5 items per passage
- Item friends: Items that need to be presented on an examination form with each other
- Item enemies: Certain items cannot be presented on an examination form with each other

Keep in mind that the constraints for any given examination are necessarily tailored to the specific needs of that organization (and the subject matter that organization assesses). These constraints may also be specific to a particular assessment method (for example, computerized adaptive testing). As a result, the applicability of a given set of constraints may vary; and could encompass many other potential aspects.

Once the list of constraints has been clearly defined, we can move forward and assemble the first draft of the examination form (or forms). It is worth noting, however, that any constraints must be carefully set and tailored to meet the needs of the assessment program (as well as the realities of what the test developer realistically has available in the item bank). As a result, there is often some fine-tuning of the constraints that occurs during the actual assembly of the examination form(s).

- Psychometric item criteria
- Number of forms and items
- Blueprint coverage



**First Draft  
Examination  
Form(s)**

## 2 | Assembling First Draft of the Examination Form(s)

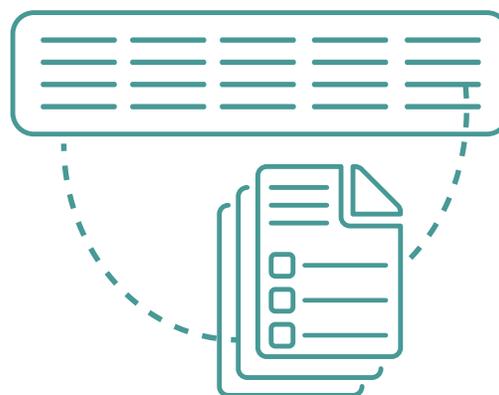
As noted, creating the “perfect” examination form requires two things: a well-defined, valid set of constraints; and an adequate pool of items (i.e., item bank) to draw from. In all cases, the size and composition of your item bank is going to put an upper limit on how much freedom you have when assembling your examination forms. If you don’t have enough questions with the right characteristics, then you will not be able to assemble the examination form(s) you need.

Realistically, you should never move forward to the examination assembly stage without having a large and robust item bank. Remember that the entire purpose of Stage Two is to ensure that the item bank is complete and well-aligned with the examination blueprint (including alignment with all constraints specified in Step 1).

Failing to have such an item bank will prove to be problematic. To illustrate, let’s consider the set of example constraints above. Here we see that the client would like three examination forms, each with 100 questions. There are no constraints listed for the number of overlapping questions (e.g., whether there needs to be a set of “anchor items”, which are the same across forms and can be used for statistical equating); so, let’s assume that each form contains 100 *unique* questions.

To meet these constraints, our item bank must have at least 300 questions. And in practice, it is

quite difficult to have an item bank where each item perfectly meets every criterion (and can be used to build perfectly parallel examination forms). So realistically, the bank would probably need to be 30-50% larger than that (i.e., 390-450 questions in total), with items properly distributed in the proportions that were specified in the examination blueprint (and with the right statistical characteristics).



Assuming the item bank manager accomplished this (somewhat daunting) feat, and the bank is ready, we can move to the actual examination assembly process. Often, this process is done manually. That is, an organization wades through the item bank, and individually selects items to meet the criteria set forth in the examination blueprint. This can prove to be a time-consuming, iterative process. This process can also fall prey to human error, as the individual (or individuals) assembling the examination form may not spot the best possible combination of items to maximize the form’s adherence to the blueprint.

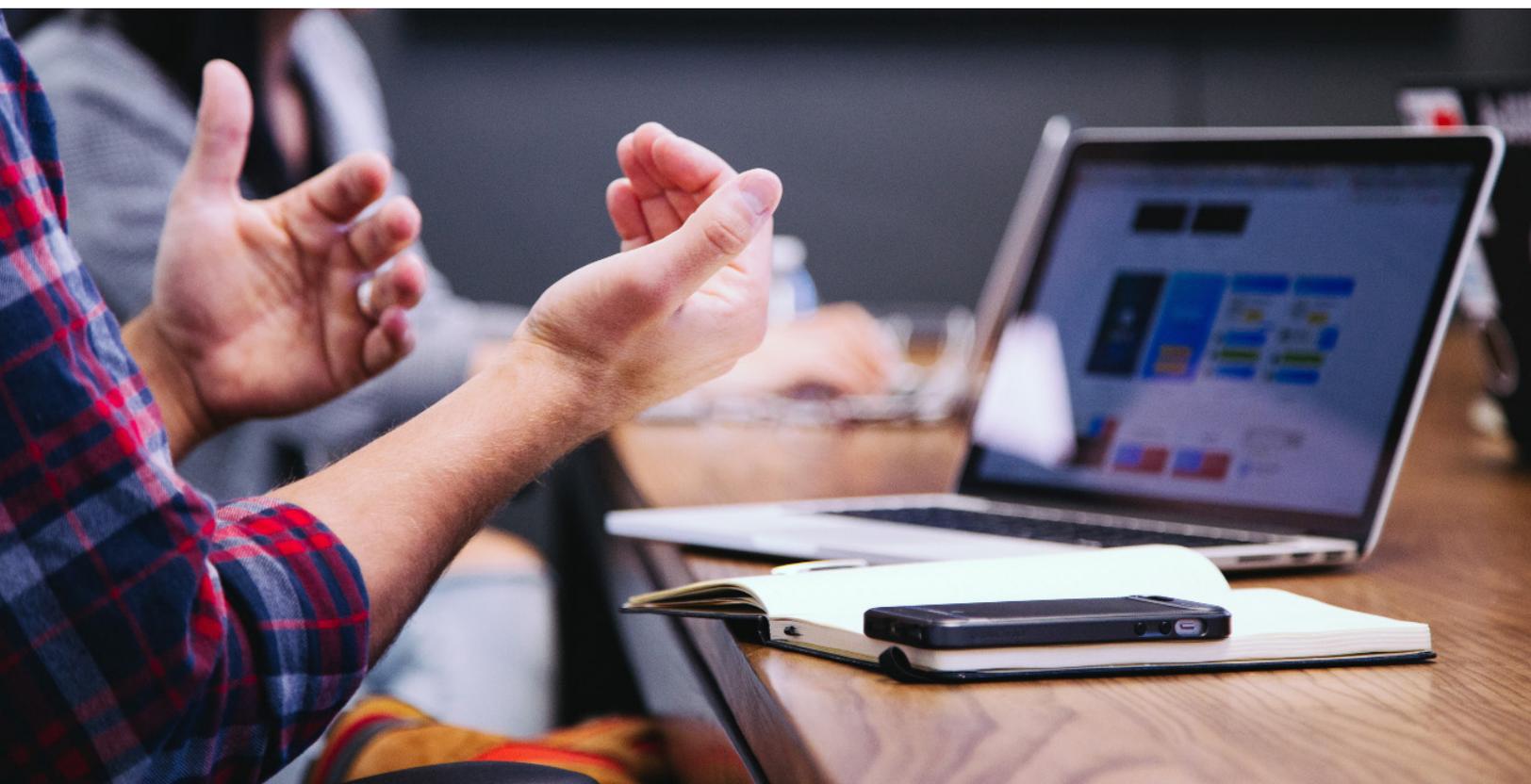
An alternative approach is to have a computer complete the examination form assembly process for you using a practice known as “Automated Test Assembly” (ATA). The ATA approach uses sophisticated optimization algorithms that are able to take all examination constraints into account, and produce the best possible solutions

(i.e., combinations of items) that will meet those requirements (inasmuch as the item bank allows). This can make the process much less time-consuming, and help maximize the resulting examination form’s adherence to the specifications and constraints in the examination blueprint.

### **3 | Reviewing and Validating the Draft Examination Form(s)**

Once all examination forms have been assembled, the next step is to conduct a review with the examination policy group and the subject matter experts (or examination development group). This review is meant to ensure a few requirements have been met. Specifically:

- The items in the examination are an appropriate and accurate representation of the blueprint.
- The examination form does not include items that are “enemies” of one another (e.g., the answer to one item shouldn’t give away the answer to another item).
- The different examination forms (if there is more than one form) are balanced in terms of their question types, images, keyed correct answers, etc.



## 4 | Reassembling the Draft Examination Form(s)

The feedback that was obtained in the last step is meant to guide the refinement of the draft examination form. At this point, some questions may need to be removed and replaced with other questions from that bank. Once a refined examination form is complete, this should be put forward to the same examination policy group and subject matter experts (or examination development group), so that they can review the changes to ensure compliance; and note any new issues that may have been introduced during the editing process.

This is an iterative process. The draft examination form should be reviewed, edited, reviewed again (and potentially edited again) until all stakeholders are satisfied with the quality of both the items and the examination overall. To be considered a valid and defensible assessment, it is important that the draft form receives this unanimous approval prior to its operational release.



## 5 | Setting Future Item Development Targets

Depending on the state of the item bank (and the specificity of the examination constraints), an examination form may be found lacking. For example, during the examination review process, suppose the committee found that their examination form under-represented one or more categories or aspects of professional practice; and upon review, they further saw that the item bank had no more questions in those categories. In this case, future item development targets may need to be set to bolster the number of items available in those areas.

This is an issue that can sometimes arise during examination form assembly. Consequently, it is advisable to keep the lines of communication open with a committed, well-trained, and readily-available group of subject matter experts, who can serve as item writers should the need arise. Once these individuals are on board, the item bank manager can offer the writers a list of specific requirements for new items to be created, which can then be fast tracked through the item development and review process, and added to new drafts of the examination form(s).



## Next Stage | Examination Administration

The next stage in the Assessment Life Cycle involves administering the newly-developed examination form(s) to your pool of candidates. Stage 4 is where the ‘rubber meets the road’; and where the candidates have the opportunity to demonstrate what they know and what they can do. The central concern at this stage is to create administration conditions (as well as test and data management protocols) that are standardized and secure, as befits the stakes (or ‘seriousness’) of your examination. This stage will be discussed in more detail in the next white paper in this series.

# Conclusion

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In summary, the Assessment Life Cycle is a way of organizing the processes involved in creating valid assessments into a series of easy-to-understand, logical stages. The focus of this whitepaper was to detail the fundamental steps and key processes that are involved in the third of these stages (i.e., examination form assembly). As covered, this involves a number of specific steps, including:

- Using the test specifications created in Stage One to develop examination constraints
- Assembling a first draft of the examination form (or forms) from the items generated in Stage 2
- Reviewing the draft examination form (i.e., validation), and collecting feedback on it
- Reassembling the draft examination form forms based on feedback
- Setting new item development targets for filling in gaps in the examination form (or for future item bank development)

Following these best practice steps – and the Assessment Life Cycle in general – will help ensure that your assessment program is valid and defensible; affording the greatest possible benefit to both your test-takers and your organization.

Let Meazure Learning help you apply the Assessment Life Cycle to your assessment program. Meazure Learning offers a full range of products and services that cover every step and process. Our clients agree: we know testing; and we will work hard to make sure that your testing program is the best that it can be.

**To explore this opportunity – or for more information – please feel free to contact us at**  
[meazurelearning.com/services](https://meazurelearning.com/services)

# List of Psychometric Services offered in Assessment Life Cycle Stage 3

At Meazure Learning, we provide a host of services to our clients that encompass each of the Assessment Life Cycle stages. Below is a list of psychometric services that Meazure Learning offers specifically for **Stage 3: Assembling your Examination Form(s)**:

Service	Description
<i>Automated Test Assembly (ATA)</i>	<p>Assembling an examination form manually requires you to search through an item bank in order to hand-pick items that fit and balance the multiple constraints in your blueprint. This process can prove to be time-consuming and prone to human error.</p> <p>To help improve the examination form assembly process, Meazure Learning offers professional Automated Test Assembly (ATA) services. We do this using advanced ‘solver’ algorithms, which can automatically assemble examination forms in a fraction of the time it takes to assemble the same examination manually.</p>
<i>Examination form validation facilitation</i>	<p>Once your examination forms are assembled, they need to be reviewed and validated prior to being used with actual candidates.</p> <p>At Meazure Learning, we will work with clients to help facilitate the examination form validation process. In doing so, we will work hard to ensure that all examination forms are thoroughly reviewed and judged to be defensible prior to seeing operational use.</p>
<i>Practice test rollout planning</i>	<p>Many organizations will offer their candidates a practice test to help them prepare for the exam. Ideally, the organization will have one or more high-quality practice tests available for candidates to purchase, without negatively impacting the core examination program requirements.</p> <p>At Meazure Learning, we work with our clients to achieve the rapid delivery of practice tests, in addition to the core certification or licensing examination but practice tests as well. By appropriately planning the item bank development process, practice tests can be fast tracked; and can be effectively rolled out in conjunction with the core certification program.</p>