

Weight-Based Rating Method

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Contents

Introduction	3
What Benefits Does the Weight-Based Rating Method Offer?	3
How Does It Differ from Legacy Rating Methods?	3
How Does the Weighting Interface Work?	4
Equal Competency and Item Weighting Using Competency-Level Scoring (Default Setting)	4
Differential Competency Weighting Using Competency-Level Scoring (Permission Required)	5
Differential Item Weighting Using Competency- Level Scoring (Permission Required)	7
Equal Item Weighting Using Item-Level Scoring (Default for Item-Level Scoring)	8
Differential Item Weighting Using Item-Level Scoring (Permission Required)	9
How Does the Scoring Work?	10
Formulas for Competency-Level Scoring	10
Formulas for Item-Level Scoring	11
How Do You Test the Scoring Protocol?	11
Testing Example 1	11
Testing Example 2	12

Introduction

The **Weight-based Rating Method** is the rating method in USA Staffing whereby point values assigned to each response option (e.g., A - 0, B - 1, C - 2, D - 3, E - 4), also called **Response Option Values**, are calculated by the system based on your scoring decisions. By default, USA Staffing calculates Response Option Values so that competencies (also called KSAs or factors) and items are weighted equally. The Weight-based Rating Method also allows users with appropriate permissions to differentially weight competencies and/or items by rating combination without manually calculating the Response Option Values. Rather, you enter the desired weight (called the **Proportional Weight**) for each competency or item, and the Response Option Values are calculated by the system to reflect these weights. To note, the terms **Competency Weight** and **Item Weight** are used in a general sense to refer to weighting applied to competencies and items, respectively. Also, later in this summary, we will make a distinction between starting (unweighted) **Baseline Response Option Values** (also called **Base Values**) and (weighted) **Final Response Option Values**.

What Benefits Does the Weight-Based Rating Method Offer?

The primary benefit of the Weight-based Rating Method is that it eliminates the steps required to manually calculate and enter Response Option Values for assessment items. Instead, you are asked to review and confirm the Response Option Values calculated by USA Staffing based on information collected by the system when you create the assessment questionnaire (AQ). In summary, the Weight-based Rating Method:

- Facilitates differential weighting of competencies and/or items for each rating combination (series/specialty/grade) covered by the assessment
- Reduces the likelihood of mathematical and/or data entry errors for Response Option Values
- Reduces the burden on the user to calculate and enter Response Option Values
- Creates a more user-friendly interface

How Does It Differ from Legacy Rating Methods?

The Weight-based Rating Method allows for both **Competency-level Scoring** (similar to the 'KSA-based Rating Method' in the Legacy USA Staffing system) and **Item-level Scoring** (similar to the 'Task-based Rating Method' in the Legacy system). The primary difference between the Weight-based Rating Method and earlier (Legacy) rating methods is that USA Staffing calculates the Response Option Values automatically based on competency and item weights entered by the user rather than requiring the user to manually compute and enter them into the system. As competency and item weights are changed by users, the Response Option Values are updated to reflect those weights. By default, Competency-level Scoring weights competencies equally within an assessment and weights items equally within a competency. By default, Item-level Scoring weights items equally within an assessment. Unless competency or item weights are changed, the Weight-based Rating Method

maintains equal weighting of competencies and items, regardless of the number of items under a given competency, the number of response options for a given item, or the maximum number of points possible for a given item. You can select 'Competency-level Scoring' to score the AQ at the competency level (as you did with the KSA-based Rating Method) or you can select 'Item-level Scoring' to score the AQ at the item level (as you did with the Task-based Rating Method).

When using Competency-level Scoring (the default scoring method), USA Staffing adjusts the Response Option Values to reflect any item weighting within a competency, taking into account any differences in the maximum number of points possible for each item (e.g., due to varying numbers of response options), to produce **Item Scores**. The system then calculates the average score across all items under a given competency (the Item Scores) to compute the **Competency Scores**, and finally sums the resulting Competency Scores to produce the **Total Raw Score**.

With Item-level Scoring, USA Staffing first adjusts the Response Option Values to reflect any item weighting, as well as any differences in the maximum number of points possible for each item (e.g., due to number of response options) to compute the Item Scores. The system then sums the Item Scores to produce the Total Raw Score. We provide examples later in this guide to illustrate each step. Item-level Scoring makes the most sense when: 1) you are assessing a group of independent tasks vs. specific competencies, 2) the tasks do not fit neatly under specific competencies, 3) you are measuring a single competency, or 4) you otherwise want to weight each individual item (vs. each competency) the same or differentially.

How Does the Weighting Interface Work?

You can weight competencies and/or items equally (which is the default setting in the system) or differentially (assuming you have appropriate permission). You weight competencies and/or items differentially by changing their **Proportional Weight**. The Proportional Weight for a competency reflects the weight of the given competency relative to the others in the assessment. For example, a competency with a Proportional Weight of '3' is weighted 3 times more heavily than a competency with a Proportional Weight of '1'. The **Percentage Weight** associated with each competency is also displayed to help you interpret the impact of changes to the Proportional Weight. As previously noted, the terms **Competency Weight** and **Item Weight** are used in a general sense to refer to weighting applied to competencies and items, respectively. Below are specific examples of how the interface works for competency and item weights.

Equal Competency and Item Weighting Using Competency-Level Scoring (Default Setting)

As a system default, USA Staffing uses Competency-level Scoring, and all competencies and items are weighted equally. As you can see by looking at the numerator (top number) in the 'Proportional Weight' column in *Example 1* below, the Proportional Weight for all competencies is '1', showing that each competency is weighted the same relative to the others for that rating combination. In this example, because there are four equally-weighted competencies, each shows a Proportional Weight of '1' and a Percentage Weight of '25%'.

Example 1: Equally Weighted Competencies (Default)

The screenshot shows the 'Rating Criteria' configuration page for 'HR Specialist'. The 'Weight Equally' toggle is highlighted in red. The table below shows the configuration for the '0201 - Human Resources Management' series.

Series	Grade	Competencies Rated
0201 - Human Resources Management	12	3

Competency Title	Rated	Rated Items
Performance Measurement	<input checked="" type="checkbox"/>	2
Personnel and Human Resources	<input checked="" type="checkbox"/>	2
Problem Solving	<input checked="" type="checkbox"/>	2

The '0201 - Human Resources Management' series is associated with Grade 12 and 3 competencies. The 'Weight Equally' toggle is currently turned on.

Additionally, the items under each competency have a default Proportional Weight of '1.' (As will be discussed later, these weights can be adjusted.) In *Example 2* below, there are five items measuring the 'Customer Service' competency, so each item is weighted 20%. USA Staffing does not display Percentage Weights for items, but the principle is the same as competency Percentage Weights.

Example 2: Equally Weighted Items Using Competency-Level Scoring (Default)

The screenshot shows the '0201 - 12 Item Weights' configuration page. The 'Performance Measurement' competency is selected. The table below shows the configuration for two items.

Number	Item Stem	Response Type	Rated	Proportional Weight
7	Award employees' performance through formal and informal ways.	Multiple Choice - Single Select	<input checked="" type="checkbox"/>	1
8	Develop performance standards, evaluate employee performance and provide feedback to employee.	Multiple Choice - Single Select	<input checked="" type="checkbox"/>	1

The 'Proportional Weight' for both items is set to 1.

Differential Competency Weighting Using Competency-Level Scoring (Permission Required)

To weight a competency differentially relative to the other competencies, you simply disable the **Weight Equally** toggle (highlighted in red in the example below) to allow you to change the numerator (top number) of the Proportional Weight. As shown in *Example 3* below, the user changed the Proportional Weight for the competency 'Auditing' from '1' to '3.' 'Auditing' is now weighted three times as much as 'Customer Service' and 'Oral Communication,' which have Proportional Weights of '1.' The user also changed the Proportional Weight for 'Mathematical Reasoning' from '1' to '5.' This competency is now weighted five times as much as 'Customer Service' and 'Oral Communication.' The denominator (number on the bottom) of the Proportional Weight automatically updates based on the values entered in the numerator to reflect the sum of the Proportional Weights you have entered. The Percentage Weights also dynamically update as the Proportional Weights are changed to help you interpret how weights are being applied.

Example 3: Differentially Weighted Competencies (Using Proportional Weights)

Series	Grade	Competencies Rated
0511 - Auditing	13	4

Competency Title	Rated	Proportional Weight	Percentage Weight	Rated Items
Auditing	<input checked="" type="checkbox"/>	30 / 100	30%	5
Customer Service (Clerical/Technical)	<input checked="" type="checkbox"/>	10 / 100	10%	5
Mathematical Reasoning	<input checked="" type="checkbox"/>	50 / 100	50%	5
Oral Communication	<input checked="" type="checkbox"/>	10 / 100	10%	6

If you prefer to work with percentages totaling 100% vs. Proportional Weights, you can simply enter whole numbers that total to 100 into the numerator of the Proportional Weight. The denominator will dynamically update to reflect the sum of the ‘percentages’ you have entered. Values in the Percentage Weight column cannot be edited directly because all Final Response Option Values are calculated based on the Proportional Weights. However, entering in whole number percentages into the Proportional Weight column works the same way. As shown in *Example 4 below*, the numbers entered into the numerator of the Proportional Weight column are the same as those in the Percentage Weight column.

Example 4: Differentially Weighted Competencies (Using Percentage Weights)

Series	Grade	Competencies Rated
0511 - Auditing	13	4

Competency Title	Rated	Proportional Weight	Percentage Weight	Rated Items
Auditing	<input checked="" type="checkbox"/>	30 / 100	30%	5
Customer Service (Clerical/Technical)	<input checked="" type="checkbox"/>	10 / 100	10%	5
Mathematical Reasoning	<input checked="" type="checkbox"/>	50 / 100	50%	5
Oral Communication	<input checked="" type="checkbox"/>	10 / 100	10%	6

The impact of the competency weights can be seen in the Final Response Option Values that are automatically adjusted by USA Staffing. In *Example 5 below*, the Base Values range from 0 – 4 points. Increasing the Proportional Weight of ‘Mathematical Reasoning’ from 1 to 5 increases the Final Response Option Values for items measuring this competency (x 5). The Final Response Option Values are displayed in parentheses next to the Base Values.

Example 5: Final Response Option Values for Differentially Weighted Competencies

0511 - 13 Item Weights					
Mathematical Reasoning			Response Type	Rated	Proportional Weight
+ / -	8	Establish milestones to execute audit plans.	Multiple Choice - Single Select	<input checked="" type="checkbox"/>	1
Response Option	Response Text		Base Value		
A	I have not had education, training, or experience in performing this task.		0	(0)	
B	I have had education or training in how to perform this task, but have not yet performed it on the job.		1	(5)	
C	I have performed this task on the job. My work on this task was monitored closely by a supervisor or senior employee to ensure compliance with proper procedures.		2	(10)	
D	I have performed this task as a regular part of a job. I have performed it independently and normally without review by a supervisor or senior employee.		3	(15)	
E	I am considered an expert in performing this task. I have supervised performance of this task or am normally the person who is consulted by other workers to assist or train them in doing this task because of my expertise.		4	(20)	
<input type="button" value="Apply to all Rating Combinations"/>					
+ / -	9	Participate in entrance conferences with high ranking officials.	Multiple Choice - Single Select	<input checked="" type="checkbox"/>	1
+ / -	10	Independently execute audit survey to include intensive analysis of problems related to audit objectives.	Multiple Choice - Single Select	<input checked="" type="checkbox"/>	1
+ / -	11	Develop finding elements (i.e. condition, criteria, cause, and effect).	Multiple Choice - Single Select	<input checked="" type="checkbox"/>	1
+ / -	12	Develop viable recommendations to improve operations.	Multiple Choice - Single Select	<input checked="" type="checkbox"/>	1
<input type="button" value="Save"/> <input type="button" value="Save & Close"/> <input type="button" value="Cancel"/>					

In addition to competency weights, Competency-Level Scoring takes item weights into account when calculating Final Response Option Values as discussed below.

Differential Item Weighting Using Competency- Level Scoring (Permission Required)

When using Competency-level Scoring, it is possible to weight items differentially relative to other items measuring the same competency. In other words, items measuring a given competency can be weighted differentially within the competency regardless of how the competency is weighted relative to the other competencies.

In *Example 6* below, the AQ is being used to measure three equally weighted competencies, and the user has job analysis evidence that supports weighting 1 of the 3 items that measure the competency ‘Mathematical Reasoning’ three times as heavily as the other 2 items measuring that competency. In this case, she entered a ‘3’ in the ‘Proportional Weight’ column for that item, indicating that the item is weighted three times more heavily than the other 2 items with a Proportional Weight of ‘1’. You can see the Base Values associated with each of the response options (0, 1, 2, 3, 4) in the white boxes under the ‘Base Value’ column, as well as the Final Response Option Values (x 3, in parentheses) to the right of the Base Values. Because this example involves differential item weighting and Competency level Scoring, computation of the Final Response Option Values is going to be more complex. For example, if the **Maximum Base Value** (maximum number of points you can earn for a given item) varies across items within a competency (e.g., due to differing number of response options), USA Staffing will automatically adjust the points so that all items have the same maximum value prior to applying the Proportional Item Weights. Scoring related to this example is discussed in more detail in the “How Does the Scoring Work?” section.

Example 6: Differentially Weighted Items Using Competency-Level Scoring

The screenshot shows the 'Rating Criteria' section for the '0802 - Engineering Technical' series. The main table lists three competencies: Civil Engineering, Mathematical Reasoning, and Surveying. Each has a 'Rated' checkbox checked, a 'Proportional Weight' of 1/3, and a 'Percentage Weight' of 33.33%. The 'Rated Items' column shows 4 items for Civil Engineering, 3 for Mathematical Reasoning, and 3 for Surveying.

The 'Mathematical Reasoning' competency is expanded to show a detailed view of its items and response options. The '0802 - 9 Item Weights' window displays the following data:

Number	Item Stem	Response Type	Rated	Proportional Weight
6	Use project blueprints and structural specifications to perform computations for project tasks.	Multiple Choice - Single Select	<input checked="" type="checkbox"/>	3

Below the item list, the response options for item 6 are shown with their respective base values:

Response Option	Response Text	Base Value
A	I have not had education, training, or experience in performing this task.	0 (0)
B	I have had education or training in how to perform this task, but have not yet performed it on the job.	1 (9)
C	I have performed this task on the job. My work on this task was monitored closely by a supervisor or senior employee to ensure compliance with proper procedures.	2 (18)
D	I have performed this task as a regular part of a job. I have performed it independently and normally without review by a supervisor or senior employee.	3 (27)
E	I am considered an expert in performing this task. I have supervised performance of this task or am normally the person who is consulted by other workers to assist or train them in doing this task because of my expertise.	4 (36)

At the bottom of the window, there are two additional items listed with their respective response types, 'Rated' checkboxes, and 'Proportional Weight' values:

10	Calculate project specifications such as dimensions, square footage, or material quantities using a calculator or computer.	Multiple Choice - Single Select	<input checked="" type="checkbox"/>	1
11	Develop plans and estimate costs for installation of systems, utilization of facilities, or construction of structures.	Multiple Choice - Single Select	<input checked="" type="checkbox"/>	1

Equal Item Weighting Using Item-Level Scoring (Default for Item-Level Scoring)

Example 7 shows items weighted equally relative to one another using Item-level Scoring. In this example, the user has previously selected 'Item-level Scoring' (on the 'Assessment Information' tab). Important to note, when using Item-level Scoring, all items must be linked to a single competency (e.g., Technical Competence). USA Staffing will sum the Item Scores or weighted values associated with the response options selected for all items (under the single competency) to get the Total Raw Score (rather than computing an average at the competency level). The Proportional Weight for all items in this example is '1', showing that each item is weighted the same relative to one another. As a default, Proportional Item Weights are set to '1' when using Item-level Scoring. USA Staffing will automatically adjust the points if the Maximum Base Value varies across items (e.g., due to differing number of response options), so that all items have the same maximum value.

As shown in *Example 7*, Base Values (0 – 4) are assigned to each of the 5 response options (A – E, respectively). In this case, all items are equally weighted so the Base Values and the Final Response Option Values will be the same.

Example 7: Equally Weighted Items Using Item-Level Scoring

0025 - 9 Item Weights					
Technical Competence					
+	Number	Item Stem	Response Type	Rated	Proportional Weight
-	10	Operate motorboats under extreme conditions of darkness, weather and rough water.	Multiple Choice - Single Select	<input checked="" type="checkbox"/>	1
Response Option	Response Text			Base Value	
A	I have not had education, training, or experience in performing this task.			0 (0)	
B	I have had education or training in how to perform this task, but have not yet performed it on the job.			1 (1)	
C	I have performed this task on the job. My work on this task was monitored closely by a supervisor or senior employee to ensure compliance with proper procedures.			2 (2)	
D	I have performed this task as a regular part of a job. I have performed it independently and normally without review by a supervisor or senior employee.			3 (3)	
E	I am considered an expert in performing this task. I have supervised performance of this task or am normally the person who is consulted by other workers to assist or train them in doing this task because of my expertise.			4 (4)	
<input type="button" value="Apply to all Rating Combinations"/>					
+	11	Conduct motorboat patrols in a lake environment with large numbers of other vessels moving in all directions around your boat.	Multiple Choice - Single Select	<input checked="" type="checkbox"/>	1
+	12	Issue written warnings and/or citations to stop unlawful behavior and resolve the situation.	Multiple Choice - Single Select	<input checked="" type="checkbox"/>	1
+	13	Monitor timber cutting, energy exploration or unauthorized activities on park lands or waters.	Multiple Choice - Single Select	<input checked="" type="checkbox"/>	1
<input type="button" value="Save"/> <input type="button" value="Save & Close"/> <input type="button" value="Cancel"/>					

Differential Item Weighting Using Item-Level Scoring (Permission Required)

When setting up the rating criteria, it is important to know whether you want to weight items differentially relative to all other items in the AQ (using Item-level Scoring) or relative to the other items under a given competency (using Competency-level Scoring). *Example 8* shows a common application of differential item weighting whereby certain items are weighted differentially relative to other items in the AQ using Item-level Scoring. To weight one or more items differentially using Item-level Scoring, you must first ensure all items are linked to a single competency. You can then change the Proportional Weight for the item(s) based on supporting job analysis information. The Proportional Weight for a given item indicates the desired weight of the item relative to the other items linked to that single competency. The system will make needed adjustments (e.g., due to differing number of response options) to ensure the Maximum Base Values are the same prior to applying Proportional Item Weights.

In *Example 8* below, the AQ is being used to measure a broad single factor, 'Technical Competence'. The user has job analysis evidence that supports weighting 4 of the 12 items three times more heavily than the other 8 items, so he entered '3' in the 'Proportional Weight' column for those 4 items, indicating that these items are weighted three times more heavily than items with a Proportional Weight of '1'. (To note, associated 'Percentage Weights' are not displayed at the item level.) As shown in *Example 7* above, the Base Values associated with each of the response options are 0, 1, 2, 3, 4. Assuming no other adjustments are needed (e.g., due to differences in the number of response options), the Final Response Option Values for the 4 weighted items will be the Base Values (0, 1, 2, 3, 4) x 3 (the Proportional Weight for these items) or 0, 3, 6, 9, 12. Final Response Option Values are available for user review during the testing phase.

Example 8: Differentially Weighted Items Using Item-Level Scoring

0025 - 9 Item Weights					
Technical Competence					
	Number	Item Stem	Response Type	Rated	Proportional Weight
+	2	Navigate in a backcountry or wilderness area using a map, compass, and/or Global Positioning System (GPS).	Multiple Choice - Single Select	<input checked="" type="checkbox"/>	3
+	3	Respond to emergency calls and take necessary action to preserve public safety.	Multiple Choice - Single Select	<input checked="" type="checkbox"/>	3
+	4	Check for camping, boating and fishing permits to determine compliance with relevant laws or regulations.	Multiple Choice - Single Select	<input checked="" type="checkbox"/>	3
+	5	Communicate effectively in situations that require tact and diplomacy.	Multiple Choice - Single Select	<input checked="" type="checkbox"/>	3
+	6	Collaborate with other park employees who are performing resource, visitor services and education work.	Multiple Choice - Single Select	<input checked="" type="checkbox"/>	1
+	7	Provide orientation and on-the-job training for less experienced employees.	Multiple Choice - Single Select	<input checked="" type="checkbox"/>	1
+	8	Follow up on requests or complaints from the public to facilitate appropriate use of the park and its resources.	Multiple Choice - Single Select	<input checked="" type="checkbox"/>	1
+	9	Verbally justify law enforcement actions or conduct to supervisors or agents of the court.	Multiple Choice - Single Select	<input checked="" type="checkbox"/>	1
+	10	Operate motorboats under extreme conditions of darkness, weather and rough water.	Multiple Choice - Single Select	<input checked="" type="checkbox"/>	1
+	11	Conduct motorboat patrols in a lake environment with large numbers of other vessels moving in all directions around your boat.	Multiple Choice - Single Select	<input checked="" type="checkbox"/>	1
+	12	Issue written warnings and/or citations to stop unlawful behavior and resolve the situation.	Multiple Choice - Single Select	<input checked="" type="checkbox"/>	1
+	13	Monitor timber cutting, energy exploration or unauthorized activities on park lands or waters.	Multiple Choice - Single Select	<input checked="" type="checkbox"/>	1

How Does the Scoring Work?

The math carried out by the system to account for rating scales with differing maximum point values (e.g., due to number of response options), as well as various competency/item weighting options, is somewhat complex. Broadly speaking, USA Staffing uses a **Greatest Common Divisor** and **Least Common Multiple** approach to identify Final Response Option Values, where the Greatest Common Divisor is the largest whole number that divides into all competency weights and the Least Common Multiple is the smallest whole number that is divisible by all of the relevant Response Option Values or Competency Scores being considered at a particular time. Specifically, using each item's Base Values, the Proportional Weight of each item, and the Proportional Weight of each competency, the system identifies a **Response Option Multiplier** for each item on the AQ. The Final Response Option Values for each item are calculated by multiplying the Base Values by the Response Option Multiplier. Once Greatest Common Divisors, Least Common Multiples and Response Option Multipliers are identified, all weights are applied, and Final Response Option Values are computed, applicants' **Item Scores**, **Competency Scores**, Total Raw Scores and **Transmuted Scores** are calculated using the formulas below.

Formulas for Competency-Level Scoring

Item Score = The Final Response Option Value associated with the response option(s) selected by the applicant (or sum of values for select-all-that-apply item formats).

- For single response item formats (i.e., multiple choice-single select), the Maximum Item Score = the largest Final Response Option Value (the response option worth the most points, e.g., 'E' on the default A to E scale).

- For select-all-that-apply item formats (i.e., multiple choice-multiple select), the Maximum Item Score = the sum of all Final Response Option Values.

Competency Score = Sum of the applicant's Item Scores under a given competency / Number of Items under the competency.

Total Raw Score = Sum of the applicant's Competency Scores.

Transmuted Score = Total Raw Score transmuted to a scale of 70 - 100.

Formulas for Item-Level Scoring

Item Score = The Final Response Option Value associated with the response option(s) selected by the applicant (or sum of values for select-all-that-apply item formats).

- For single response item formats, the Maximum Item Score = the largest Final Response Option Value (the response option worth the most points, e.g., 'E' on the default A to E scale).
- For select-all-that-apply item formats, the Maximum Item Score = the sum of all Final Response Option Values.

Total Raw Score = Sum of the applicant's Item Scores.

Transmuted Score = Total Raw Score transmuted to a scale of 70 - 100.

How Do You Test the Scoring Protocol?

The primary benefit of the Weight-based Rating Method is that it eliminates the steps required to manually calculate and enter the Final Response Option Values. However, it is still your responsibility to review and confirm the point values calculated by USA Staffing based on information provided during the AQ development process prior to questionnaire use. Final Response Option Values can be reviewed by navigating to the Rating Criteria page for an Assessment, clicking on the competency title, and expanding the item(s) to show Response Options. The Final Response Option Values are displayed in parentheses (). You will want to confirm that these values coincide with the Proportional Weights specified for both items and competencies.

Testing Example 1

For example, as outlined in *Testing Example 1* below, if you are weighting one competency three times more than the other competencies (Proportional Weight of 3 vs. 1) you should ensure that the Final Response Option Values for each of the items under that competency are three times higher than the Final Response Option Values for the items under the competencies that have Proportional Weights of 1. You also should make sure the maximum possible competency scores, called **Maximum Competency Scores**, reflect the Competency Proportional Weights specified. As shown in *Testing Example 1*, the Maximum Competency Score for the competency 'Cost Accounting' is correctly listed as 12 (based on the formula for Competency Scores above, $[12 + 12 + 12 + 12 + 12 + 12] / 6 = 12$), which is 3 times the Maximum Competency Score of the other two competencies, 'Project Management' and 'Financial Systems', which is 4.

Competency	Item Information	Base Values	Proportional Item Weight	Proportional Competency Weight	Final Response Option Values	Maximum Competency Score
Cost Accounting	6 items that use a 5-point rating scale	A = 0 B = 1 C = 2 D = 3 E = 4	x 1	x 3	A = 0 B = 3 C = 6 D = 9 *E = 12	12
Project Management	3 items that use a 5-point rating scale	A = 0 B = 1 C = 2 D = 3 E = 4	x 1	x 1	A = 0 B = 1 C = 2 D = 3 *E = 4	4
Financial Systems	5 items that use a 5-point rating scale	A = 0 B = 1 C = 2 D = 3 E = 4	x 1	x 1	A = 0 B = 1 C = 2 D = 3 *E = 4	4

This is a straightforward example that assumes use of default scoring and the same rating scale (or number of response options on the rating scale). As illustrated in the second example below, the math becomes increasingly more complex when using rating scales with varying numbers of response options, differentially weighting competencies, and differentially weighting items within competencies. Although the system carries out the calculations, users must confirm that the Final Response Option Values coincide with the Proportional Weights specified for both items and competencies.

Testing Example 2

Testing Example 2 uses the same competencies and items, but also reflects differential item weights within the ‘Project Management’ competency (Competency 2 below). Note that both competency and item weights impact the Final Response Option Values as detailed below.

Specifically, the AQ depicted in *Testing Example 2* below assesses 3 competencies and contains 25 items, 10 of which use a 5-point rating scale (A – E), such as the default scale for General Schedule Positions, with Base Values A = 0, B = 1, C = 2, D = 3, and E = 4. Two of the items under Competency 1¹ that use a 5-point rating scale are weighted twice as heavily as the others. Another 10 items use a 6-point rating scale, with Base Values A = 0, B = 1, C = 2, D = 3, E = 4, and F = 5. One of the items under Competency 2 that uses a 6-point rating scale is weighted twice as heavily as the others. The remaining 5 items use a 3-point rating scale, with Base Values A = 0, B = 1, and C = 2. Competency 1 and Competency 2 are equally weighted (i.e., Proportional Weight is 1), and Competency 3 is weighted twice as heavily as Competencies 1 and 2 (i.e., Proportional Weight is 2).

In reviewing and approving the testing output, it is important to know how to address each of the questions below and to ensure that the output matches expectations. By the end of the testing process, the answer to all questions should be ‘Yes!’

1. Does each item contain the appropriate number of response options?
 - Unless using the default rating scales, double check to make sure you entered these correctly.
2. Are the Base Values correct (particularly if they are modified by the user)?
 - Unless using the default rating scales/Base Values, double check to make sure you entered these correctly.
3. Are the Proportional Weights specified for each item and competency correct?
 - Unless using the default weights, double check to make sure that you entered these correctly.
4. Do the Final Response Option Values for each item reflect the specified Item Proportional Weights?
 - To answer this question, look at the Maximum Item Score for each item (e.g., E = 160, E = 320 and E = 160 for the items under Competency 1) to make sure they reflect the appropriate Item Proportional Weights. As an example, in that E = 320 for the items weighted twice as much as the others under that competency, which have a Maximum Item Score of 160, the values are correctly representing the Item Proportional Weight of 2 ($160 \times 2 = 320$). Similarly, for Competency 2, the Maximum Item Score for the differentially weighted item (Item Proportional Weight = 2, F = 360) is twice as great as those items that have Proportional Weights of 1 ($E/F/C = 180$) ($180 \times 2 = 360$).
5. Do the Maximum Competency Scores reflect the specified Competency Proportional Weights?
 - To answer this question, look at the Maximum Competency Scores. As shown below, the Maximum Competency Score for Competency 3 is 400 which is 2 times the Maximum Competency Score for Competencies 1 and 2, which is 200.

Although the Final Response Option Values may be large, this is not a concern as long as the rationale for item development and scoring decisions is sound and based on job analysis. The large values are merely a result of the need to identify common divisors and least common multiples that ensure the specified weights are applied appropriately and the values are expressed in whole numbers. By not setting an upper limit on values permitted, the system can allow for maximum flexibility with regard to item development and scoring.

*Maximum Item Score

¹Competency numbers (1, 2, 3) vs. competency labels (e.g., Cost Accounting) are used for ease of reference in following this example.

Competency	Item Information	Base Values	Proportional Item Weight	Proportional Competency Weight	Final Response Option Values	Maximum Competency Score
Competency 1	3 items that use a 5-point scale	A = 0 B = 1 C = 2 D = 3 E = 4	x 1	x 1	A = 0 B = 40 C = 80 D = 120 *E = 160	200 ²
	2 differentially-weighted items that use a 5-point scale	A = 0 B = 1 C = 2 D = 3 E = 4	x 2		A = 0 B = 80 C = 160 D = 240 *E = 320	
	3 items that use a 6-point scale	A = 0 B = 1 C = 2 D = 3 E = 4 F = 5	x 1		A = 0 B = 32 C = 64 D = 96 E = 128 *F = 160	
Competency 2	3 items that use a 5-point scale	A = 0 B = 1 C = 2 D = 3 E = 4	x 1	x 1	A = 0 B = 45 C = 90 D = 135 *E = 180	200 ³
	3 items that use a 6-point scale	A = 0 B = 1 C = 2 D = 3 E = 4 F = 5	x 1		A = 0 B = 36 C = 72 D = 108 E = 144 *F = 180	
	1 differentially-weighted item that uses a 6-point scale	A = 0 B = 1 C = 2 D = 3 E = 4 F = 5	x 2		A = 0 B = 72 C = 144 D = 216 E = 288 F = 360	
	2 items that use a 3-point scale	A = 0 B = 1 C = 2	x 1		A = 0 B = 90 *C = 180	

*Maximum Item Score

²[(3 items x Maximum Item Score of 160 = 480) + (2 items x Maximum Item Score of 320 = 640) + (3 items x Maximum Item Score of 160 = 480) = 1600]/8 items = 200

³[(3 items x Maximum Item Score of 180 = 540) + (3 items x Maximum Item Score of 180 = 540) + (1 item x Maximum Item Score of 360 = 360) + (2 items x Maximum Item Score of 180 = 360) = 1800]/9 items = 200

Competency	Item Information	Base Values	Proportional Item Weight	Proportional Competency Weight	Final Response Option Values	Maximum Competency Score
Competency 3	2 items that use a 5-point rating scale	A = 0 B = 1 C = 2 D = 3 E = 4	x 1	x 2	A = 0 B = 100 C = 200 D = 300 *E = 400	400 ⁴
	3 items that use a 6-point rating scale	A = 0 B = 1 C = 2 D = 3 E = 4 F = 5	x 1		A = 0 B = 80 C = 160 D = 240 E = 320 *F = 400	
	3 items that use a 3-point scale	A = 0 B = 1 C = 2	x 1		A = 0 B = 200 *C = 400	

*Maximum Item Score

⁴[(2 items x Maximum Item Score of 400 = 800) + (3 items x Maximum Item Score of 400 = 1200) + (3 items x Maximum Item Score of 400 = 1200) = 3200]/8 items = 400