

The Power Law Formula

The Power Law Formula is the algorithm used to calculate scores for standards based grading. In his highly regarded book *TRANSFORMING CLASSROOM GRADING*, Robert J. Marzano describes the use of this formula for standards based grading. The math for the formula is quite complex, but all that is necessary for its use is that you know how to interpret its scores and when to best use it.

In essence the Power Law Formula predicts what the student's next score will be based on scores already present. It answers the question, "If the student were assessed right now on a skill, what level would the student likely perform?" Since the student's grade on a standard is meant to be an indication of skill at a certain time, the power formula can be used to calculate standard grades.

To gain an understanding of how the Power Law Formula works, let's look at a set of student scores and *Synergy Gradebook's* power law calculation of each set. To keep it simple let's say there are four assessments and four students, and each student has earned the same scores 1, 2, 3, and 4, but in a different order. If we were to simply average the four scores, all students would receive a 2. However, with the power law formula, we'll get different values because the power law puts more weight on recent assignments. Let's take a look:

	Assessment #1	Assessment #2	Assessment #3	Assessment #4	Power Law Score	SBPR Score	Interpretation of the Power Law Score
Student #1	1	2	3	4	4	4	The scores show continuous improvement. The student will likely demonstrate mastery on the next assessment
Student #2	1	3	2	4	3	3	The scores show irregular improvement. The student will likely demonstrate high but not complete mastery on the next assessment.
Student #3	2	4	1	3	2	2	The scores show very uneven performance. The student will likely demonstrate a mid-level of achievement on the next assessment.
Student #4	4	3	2	1	1	1	The scores show continuous decline. The student will likely demonstrate a low level of achievement on the next assessment.

For those with the inclination, here is the power law formula used by *Synergy Gradebook* where x is the ordinal number of the score, s is the score, and N is the number of scores with all scores in date order:

$$\left[\left(\sum \ln x \right) \left[\frac{\sum (\ln x)(\ln s) - \frac{(\sum \ln x)(\sum \ln s)}{N}}{\sum (\ln x)^2 - \frac{(\sum \ln x)^2}{N}} \right] \right] + \left[\frac{\sum (\ln y) - (\sum \ln x) \left[\frac{\sum (\ln x)(\ln s) - \frac{(\sum \ln x)(\sum \ln s)}{N}}{\sum (\ln x)^2 - \frac{(\sum \ln x)^2}{N}} \right]}{N} \right]$$