

The following information applies to Rubric Gradebooks in Aeries

Based on <https://www.easycalculation.com/statistics/learn-regression.php>

We use the regression equation $y = a + bx$

Where

$$a = \frac{\sum Y - b \sum X}{N}$$

and

$$b = \frac{N \sum XY - (\sum X)(\sum Y)}{N \sum X^2 - (\sum X)^2}$$

X values simply go from 1 to the number of assignment scores being counted. So, if there are 10 assignment scores for the standard, X values will be from 1 to 10.

Y values are the assignment scores.

Each X value is paired with a Y value, and scores are sorted by date . For example, 10 rubric assignment scores (scored on a 1-4 scale) might be paired into X, Y values as follows. (This is just a made-up example.)

X	Y
1	4
2	3
3	3
4	2
5	2
6	4
7	3
8	4
9	4
10	4

N is the number of assignment scores being counted.

So, to run through the calculation for the above example.

Step 1: Count the number of scores

$N = 10$

$x = 11$ (The value that is incrementing, which is simply the number of scores plus one).

Step 2: Find XY, X^2

X	Y	X*Y	X*X
1	4	4	1
2	3	6	4
3	3	9	9
4	2	8	16
5	2	10	25
6	4	24	36
7	3	21	49
8	4	32	64
9	4	36	81
10	4	40	100

Step 3: Find $\sum X, \sum Y, \sum XY, \sum X^2$

$$\sum X = 55$$

$$\sum Y = 33$$

$$\sum XY = 190$$

$$\sum X^2 = 385$$

Step 4: Substitute in the above slope formula

$$\begin{aligned} b &= \frac{N \sum XY - (\sum X)(\sum Y)}{N \sum X^2 - (\sum X)^2} \\ &= \frac{10 \times 190 - 55 \times 33}{10 \times 385 - 55^2} \\ &= \frac{1900 - 1815}{3850 - 3025} \\ &= \frac{85}{825} \\ &= 0.10303 \end{aligned}$$

Step 5: Substitute in the above intercept formula

$$\begin{aligned} a &= \frac{\sum Y - b \sum X}{N} \\ &= \frac{33 - .10303 \times 55}{10} \\ &= \frac{33 - 5.66667}{10} \\ &= \frac{27.33333}{10} \\ &= 2.73333 \end{aligned}$$

Step 6: Substitute these values in the regression formula.

$$\begin{aligned}
 y &= a + bx \\
 &= 2.73333 + .10303 \times 11 \\
 &= 2.73333 + 1.13333 \\
 &= \mathbf{3.86667}
 \end{aligned}$$

This is the value that would be shown for the trend when loading standards-based grades from gradebook. When displaying the value to the teacher, we truncate to two places after the decimal.

Notes:

- If the value is lower than the lowest score, then the lowest score will be returned.
- If the value is higher than the highest score, then the highest score will be returned.
- If there are no scores, then 0 will be returned.
- If there is only one score, that score will be returned.
- If there are only two scores, the 2nd score will be returned.

IMPORTANT:

The regression formula is used for assignment scores when the assignment is directly linked to a standard. The linear regression trend scores at the lowest tier in the standards hierarchy are averaged to get an average score for the parent standard. Successive levels of parent standards will take the average of their child standards, up to the highest level standard.

This concept is illustrated in the following table:

Standard	Linear Regression Trend	Highest Level "Standard"		Subject-ELA	Final Grade
Range of Writing	3.8	Writing	2.95	3.283333	B
Production and Dist	3				
Research	2				
Text Types	3				
Informational Text	4	Reading	3.9		
Literature	3.8				
Conventions of Eng	2	Language	3		
Knowledge of Lang	3				
Vocabulary	4				