



2025 No. 108

Third-Party Checking of 2025 Scaling and Equating for the Kentucky Summative Assessments (KSA)

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Executive Summary

Pearson and the Human Resources Research Organization (HumRRO) independently calibrated, scaled, and equated the 2025 Kentucky Summative Assessments (KSA) and produced the raw-score-to-theta-score tables to be applied to students' test results. HumRRO further verified that scoring tables were applied accurately by independently scoring students and comparing scoring results to Pearson's. Results calculated by HumRRO were identical to those calculated by Pearson (L. Hou, email communication, July 14, 2025 [mathematics, reading, editing and mechanics, social studies]; July 17, 2025 [writing]; July 31, 2025 [science]). Given that HumRRO's results were identical to Pearson's, we are assured that no processing errors were committed.

Third-Party Checking of 2025 Scaling and Equating for the Kentucky Summative Assessments (KSA) Tests

Introduction

Kentucky started administering the Kentucky Summative Assessments (KSA) in the spring of 2022. The KSA assesses student performance on the Kentucky Academic Standards (KAS) using a combination of multiple choice, short answer, and extended response items. Student scores are estimated using a Rasch Item-Response Theory (IRT) model (Rasch, 1960). As new test forms have been developed, an equating process has been implemented to allow for meaningful comparisons over the years with Kentucky's previous assessments.

In spring 2025, the KSA were administered in reading, mathematics, science, social studies, editing and mechanics, and on-demand writing. Reading and mathematics were assessed in Grades 3 through 8 and Grade 10; science in Grades 4, 7, and 11; social studies, editing and mechanics, and On-Demand Writing (ODW) in Grades 5, 8, and 11.

This report describes how student test responses for the 2025 KSA were used to create scale scores and place students in Novice, Apprentice, Proficient, or Distinguished (NAPD) performance categories. The complex analyses to accomplish these tasks were conducted independently but cooperatively by both HumRRO and Pearson staff members. Several interim checks were conducted during the analyses, and any discrepancies between the two companies were investigated and resolved. This process was conducted transparently among Pearson, HumRRO, the Kentucky Department of Education (KDE), and Kentucky's psychometric consultant (Dr. Bill Auty of Education Measurement Consulting) via frequent email communications. The process was guided by a specifications document created by Pearson¹ and regularly updated based on decisions before and during calibration. This documentation is vital for ensuring consistency of processing across years and for guiding psychometric processing in future years.

Brief Description of 2025 Assessments

In response to the COVID-19 pandemic's impact on schools during the 2020-2021 school year, the United States Department of Education (USED) waived accountability reporting requirements but maintained that states should continue to administer annual summative assessments. This led to a directive from KDE leadership to develop a simple, straightforward assessment focused on comparing current student performance to past student performance.

Beginning with the 2021-2022 academic year, the KSA covers new and revised content standards in reading, mathematics, science, social studies, and writing. For writing, there are two assessment components: (1) editing and mechanics, and (2) writing. Except for writing, all tests are a blend of selected responses and constructed response items. The writing component is a single essay prompt scored on multiple writing skills (or traits).

Each subject-grade assessment combination in the 2025 KSA consisted of multiple test forms. Grades 3-8 and 10 for reading included 10 forms. The number of operational items ranged from 32 to 35 per form. For mathematics, Grades 3-8 and 10 had four forms. The number of

¹ KSA Spring 2025 Psychometric Analysis Specifications v1.0.

operational items ranged from 32 to 35 per form. Science assessments in Grades 4, 7, and 11 consisted of 17 forms, with the number of operational items ranging between 19 and 32 items per form. Social studies assessments in Grades 5, 8, and 11 consisted of four forms, with the number of operational items ranging between 31 and 34 items per form. Editing and mechanics assessments in Grades 5 and 11 consisted of 8 forms, and Grade 8 consisted of 10 forms, with each form consisting of 26 operational items. Writing assessments in Grades 5, 8, and 11 consisted of 12 forms, each with a single essay prompt.

Analysis Procedures

Item parameters were generated (i.e., calibrated) across all grade-level forms for each subject in a single run. This equates test forms for a given grade so that test scores across forms are interchangeable in terms of difficulty. Except for science, anchored item calibration and equating analyses were then conducted for the KSA assessments. A new reporting scale was developed for science through a standard setting procedure, so anchored item calibration and equating were not conducted for this assessment. Finally, Raw-Score-to-Scale (RSS) score tables were generated. For each of these analyses, HumRRO followed the analysis specifications provided by Pearson, independently conducted analyses, and verified that our results matched Pearson's results. We summarize HumRRO's processes and procedures for conducting these analyses below.

Sample Identification and File Construction

We first applied exclusion rules to select the sample of student responses to include in the calibration analyses.² Kentucky selects most of its student population for use in the calibration sample for scaling and equating. However, some students are purposefully excluded from the calibration samples, as specified in the 2025 psychometrics specifications document.³ Kentucky's exemption rules generally only apply to students who receive accommodations (e.g., Braille forms, audio, large print, etc.), students with duplicate records (the same identification number and name), and students with blank total test score values. Pearson and HumRRO verified n-counts after this step.

The next step was to format all subject/grade files to be read into the Winsteps IRT psychometric software and create Winsteps⁴ control files to read student responses and estimate item parameters. A sample control file is provided in Appendix A. HumRRO created specialized R statistical software programs to generate all input and control files automatically. An item documentation file was used to specify item types, locations, keys, item use, and other important information. HumRRO and Pearson used the same raw student data files (containing all student responses) but did not share programming or methodology for creating the input, control, or data files for Winsteps. When creating the input data files, HumRRO followed the guidance provided by Pearson (with input from KDE) regarding the treatment of blank responses, condition codes, etc.

Calibration and Scaling Procedures

Once input and control files were prepared, Winsteps software was used to calibrate test items across grade-level test forms. Multiple-choice items fit the Rasch measurement model, and constructed-response items (short constructed response and extended response items) fit the

² Students who are excluded from calibration analyses are not excluded from scoring and reporting.

³ Kentucky Spring 2025 Psychometric Analysis Specifications v1.0.

⁴ HumRRO used Winsteps version 4.8.0.0 for this project.

Partial Credit Model (PCM; Masters, 1982). Both types of items were simultaneously calibrated in Winsteps, and item difficulty parameters (logits) were produced. “Step parameters” were also produced for constructed response items. Step parameters for an item indicate how the various points possible on the item relate to the item’s overall difficulty and are important for generating scoring tables. These parameters are produced on the theta scale (a commonly used scale with a mean of 0 and a standard deviation of 1). Appendix B contains an example of item parameters for one grade subject (logits and step parameters). Pearson and HumRRO verified item parameter estimates after this step.

Equating Procedures

HumRRO conducted two types of equating for the KSA: (a) forms equating within a given test administration year and (b) equating across test administration years using common anchor items. Forms equating is accomplished by calibrating all items for a given subject-grade combination. Calibrating all the items together (i.e., across all forms) effectively equates the various forms for a given subject-grade combination such that test scores across forms are interchangeable in terms of difficulty.

Except for science, we also equated the current year’s scores to scores from prior years for each non-ODW assessment. To accomplish this, we first examined the stability of the linking items to ensure that item difficulty had not shifted excessively between administrations. We conducted the Robust Z (Huyn, 2000; Huynh & Meyer, 2010; Huyn & Rawls, 2009) statistical procedure to determine whether any linking items should be dropped from the equating process. Items with a substantial difference in item difficulty, as defined in the test specifications document, were not included as anchor items in equating. The resulting set of anchor items was then used to create the RSS tables.

Raw-score-to-Scale-Score Procedures

The item parameter estimates from the equating analyses for reading, mathematics, social studies, editing and mechanics, and on-demand writing were used in Winsteps to generate person ability estimates by form and by reporting categories. Ability estimates were reported in raw-score-to-theta-score tables.

Once theta scoring tables were obtained, they were linearly transformed to a reporting scale of 400-600 for reading, mathematics, social studies, and writing, and 700-900 for science. Performance levels (NAPD) were also assigned to each score. Scale score cuts were used, as opposed to theta cuts, to assign performance levels to students’ scale scores. Using these cuts allowed scale scores associated with each performance level to be fixed across test administrations.

Verification of 2025 Scoring Tables

After verification of the raw-score-to-scale score tables, scoring tables were generated to assign student performance level classifications. HumRRO checked the 2025 scoring tables and verified that the correct scale score ranges were associated with each performance level. HumRRO matched Pearson on all subjects and grades.

Field Test Item Calibration

HumRRO also conducted field test item calibration for editing and mechanics, reading, social studies, and writing. After operational items for these assessments were placed onto the base scale, field test items were placed onto the same scale through anchored item calibration linked by the operational items. Field test items with negative point-biserial correlations were excluded from the calibration. HumRRO matched Pearson on all subjects and grades.

Documentation

As HumRRO and Pearson completed each step of the process described above, Winsteps item parameter, anchor item, and score, and output files were shared to check for inconsistencies. Winsteps output files included the number of cases in the calibration sample, item-level information (e.g., p-values, parameters), and the theta scoring tables. A sample of the input and output files is appended to this document. They include:

1. Winsteps Control Files (Appendix A). These files contain the item parameter estimation specifications and essential information for reading the student score files. It also specifies the output file names. The appendix includes an example control file for the initial item parameter estimation, equated item parameter estimation, and estimation of the cluster scores.
2. Winstep Item Parameter Files (Appendix B). These files contain the item parameters for the operational items. Each multiple-choice item has one parameter, a logit difficulty (named Measure in the Winstep files). Each constructed-response item has an overall difficulty parameter and a number of step parameters indicating how the points for the item are distributed along the theta scale. The file included in the appendix is an example of a final item parameter file. Initial item parameter files are in similar formats.
3. Winsteps Anchor File (Appendix C). The file includes the 2025 item parameter values for each anchor item with the equating shift estimate applied to the overall difficulty measure. The file is read by Winsteps and used to fix the item parameter values and estimate final score files.
4. Winsteps Score File (Appendix D). The file contains the raw score to theta estimation and includes the distribution of student scores.
5. Comparison of Files Output (Appendix E). This is a spreadsheet file from HumRRO's comparison program that checks scoring table results against Pearson's results. The files match if all comparison values are 0.

Conclusion

Pearson and HumRRO independently calculated the scaled/equated raw-score-to-scale-score tables for 2025 KSA reading and math (Grades 3-8, 10) and social studies and writing (Grades 5, 8, 11), as well as the scoring tables for science (Grades 4, 7, 11), based on new scaling information obtained from the standard setting process. No differences were found between Pearson's and HumRRO's parameter estimations or raw-score-to-scale-score tables. Given that HumRRO's and Pearson's scaling and equating results were identical, HumRRO is confident that no processing errors were committed.

References

- Huynh, H. (2000, June 18). *Guidelines for Rasch Linking for PACT* [Memorandum to Paul Sandifer]. Author.
- Huynh, H., & Meyer, P. (2010). Use of robust z in detecting unstable items in item response theory models. *Practical Assessment, Research & Evaluation*, 15(2).
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- Masters, G. N. (1982). A Rasch model for partial credit scoring. *Psychometrika*, 47, 149-174.
- Rasch, G. (1960). *Probabilistic models for some intelligence and attainment tests*. University of Chicago Press.

Appendix A – Control File (Math Grade 3)

; WINSTEPS Control File

```
&INST
Item1 = 37
NI = 75
TABLES = 001000000000010000010000000001
CODES = 012
CSV = N
FITP = 3.0
FITI = 3.0
XWIDE = 1
HLINES = Y
data = KDE_MA_03.dat
IFILE = KDE_MA_03.ITM
ISFILE = KDE_MA_03.ISF
SFILE = KDE_MA_03.CSF
SCFILE = KDE_MA_03.RSS
PFILE = KDE_MA_03.PER
mprox = 10
mucon = 100
rconv = .50
lconv = .01
models = r
groups = 0
stkeep = n
realse = n
stbias = n
target = n
extrsc = 0.25
udecim = 4
;uimean = 0
;uscale = 1
ptbis = y
ILFILES = *
MA0320071
MA0320146
MA0321045
MA0320017
MA0321183
MA0320032
MA0320197
MA0320005
MA0320019
MA0320078
MA0320030
MA0320056
MA0320028
```

MA0320173
MA0320098
MA0321040
MA0321153
MA0320008
MA0320159
MA0320035
MA0321047
MA0321179
MA0320108
MA0320076
MA0320015
MA0320053
MA0321081
MA0321056
MA0320082
MA0320080
MA0320052
MA0320081
MA0321182
MA0320079
MA0320047
MA0320137
MA0320192
MA0321138
MA0321050
MA0320131
MA0320C6_02
MA0320097
MA0321142
MA0320105
MA0320089
MA0321132
MA0320123
MA0321114
MA0321096
MA0320054
MA0320086
MA0320087
MA0320093
MA0320110
MA0320037
MA0320010
MA0321008
MA0320003
MA0320069
MA0321001
MA0321002
MA0320C8_01
MA0320126
MA0320151

MA0320070
MA0320118
MA0320125
MA0321125
MA0320122
MA0320014
MA0321137
MA0320004
MA0321004
MA0320090
MA0320075
*

&END
END NAMES

Appendix B – Winsteps Item Parameter Files (Math Grade 3)

Entry	MEASURE	ST	COUNT	SCORE	MODLSE	IN.MSQ	INZSTD	OUTMSQ	OUTZST	DISPL	NAME
1	-0.9845	1	35415	26861	0.0135	0.9	-9.9	0.78	-9.9	0.0002	MA0320071
2	-1.0417	1	23410	17808	0.0168	0.97	-3.66	0.99	-0.52	-0.0016	MA0320146
3	0.8006	1	11719	5001	0.0211	0.99	-1.17	1.06	4.18	0.0017	MA0321045
4	-0.5534	1	35307	45117	0.0102	0.99	-1.2	1	-0.36	-0.0014	MA0320017
5	0.1352	1	47106	26136	0.0104	0.91	-9.9	0.88	-9.9	-0.0004	MA0321183
6	1.2533	1	11719	4020	0.022	1.09	9.05	1.2	9.9	0.0019	MA0320032
7	0.5874	1	35307	16425	0.0121	1.04	7.75	1.04	5.24	-0.0002	MA0320197
8	-2.1759	1	47106	42214	0.016	0.85	-9.9	0.55	-9.9	-0.0017	MA0320005
9	0.9373	1	11719	8804	0.0138	1	0.09	0.96	-2.05	0.0019	MA0320019
10	1.0687	1	35415	13259	0.0123	1.21	9.9	1.32	9.9	0.0009	MA0320078
11	0.9116	1	23410	9457	0.0152	1.01	1.02	1.02	1.57	-0.0002	MA0320030
12	0.2457	1	35307	18781	0.012	0.84	-9.9	0.78	-9.9	-0.0005	MA0320056
13	-0.6384	1	23410	16282	0.0158	0.9	-9.9	0.8	-9.9	-0.0012	MA0320028
14	0.5781	1	23410	22121	0.0112	0.85	-9.9	0.84	-9.9	-0.0001	MA0320173
15	-0.632	1	35415	24817	0.0128	0.89	-9.9	0.83	-9.9	0.0001	MA0320098
16	1.0829	1	47106	17511	0.0108	1.05	9.51	1.09	9.9	0.0002	MA0321040
17	-0.1216	1	23410	14091	0.015	0.99	-1.38	0.98	-1.87	-0.0008	MA0321153
18	0.6584	1	47106	21299	0.0105	0.98	-5.6	0.99	-0.83	0	MA0320008
19	0.7431	1	23518	10291	0.0148	1.11	9.9	1.15	9.9	0.0007	MA0320159
20	-1.1605	1	23410	18218	0.0172	0.97	-2.99	0.9	-4.95	-0.0017	MA0320035
21	0.2284	1	23410	12519	0.0149	0.94	-9.77	0.93	-7.46	-0.0007	MA0321047
22	0.5393	1	11719	11333	0.0162	1.2	9.9	1.19	9.9	0.0016	MA0321179
23	1.0711	1	35307	13202	0.0125	0.98	-4	0.99	-1.45	0.0002	MA0320108
24	-0.4355	1	23518	15677	0.0153	1.12	9.9	1.2	9.9	0.0003	MA0320076
25	-0.7419	1	47106	33751	0.0113	0.9	-9.9	0.83	-9.9	-0.0005	MA0320015
26	-0.2064	1	23410	14464	0.0151	1.01	1.42	1.01	0.44	-0.0009	MA0320053
27	-0.035	1	23616	28680	0.0093	1.38	9.9	1.79	9.9	0.0008	MA0321081

28	-0.198	1	35307	21804	0.0123	1.02	3.25	1.01	0.82	-0.0008	MA0321056
29	0.2471	1	23518	12599	0.0146	0.87	-9.9	0.83	-9.9	0.0006	MA0320082
30	-0.0722	1	35415	21158	0.0121	0.96	-8.09	0.94	-6.93	0.0003	MA0320080
31	-1.3598	1	23410	18863	0.018	0.89	-9.9	0.75	-9.9	-0.0017	MA0320052
32	1.346	1	23410	7646	0.0159	1.14	9.9	1.23	9.9	0	MA0320081
33	1.1769	1	23410	8331	0.0156	1.21	9.9	1.39	9.9	0.0002	MA0321182
34	-1.0596	1	23518	18114	0.0169	0.89	-9.9	0.8	-9.9	0.0001	MA0320079
35	-1.5917	1	35307	29538	0.0155	0.96	-4.74	0.96	-1.82	-0.0013	MA0320047
36	-2.3494	1	11897	10845	0.034	1.03	1.35	1.17	3.25	-0.0006	MA0320137
37	-0.0753	1	11897	13664	0.0171	1.17	9.9	1.18	9.9	-0.0002	MA0320192
38	-1.2659	1	23696	18953	0.0176	0.96	-4.36	0.94	-3.09	-0.0006	MA0321138
39	1.063	1	23588	19870	0.013	0.94	-6.49	0.94	-6.8	0.0003	MA0321050
40	0.9265	1	11897	4750	0.0211	1.01	1.59	1.05	3.78	0.0006	MA0320131
41	0.3559	1	23696	12152	0.0145	1.06	9.9	1.07	7.83	0	MA0320C6_02
42	0.8822	1	23696	9689	0.0148	1.07	9.9	1.13	9.9	0.0002	MA0320097
43	-0.2039	1	23696	14763	0.0149	1.09	9.9	1.09	8.29	-0.0001	MA0321142
44	-1.7154	1	11897	10163	0.0278	0.87	-7.9	0.68	-9.73	-0.0004	MA0320105
45	0.9415	1	23696	9419	0.0149	1.02	3.14	1.03	3.22	0.0001	MA0320089
46	0.8047	1	11897	5027	0.0209	1.06	7.45	1.11	7.49	0.0007	MA0321132
47	1.129	1	35387	12833	0.0125	1.03	5.4	1.06	6.84	-0.0003	MA0320123
48	-1.4686	1	11897	9820	0.026	0.88	-8.5	0.72	-9.63	-0.0004	MA0321114
49	1.2398	1	23696	8106	0.0153	1.12	9.9	1.22	9.9	0.0003	MA0321096
50	1.3065	1	11897	3925	0.0219	1.01	1.39	1.07	4.34	0.0009	MA0320054
51	-0.7444	1	23696	17069	0.0159	0.91	-9.9	0.81	-9.9	-0.0004	MA0320086
52	-0.2103	1	23696	14792	0.0149	1.01	2.22	1.03	2.65	-0.0003	MA0320087
53	-0.1791	1	23696	30292	0.0096	1.01	1.52	1.09	6.04	-0.0002	MA0320093
54	-0.5377	1	23588	15989	0.0155	1	0.19	1.04	2.86	-0.0016	MA0320110
55	0.2015	1	11691	6267	0.0212	1.25	9.9	1.39	9.9	-0.003	MA0320037
56	-0.6129	1	23490	16270	0.0157	0.87	-9.9	0.8	-9.9	-0.0019	MA0320010
57	-0.218	1	11691	7191	0.0215	0.85	-9.9	0.79	-9.9	-0.0033	MA0321008
58	-0.3507	1	11691	7475	0.0217	0.81	-9.9	0.73	-9.9	-0.0035	MA0320003

59	-0.589	1	11691	14781	0.0184	1.06	4.7	1.04	2.93	-0.0046	MA0320069
60	-1.1984	1	11691	9098	0.0245	0.99	-1.15	1.09	2.88	-0.0043	MA0321001
61	0.016	1	11691	6679	0.0213	1.04	4.6	1.01	0.49	-0.003	MA0321002
62	0.6363	1	11691	5300	0.0213	1.11	9.9	1.15	9.4	-0.0023	MA0320C8_01
63	-0.6013	1	11691	16087	0.0156	0.88	-9.9	0.83	-9.39	-0.0043	MA0320126
64	1.1361	1	11691	4235	0.0221	1.07	7	1.12	6.46	-0.002	MA0320151
65	-1.1276	1	11799	19016	0.0169	0.94	-4.18	0.95	-1.87	-0.0006	MA0320070
66	1.0541	1	11799	4449	0.0212	1.25	9.9	1.45	9.9	-0.0002	MA0320118
67	0.0019	1	11799	6904	0.0208	0.9	-9.9	0.85	-9.9	-0.0005	MA0320125
68	0.8763	1	11799	9600	0.0144	1.05	4.18	1.04	2.78	-0.0003	MA0321125
69	-0.3794	1	11799	7761	0.0215	0.87	-9.9	0.79	-9.9	-0.0005	MA0320122
70	0.4552	1	11799	5838	0.0206	1.08	9.5	1.09	7.21	-0.0004	MA0320014
71	0.6906	1	11799	5283	0.0207	1.13	9.9	1.17	9.9	-0.0003	MA0321137
72	-1.0174	1	11799	9029	0.0237	0.79	-9.9	0.62	-9.9	-0.0008	MA0320004
73	-0.1703	1	11799	14376	0.0155	1.14	9.9	1.14	9.9	-0.0007	MA0321004
74	0.5295	1	11799	11438	0.0163	1.21	9.9	1.22	9.9	-0.0004	MA0320090
75	0.1652	1	11799	6523	0.0206	0.83	-9.9	0.79	-9.9	-0.0004	MA0320075

Step parameters 2025 – Math Grade 3

; STRUCTURE-THRESHOLD MEASURE ANCHOR FILE FOR C:\Users\...\OneDrive - Human Resources Research Organization\Documents\K Jul 8 2025 12:47

; ITEM CATEGORY Rasch-Andrich threshold MEASURE

1	0	0
1	1	0
2	0	0
2	1	0
3	0	0
3	1	0
4	0	0
4	1	-1.586
4	2	1.586
5	0	0
5	1	0
6	0	0
6	1	0
7	0	0
7	1	0
8	0	0
8	1	0
9	0	0
9	1	0.4095
9	2	-0.4095
10	0	0
10	1	0
11	0	0
11	1	0
12	0	0
12	1	0
13	0	0
13	1	0
14	0	0
14	1	-1.0019
14	2	1.0019
15	0	0
15	1	0
16	0	0
16	1	0
17	0	0
17	1	0
18	0	0
18	1	0
19	0	0
19	1	0
20	0	0
20	1	0
21	0	0

21	1	0
22	0	0
22	1	-1.2691
22	2	1.2691
23	0	0
23	1	0
24	0	0
24	1	0
25	0	0
25	1	0
26	0	0
26	1	0
27	0	0
27	1	0.4753
27	2	-0.4753
28	0	0
28	1	0
29	0	0
29	1	0
30	0	0
30	1	0
31	0	0
31	1	0
32	0	0
32	1	0
33	0	0
33	1	0
34	0	0
34	1	0
35	0	0
35	1	0

Appendix C – Winsteps Anchor File (Math Grade 3)

Item Anchor File

1	-0.9192
2	-0.9116
5	0.1709
7	0.7164
8	-2.0587
10	1.1611
11	1.0363
12	0.3614
14	0.7269
16	1.2056
20	-1.0091
21	0.3665
23	1.2486
24	-0.3979
25	-0.6521
27	0.1031
28	-0.187
29	0.4343
41	0.3758
43	-0.0834
45	1.1151
46	0.9259
48	-1.3034
55	0.2558
56	-0.5445
58	-0.1698
59	-0.4653
60	-1.1059
61	0.1994
62	0.7646
66	1.0715
67	0.0788
69	-0.2242
70	0.6061
71	0.6883
72	-0.9975
74	0.6766

Step Parameter Anchor File

14	0	0
14	1	-1.0019
14	2	1.0019
27	0	0
27	1	0.4753
27	2	-0.4753
59	0	0
59	1	-1.7615
59	2	1.7615
74	0	0
74	1	-1.4413
74	2	1.4413

Appendix D – Winsteps Score File (Math Grade 3)

PERSON SCORE FILE FOR C:\Users\...\OneDrive - Human Resources Research Organization\Documents Jul 8 2025 12:47
 USCALE=1.00

SCORE	MEASURE	S.E.	INFO	NORMED	S.E.	FREQUENCY	%	CUM.FREQ	%	PERCENTILE
0	-5.3868	2.0158	0.25	3	168	2	0	2	0	0.1
1	-3.9531	1.0309	0.94	122	86	12	0.1	14	0.1	0.1
2	-3.1975	0.7498	1.78	185	63	14	0.1	28	0.2	0.2
3	-2.7302	0.6283	2.53	225	52	21	0.2	49	0.4	0.3
4	-2.3814	0.5575	3.22	254	47	12	0.1	61	0.5	0.5
5	-2.0977	0.5102	3.84	277	43	26	0.2	87	0.7	0.6
6	-1.8552	0.476	4.41	298	40	30	0.3	117	1	0.9
7	-1.6413	0.4499	4.94	315	38	75	0.6	192	1.6	1.3
8	-1.4484	0.4293	5.42	332	36	152	1.3	344	2.9	2.3
9	-1.2713	0.4127	5.87	346	34	161	1.4	505	4.3	3.6
10	-1.1068	0.3989	6.28	360	33	262	2.2	767	6.5	5.4
11	-0.9524	0.3874	6.66	373	32	296	2.5	1063	9.1	7.8
12	-0.8061	0.3777	7.01	385	32	382	3.3	1445	12.3	10.7
13	-0.6665	0.3696	7.32	397	31	387	3.3	1832	15.6	14
14	-0.5325	0.3627	7.6	408	30	431	3.7	2263	19.3	17.5
15	-0.4031	0.357	7.85	419	30	410	3.5	2673	22.8	21.1
16	-0.2773	0.3523	8.06	429	29	470	4	3143	26.8	24.8
17	-0.1546	0.3486	8.23	440	29	448	3.8	3591	30.6	28.7
18	-0.0341	0.3457	8.37	450	29	450	3.8	4041	34.5	32.6
19	0.0847	0.3437	8.46	460	29	480	4.1	4521	38.6	36.5
20	0.2024	0.3425	8.52	469	29	479	4.1	5000	42.7	40.6
21	0.3195	0.3421	8.54	479	29	464	4	5464	46.6	44.6
22	0.4366	0.3425	8.52	489	29	438	3.7	5902	50.4	48.5
23	0.5543	0.3437	8.46	499	29	447	3.8	6349	54.2	52.3
24	0.6731	0.3458	8.36	509	29	446	3.8	6795	58	56.1
25	0.7937	0.3488	8.22	519	29	455	3.9	7250	61.9	59.9
26	0.9167	0.3528	8.03	529	29	449	3.8	7699	65.7	63.8
27	1.043	0.3581	7.8	540	30	452	3.9	8151	69.6	67.6
28	1.1734	0.3647	7.52	551	30	474	4	8625	73.6	71.6
29	1.3093	0.3729	7.19	562	31	382	3.3	9007	76.9	75.2

30	1.4521	0.3832	6.81	574	32	392	3.3	9399	80.2	78.5
31	1.6037	0.3959	6.38	587	33	367	3.1	9766	83.3	81.8
32	1.7666	0.4118	5.9	600	34	349	3	10115	86.3	84.8
33	1.9443	0.432	5.36	615	36	317	2.7	10432	89	87.7
34	2.1419	0.458	4.77	631	38	340	2.9	10772	91.9	90.5
35	2.367	0.4925	4.12	650	41	268	2.3	11040	94.2	93.1
36	2.6324	0.5405	3.42	672	45	211	1.8	11251	96	95.1
37	2.9621	0.6125	2.67	700	51	183	1.6	11434	97.6	96.8
38	3.4093	0.7359	1.85	737	61	151	1.3	11585	98.9	98.2
39	4.1439	1.0205	0.96	799	85	93	0.8	11678	99.7	99
40	5.5613	2.0103	0.25	917	168	41	0.3	11719	100	99

Appendix E – Comparison of Files Output (Math Grade 3)

All RSSS Differences – Math Grade 3

subject	grade	form	rs	pearson_theta	pearson_se	humrro_theta	humrro_se	theta_diff	se_diff
MA	03	1	0	-5.3868	2.0158	-5.3868	2.0158	0	0
MA	03	1	1	-3.9531	1.0309	-3.9531	1.0309	0	0
MA	03	1	2	-3.1975	0.7498	-3.1975	0.7498	0	0
MA	03	1	3	-2.7302	0.6283	-2.7302	0.6283	0	0
MA	03	1	4	-2.3814	0.5575	-2.3814	0.5575	0	0
MA	03	1	5	-2.0977	0.5102	-2.0977	0.5102	0	0
MA	03	1	6	-1.8552	0.476	-1.8552	0.476	0	0
MA	03	1	7	-1.6413	0.4499	-1.6413	0.4499	0	0
MA	03	1	8	-1.4484	0.4293	-1.4484	0.4293	0	0
MA	03	1	9	-1.2713	0.4127	-1.2713	0.4127	0	0
MA	03	1	10	-1.1068	0.3989	-1.1068	0.3989	0	0
MA	03	1	11	-0.9524	0.3874	-0.9524	0.3874	0	0
MA	03	1	12	-0.8061	0.3777	-0.8061	0.3777	0	0
MA	03	1	13	-0.6665	0.3696	-0.6665	0.3696	0	0
MA	03	1	14	-0.5325	0.3627	-0.5325	0.3627	0	0
MA	03	1	15	-0.4031	0.357	-0.4031	0.357	0	0
MA	03	1	16	-0.2773	0.3523	-0.2773	0.3523	0	0
MA	03	1	17	-0.1546	0.3486	-0.1546	0.3486	0	0
MA	03	1	18	-0.0341	0.3457	-0.0341	0.3457	0	0
MA	03	1	19	0.0847	0.3437	0.0847	0.3437	0	0
MA	03	1	20	0.2024	0.3425	0.2024	0.3425	0	0
MA	03	1	21	0.3195	0.3421	0.3195	0.3421	0	0
MA	03	1	22	0.4366	0.3425	0.4366	0.3425	0	0
MA	03	1	23	0.5543	0.3437	0.5543	0.3437	0	0
MA	03	1	24	0.6731	0.3458	0.6731	0.3458	0	0

MA	03	1	25	0.7937	0.3488	0.7937	0.3488	0	0
MA	03	1	26	0.9167	0.3528	0.9167	0.3528	0	0
MA	03	1	27	1.043	0.3581	1.043	0.3581	0	0
MA	03	1	28	1.1734	0.3647	1.1734	0.3647	0	0
MA	03	1	29	1.3093	0.3729	1.3093	0.3729	0	0
MA	03	1	30	1.4521	0.3832	1.4521	0.3832	0	0
MA	03	1	31	1.6037	0.3959	1.6037	0.3959	0	0
MA	03	1	32	1.7666	0.4118	1.7666	0.4118	0	0
MA	03	1	33	1.9443	0.432	1.9443	0.432	0	0
MA	03	1	34	2.1419	0.458	2.1419	0.458	0	0
MA	03	1	35	2.367	0.4925	2.367	0.4925	0	0
MA	03	1	36	2.6324	0.5405	2.6324	0.5405	0	0
MA	03	1	37	2.9621	0.6125	2.9621	0.6125	0	0
MA	03	1	38	3.4093	0.7359	3.4093	0.7359	0	0
MA	03	1	39	4.1439	1.0205	4.1439	1.0205	0	0
MA	03	1	40	5.5613	2.0103	5.5613	2.0103	0	0
MA	03	2	0	-5.6132	2.0164	-5.6132	2.0164	0	0
MA	03	2	1	-4.1773	1.0326	-4.1773	1.0326	0	0
MA	03	2	2	-3.4178	0.7526	-3.4178	0.7526	0	0
MA	03	2	3	-2.946	0.6323	-2.946	0.6323	0	0
MA	03	2	4	-2.5919	0.5624	-2.5919	0.5624	0	0
MA	03	2	5	-2.3025	0.5159	-2.3025	0.5159	0	0
MA	03	2	6	-2.0542	0.4822	-2.0542	0.4822	0	0
MA	03	2	7	-1.8344	0.4565	-1.8344	0.4565	0	0
MA	03	2	8	-1.6356	0.436	-1.6356	0.436	0	0
MA	03	2	9	-1.4529	0.4193	-1.4529	0.4193	0	0
MA	03	2	10	-1.283	0.4054	-1.283	0.4054	0	0
MA	03	2	11	-1.1235	0.3936	-1.1235	0.3936	0	0
MA	03	2	12	-0.9726	0.3836	-0.9726	0.3836	0	0
MA	03	2	13	-0.8288	0.3751	-0.8288	0.3751	0	0
MA	03	2	14	-0.6908	0.3679	-0.6908	0.3679	0	0

MA	03	2	15	-0.5577	0.3619	-0.5577	0.3619	0	0
MA	03	2	16	-0.4285	0.3571	-0.4285	0.3571	0	0
MA	03	2	17	-0.3024	0.3533	-0.3024	0.3533	0	0
MA	03	2	18	-0.1786	0.3505	-0.1786	0.3505	0	0
MA	03	2	19	-0.0564	0.3488	-0.0564	0.3488	0	0
MA	03	2	20	0.0649	0.348	0.0649	0.348	0	0
MA	03	2	21	0.186	0.3482	0.186	0.3482	0	0
MA	03	2	22	0.3077	0.3494	0.3077	0.3494	0	0
MA	03	2	23	0.4305	0.3516	0.4305	0.3516	0	0
MA	03	2	24	0.5552	0.3548	0.5552	0.3548	0	0
MA	03	2	25	0.6825	0.359	0.6825	0.359	0	0
MA	03	2	26	0.8132	0.3644	0.8132	0.3644	0	0
MA	03	2	27	0.9483	0.3709	0.9483	0.3709	0	0
MA	03	2	28	1.0887	0.3787	1.0887	0.3787	0	0
MA	03	2	29	1.2356	0.3882	1.2356	0.3882	0	0
MA	03	2	30	1.3906	0.3995	1.3906	0.3995	0	0
MA	03	2	31	1.5556	0.4132	1.5556	0.4132	0	0
MA	03	2	32	1.7331	0.43	1.7331	0.43	0	0
MA	03	2	33	1.9267	0.4509	1.9267	0.4509	0	0
MA	03	2	34	2.1418	0.4776	2.1418	0.4776	0	0
MA	03	2	35	2.3862	0.5128	2.3862	0.5128	0	0
MA	03	2	36	2.6734	0.5615	2.6734	0.5615	0	0
MA	03	2	37	3.028	0.6342	3.028	0.6342	0	0
MA	03	2	38	3.5048	0.7577	3.5048	0.7577	0	0
MA	03	2	39	4.2756	1.04	4.2756	1.04	0	0
MA	03	2	40	5.7257	2.0221	5.7257	2.0221	0	0
MA	03	3	0	-5.5751	2.0156	-5.5751	2.0156	0	0
MA	03	3	1	-4.142	1.0307	-4.142	1.0307	0	0
MA	03	3	2	-3.3868	0.7495	-3.3868	0.7495	0	0
MA	03	3	3	-2.9198	0.6282	-2.9198	0.6282	0	0
MA	03	3	4	-2.571	0.5576	-2.571	0.5576	0	0

MA	03	3	5	-2.2871	0.5105	-2.2871	0.5105	0	0
MA	03	3	6	-2.0442	0.4766	-2.0442	0.4766	0	0
MA	03	3	7	-1.8296	0.4508	-1.8296	0.4508	0	0
MA	03	3	8	-1.6357	0.4307	-1.6357	0.4307	0	0
MA	03	3	9	-1.4573	0.4146	-1.4573	0.4146	0	0
MA	03	3	10	-1.291	0.4014	-1.291	0.4014	0	0
MA	03	3	11	-1.1343	0.3907	-1.1343	0.3907	0	0
MA	03	3	12	-0.9852	0.3818	-0.9852	0.3818	0	0
MA	03	3	13	-0.8422	0.3746	-0.8422	0.3746	0	0
MA	03	3	14	-0.7042	0.3686	-0.7042	0.3686	0	0
MA	03	3	15	-0.5701	0.3638	-0.5701	0.3638	0	0
MA	03	3	16	-0.4392	0.3601	-0.4392	0.3601	0	0
MA	03	3	17	-0.3106	0.3572	-0.3106	0.3572	0	0
MA	03	3	18	-0.1837	0.3553	-0.1837	0.3553	0	0
MA	03	3	19	-0.058	0.3541	-0.058	0.3541	0	0
MA	03	3	20	0.0672	0.3537	0.0672	0.3537	0	0
MA	03	3	21	0.1924	0.354	0.1924	0.354	0	0
MA	03	3	22	0.318	0.3551	0.318	0.3551	0	0
MA	03	3	23	0.4448	0.357	0.4448	0.357	0	0
MA	03	3	24	0.5732	0.3598	0.5732	0.3598	0	0
MA	03	3	25	0.7039	0.3635	0.7039	0.3635	0	0
MA	03	3	26	0.8377	0.3681	0.8377	0.3681	0	0
MA	03	3	27	0.9752	0.3739	0.9752	0.3739	0	0
MA	03	3	28	1.1177	0.3811	1.1177	0.3811	0	0
MA	03	3	29	1.2661	0.3898	1.2661	0.3898	0	0
MA	03	3	30	1.4221	0.4005	1.4221	0.4005	0	0
MA	03	3	31	1.5877	0.4136	1.5877	0.4136	0	0
MA	03	3	32	1.7653	0.4299	1.7653	0.4299	0	0
MA	03	3	33	1.9588	0.4505	1.9588	0.4505	0	0
MA	03	3	34	2.1733	0.4768	2.1733	0.4768	0	0
MA	03	3	35	2.4169	0.5118	2.4169	0.5118	0	0

MA	03	3	36	2.703	0.5604	2.703	0.5604	0	0
MA	03	3	37	3.0562	0.633	3.0562	0.633	0	0
MA	03	3	38	3.5313	0.7564	3.5313	0.7564	0	0
MA	03	3	39	4.2999	1.0388	4.2999	1.0388	0	0
MA	03	3	40	5.7481	2.0214	5.7481	2.0214	0	0
MA	03	4	0	-5.293	2.012	-5.293	2.012	0	0
MA	03	4	1	-3.8711	1.0232	-3.8711	1.0232	0	0
MA	03	4	2	-3.1316	0.7388	-3.1316	0.7388	0	0
MA	03	4	3	-2.6807	0.6152	-2.6807	0.6152	0	0
MA	03	4	4	-2.348	0.5431	-2.348	0.5431	0	0
MA	03	4	5	-2.08	0.4949	-2.08	0.4949	0	0
MA	03	4	6	-1.8525	0.4604	-1.8525	0.4604	0	0
MA	03	4	7	-1.6528	0.4344	-1.6528	0.4344	0	0
MA	03	4	8	-1.4731	0.4142	-1.4731	0.4142	0	0
MA	03	4	9	-1.3084	0.3981	-1.3084	0.3981	0	0
MA	03	4	10	-1.1552	0.3851	-1.1552	0.3851	0	0
MA	03	4	11	-1.011	0.3746	-1.011	0.3746	0	0
MA	03	4	12	-0.874	0.3659	-0.874	0.3659	0	0
MA	03	4	13	-0.7428	0.3589	-0.7428	0.3589	0	0
MA	03	4	14	-0.6161	0.3532	-0.6161	0.3532	0	0
MA	03	4	15	-0.493	0.3486	-0.493	0.3486	0	0
MA	03	4	16	-0.3728	0.345	-0.3728	0.345	0	0
MA	03	4	17	-0.2547	0.3424	-0.2547	0.3424	0	0
MA	03	4	18	-0.1381	0.3406	-0.1381	0.3406	0	0
MA	03	4	19	-0.0224	0.3397	-0.0224	0.3397	0	0
MA	03	4	20	0.0928	0.3395	0.0928	0.3395	0	0
MA	03	4	21	0.2082	0.3401	0.2082	0.3401	0	0
MA	03	4	22	0.3243	0.3414	0.3243	0.3414	0	0
MA	03	4	23	0.4415	0.3435	0.4415	0.3435	0	0
MA	03	4	24	0.5605	0.3465	0.5605	0.3465	0	0
MA	03	4	25	0.6818	0.3503	0.6818	0.3503	0	0

MA	03	4	26	0.8062	0.3551	0.8062	0.3551	0	0
MA	03	4	27	0.9344	0.3611	0.9344	0.3611	0	0
MA	03	4	28	1.0672	0.3683	1.0672	0.3683	0	0
MA	03	4	29	1.206	0.377	1.206	0.377	0	0
MA	03	4	30	1.352	0.3876	1.352	0.3876	0	0
MA	03	4	31	1.5071	0.4005	1.5071	0.4005	0	0
MA	03	4	32	1.6738	0.4165	1.6738	0.4165	0	0
MA	03	4	33	1.8554	0.4366	1.8554	0.4366	0	0
MA	03	4	34	2.0569	0.4623	2.0569	0.4623	0	0
MA	03	4	35	2.286	0.4965	2.286	0.4965	0	0
MA	03	4	36	2.5554	0.5441	2.5554	0.5441	0	0
MA	03	4	37	2.889	0.6157	2.889	0.6157	0	0
MA	03	4	38	3.34	0.7386	3.34	0.7386	0	0
MA	03	4	39	4.0787	1.0225	4.0787	1.0225	0	0
MA	03	4	40	5.4991	2.0114	5.4991	2.0114	0	0