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Third-Party Checking of 2017 Scaling and Equating for the Kentucky Performance Rating for Educational Progress (K-PREP) Tests

Final Report

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Executive Summary

Pearson and HumRRO independently calibrated, scaled and equated the 2017 Kentucky Performance Rating for Educational Progress (K-PREP) assessments and produced the raw-score-to-theta-score tables to be applied to students' test results. HumRRO further verified that scoring table were applied accurately by checking our scoring of the student sample against Pearson's. Results calculated by HumRRO were identical to those calculated by Pearson (M. Johnson, email communication, July 19-20, 2017). Given that HumRRO's results were identical to those of Pearson, we are assured that Pearson did not commit processing errors.

Third-Party Checking of 2017 Scaling and Equating for the Kentucky Performance Rating for Educational Progress (K-PREP) Tests

Introduction

In 2012, Kentucky transitioned from the Kentucky Core Content Test (KCCT) to the K-PREP system for spring testing. This transition represented a significant departure from the prior assessment system. The 3-parameter logistic Item-Response Theory (IRT) model was replaced with a Rasch model, a new item-type (i.e., short-constructed-response) was added to the assessments, a new scale-score reporting system was developed for sub-scores, and new cut scores were identified for the reading and mathematics assessments. The transition was also accompanied by a new primary testing contractor, Pearson. As a result, HumRRO's third-party checking process underwent significant changes to accommodate the transition¹.

Equating was added to the process in 2013 to permit comparison of the results across test years. The 2014 tests were equated to the 2013 tests using linking items. In this manner, comparable scores were produced for the 2014 and 2015 K-PREP. Forms for all subjects other than writing were repeated in 2016 from prior years, meaning that existing scoring tables could be used, and no equating was necessary. Beginning in 2015, scale scores were computed for the On-Demand Writing tests where simple number correct scores had been used in the past². In 2016, writing was equated using a sample of students who took one of the 2015 writing prompt. A pre-selected 2017 writing prompt was also administered to a sample of 2016 student to facilitate equating in 2017.

In 2017, new test forms were created for Reading, Mathematics and Writing. For these forms, we calibrated the operational items, performed equating via common-item inking, and derived scale scores. The Social Studies forms were repeated from 2012 and the science test was composed entirely from a previous form of Stanford Achievement Test Series (SAT10) items, as such no equating was necessary.

This report describes how student test responses for the 2017 K-PREP assessments 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 was investigated and ultimately resolved. This process was conducted transparently among Pearson, HumRRO, KDE, and Kentucky's psychometric consultant (Dr. Bill Auty of EdMeasure) via frequent email communications and daily conference calls. The process was guided by a specifications document created by Pearson³ and regularly updated based on decisions before and during calibration. This documentation is vital for ensuring consistency of processing across years and serves as a guiding document for subsequent years.

¹ For additional details on how the assessment system and third-party checking procedures changed, see Bynum and Thacker (2013).

² For additional information on how writing was calibrated and scaled, see the 2015 calibration and scaling specifications: K-PREP SP15 ODW Calibration and Scaling Specs v0.2.docx.

³ K-PREP SP17 CES Specs v1.3.docx.

Sample Identification and File Construction

Kentucky selects most of its student population for use in the calibration sample for scaling and equating. However, some students are purposefully exempted. KDE established a set of invalidation codes for excluding students in the calibration file. Kentucky's exemption rules only apply to students who receive accommodations (e.g., Braille forms, audio, large print, etc.) and students with duplicate records (the same identification number and name). The accommodated students receive scores but are simply omitted from the calibration sample. Pearson and HumRRO verified n-counts after this step. For Reading and Math, grades 3-8 were equated; for On Demand Writing, grades 5, 8, and 11.

The next step was to format all the grade/subject files to be read into the Winsteps IRT program and create Winsteps⁴ control files to read the student responses and estimate parameters. A sample control file is provided in Appendix A. HumRRO created specialized SAS programs to generate all input and control files automatically. The item documentation file was used to specify item types, location, keys, item use (e.g. field test vs. operational items), and other important information. HumRRO and Pearson did not share programming or methodology for creating the input and control files. Both companies did use the same student data files (containing all student responses). HumRRO followed the guidance provided by Pearson (with input from KDE) regarding the treatment of blank responses, condition codes, etc. in creating the input data files.

Calibration and Scaling Procedures

Once input and control files were prepared, Winsteps was used to calibrate items. Multiple-choice items were fit to the Rasch measurement model and constructed-response items (short constructed response and extended response items) were fit to the Partial Credit Model (PCM). 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 tell us 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).

Equating Procedures

Two types of equating occurred for the K-PREP: (a) forms equating within a given test administration year and (b) equating across test administration years using common anchor items. The first of these, forms equating, is accomplished by calibrating all the items for a given grade/subject together. By calibrating all the items together (i.e., across all forms), this effectively equates the various forms for a given grade/subject such that test scores on form 2 and form 3, for example, are interchangeable in terms of difficulty. For all subjects other than On-Demand Writing, Kentucky uses common forms for all operational items (those that contribute to student scores), but the forms differ on field-test items. Field-test items are used to build future forms. The writing test forms differ for operational items. Each writing form includes three items, one that all students who receive the form answer, plus two additional items from which students select and respond to one.

⁴ HumRRO used Winsteps version 3-73-00 for this project.

In addition to the need to equate the forms of a test within a given year, there is also the need for the current year's scores to be comparable to scores from prior years. Kentucky uses a common-item anchor design to equate K-PREP scores across years. The anchor items are "internal" in the sense that they are dispersed across forms rather than externally located in a separate anchor item form. Both multiple-choice and short answer items are designated as anchor items for equating for all grades and subjects.

To equate the 2017 On-Demand Writing form, we used a common-item analysis, comparing the common item prompt administered in 2016 and 2017. The step parameters from the 2016 and 2017 estimates were used to compute a shift estimate that was then applied to all the 2017 item parameter estimates. This procedure ensured the 2017 writing scores were comparable to the 2016 scores.

Raw-score-to-Scale-Score Procedures

Once the final item parameters were estimated, they were used to create scoring tables. At this stage, the scoring tables produced by the final item calibration run in Winsteps are still on the theta metric. Each potential "number of total score points (multiple-choice items correct plus total points on constructed response items)" is associated with a theta estimate. This "person-level" theta would be their score on the theta scale. Output files were verified to match between HumRRO and Pearson at this stage.

Once theta scoring tables were obtained, they were linearly transformed to a reporting scale of 100-300 for all grade subjects. Performance levels (Novice, Apprentice, Proficient, and Distinguished) were also assigned to each score. Cut scores for the performance levels were determined following a standard setting workshop conducted in the summer of 2012 (see Pearson, 2013). The results of that workshop included cut scores on the theta metric that can be used to assign NAPD categories to students. Scale score cuts were used, as opposed to theta cuts, to assign performance levels to students' scale scores. Using these cuts allowed the scale scores associated with each performance level to be fixed across test administrations. HumRRO verified the raw-score-to-scale-score tables and the associated performance levels.

In addition to overall scores, Kentucky also reports cluster scores (subscores based on subsets of items within each test). The generation of cluster scores uses the previously estimated item parameters and is accomplished by generating scoring tables in Winsteps on the theta metric, based on the specific items identified for each scoring cluster. These theta scores are then transformed in exactly the same manner as the full test scores.

Verification of 2017 Scoring Tables

After the final scoring tables were constructed, the scoring tables were applied to the 2017 student data. HumRRO checks the 2017 scored student data to verify that the scoring tables are being appropriately applied to the data and to check the distribution of students falling into each performance level. HumRRO verified Reading, Math, Social Studies, and Writing performance level distributions. HumRRO matched Pearson on the number and percent of students assigned to each performance level by subject and grade.

Documentation

As HumRRO and Pearson completed each step of the process described above, Winsteps control, item parameter, score, and output files were shared to check for inconsistencies. Winsteps output contained 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 output files are appended to this document. They include:

1. Winsteps Control Files (Appendix A). These files contain the item parameter estimation specifications and important 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 2017 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 SAS output 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 the 2017 K-PREP assessments. No differences were found between Pearson's and HumRRO's parameter estimation, Stocking-Lord transformation constants, or raw-score-to-scale-score tables. Given that HumRRO's and Pearson's scaling and equating results were identical, HumRRO is confident that Pearson did not commit processing errors.

References

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- Thacker, A. A., Dickinson, E. R., & Sinclair, A. L. (2013). *Policy capture for setting end-of-course and Kentucky Performance Rating for Education Progress (K-PREP) cut scores (2013 No. 007)*. Alexandria, VA: Human Resources Research Organization.
- Pearson (2012). *Kentucky performance rating for educational progress performance standards workshop: Performance level descriptor creation and standard setting, v1.1*. Pearson, Inc.

Appendix A – Control File (Math Grade 3)

```
;Winstep Control file f03MA_v0
; HumRRO
&INST
Item1 = 25
NI = 47
TABLES = 00100000000001000001000000001
CODES = 012
CSV = N
FITP = 3.0
FITI = 3.0
XWIDE =1
HLINES = Y
data=f03MAmopv0.dat
IFILE= f03MAv0.ITM
ISFILE = f03MAv0.ISF
SFILE = f03MAv0.CSF
SCFILE = f03MAv0.RSS
PFILE = f03MAv0.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
;upmean=0
;uanchor=y
ptbis=y
ILFILES = *
2109734
2109746
2109748
2109751
2109759
2109770
200154
202420
M3058
202400
200532
200227
200252
```

200053

M3023

202412

202405

200143

200223

200095

202427

200142

M3094

M3066

200248

M3075

202429

202419

M3079

200021

202411

M3022

202422

200109

200225

200156

M3008

200323

200324

200534

200130

200093

200118

200054

200243

M3016

M3090

*

&END

END NAMES

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

Item parameters - Math Grade 3 (f03MAv0.ITM)

; ITEM D:\Data\Kentucky\KPREP2017\WINSTEP\f03MAv0.con Jul 20 9:03 2017																								
;ENTRY	MEASURE	ST	COUNT	SCORE	ERROR	IN.MSQ	IN.ZST	OUT.MS	OUT.ZS	DISPL	PTBISE	WEIGHT	OBSMA	EXPMA	DISCRM	LOWER	UPPER	PVALU	PBE-E	RMSR	G	M	R	NAME
1	-1.7032	1	51826.0	45798.0	.0148	1.13	9.90	1.71	9.90	-.0005	.17	1.00	88.3	88.8	.85	.43	.98	.88	.30	.32	0	R	.	2109734
2	-1.8804	1	51826.0	46573.0	.0156	.92	-7.43	.81	-9.27	-.0015	.37	1.00	90.4	90.3	1.07	.00	1.00	.90	.29	.27	0	R	.	2109746
3	.7057	1	51826.0	26629.0	.0099	1.20	9.90	1.29	9.90	.0000	.24	1.00	61.2	69.5	.43	.14	.88	.51	.41	.49	0	R	.	2109748
4	-.6863	1	51826.0	39560.0	.0114	.89	-9.90	.79	-9.90	-.0009	.48	1.00	80.4	78.6	1.17	.00	1.00	.76	.37	.36	0	R	.	2109751
5	-.8425	1	51826.0	40726.0	.0118	.89	-9.90	.77	-9.90	-.0009	.47	1.00	82.1	80.3	1.16	.00	1.00	.79	.36	.35	0	R	.	2109759
6	-1.0213	1	51826.0	41967.0	.0122	.92	-9.90	.88	-8.39	-.0005	.43	1.00	83.2	82.2	1.10	.00	1.00	.81	.35	.34	0	R	.	2109770
7	-.9557	1	51826.0	41529.0	.0121	1.00	.59	.99	-.82	-.0009	.35	1.00	81.4	81.5	1.00	.00	1.00	.80	.36	.37	0	R	.	200154
8	.0458	1	51826.0	33199.0	.0102	1.13	9.90	1.29	9.90	.0000	.29	1.00	69.1	72.0	.67	.06	.93	.64	.40	.46	0	R	.	202420
9	.1763	1	51826.0	31938.0	.0101	.98	-4.95	.96	-5.85	-.0007	.43	1.00	71.7	71.2	1.06	.00	1.00	.62	.41	.43	0	R	.	M3058
10	.3783	1	51826.0	29944.0	.0100	.91	-9.90	.86	-9.90	-.0002	.49	1.00	73.9	70.2	1.24	.00	1.00	.58	.41	.42	0	R	.	202400
11	-1.0004	1	51826.0	41833.0	.0122	.94	-9.45	.92	-5.74	-.0012	.41	1.00	82.9	81.9	1.07	.00	1.00	.81	.35	.35	0	R	.	200532
12	.0804	1	51826.0	32867.0	.0102	1.05	9.90	1.08	9.90	-.0002	.36	1.00	69.6	71.8	.87	.05	.98	.63	.41	.44	0	R	.	200227
13	.8951	1	51826.0	24702.0	.0099	1.04	9.90	1.07	9.90	.0001	.37	1.00	68.2	69.6	.88	.04	.99	.48	.41	.45	0	R	.	200252
14	-.5697	1	51826.0	38642.0	.0111	.96	-7.00	.92	-6.91	-.0006	.42	1.00	78.1	77.4	1.06	.00	1.00	.75	.38	.39	0	R	.	200053
15	.2446	1	51826.0	31272.0	.0101	1.09	9.90	1.08	9.90	-.0004	.33	1.00	66.0	70.8	.79	.13	.98	.60	.41	.46	0	R	.	M3023
16	-.2756	1	51826.0	36155.0	.0106	.89	-9.90	.84	-9.90	-.0008	.49	1.00	77.7	74.5	1.20	.00	1.00	.70	.39	.39	0	R	.	202412
17	-1.1318	1	51826.0	42688.0	.0126	.91	-9.90	.82	-9.90	-.0009	.43	1.00	84.2	83.3	1.10	.00	1.00	.82	.35	.33	0	R	.	202405
18	1.5429	1	51826.0	18316.0	.0103	.95	-9.90	1.00	.19	.0005	.42	1.00	75.6	72.7	1.08	.00	1.00	.35	.39	.41	0	R	.	200143
19	-1.1127	1	51826.0	42572.0	.0125	1.02	3.35	1.12	7.72	-.0009	.31	1.00	83.5	83.1	.96	.00	.99	.82	.35	.36	0	R	.	200223
20	-.0479	1	51826.0	34078.0	.0103	.90	-9.90	.84	-9.90	-.0004	.49	1.00	75.8	72.7	1.22	.00	1.00	.66	.40	.40	0	R	.	200095
21	.6524	1	51826.0	27172.0	.0099	1.02	5.70	1.03	4.18	.0001	.39	1.00	68.8	69.5	.94	.02	.99	.52	.41	.45	0	R	.	202427
22	-1.3321	1	51826.0	43897.0	.0132	.93	-8.43	.83	-9.90	-.0005	.40	1.00	86.1	85.4	1.07	.00	1.00	.85	.33	.32	0	R	.	200142
23	.5123	1	51826.0	28592.0	.0099	1.08	9.90	1.09	9.90	.0000	.35	1.00	66.4	69.8	.80	.08	.97	.55	.42	.46	0	R	.	M3094
24	1.5051	1	51826.0	18672.0	.0103	.98	-3.99	1.09	9.90	.0004	.38	1.00	74.9	72.4	.99	.02	1.00	.36	.40	.42	0	R	.	M3066
25	.9966	1	51826.0	23672.0	.0099	1.04	9.75	1.06	9.02	.0002	.37	1.00	68.5	69.8	.89	.05	1.00	.46	.41	.45	0	R	.	200248
26	-.0113	1	51826.0	33737.0	.0103	.96	-9.02	.94	-7.94	-.0002	.44	1.00	73.8	72.4	1.09	.00	1.00	.65	.40	.42	0	R	.	M3075
27	-.5266	1	51826.0	38291.0	.0111	.95	-9.39	.85	-9.90	-.0006	.43	1.00	77.6	77.0	1.10	.00	1.00	.74	.38	.39	0	R	.	202429
28	.0404	1	51826.0	33248.0	.0103	.87	-9.90	.82	-9.90	-.0005	.52	1.00	76.9	72.0	1.29	.00	1.00	.64	.41	.40	0	R	.	202419
29	.4267	1	51826.0	29457.0	.0100	.97	-7.05	.94	-9.08	-.0002	.44	1.00	71.0	70.0	1.08	.02	1.00	.57	.41	.43	0	R	.	M3079
30	1.6955	1	51826.0	16908.0	.0105	1.15	9.90	1.38	9.90	.0005	.23	1.00	71.4	73.9	.65	.08	.94	.33	.39	.45	0	R	.	200021
31	-.1969	1	51826.0	35451.0	.0105	1.00	.95	.97	-3.08	-.0001	.40	1.00	73.5	73.9	1.00	.01	1.00	.68	.40	.42	0	R	.	202411
32	.5958	1	51826.0	27750.0	.0099	1.06	9.90	1.07	9.90	-.0003	.36	1.00	67.1	69.6	.84	.06	.98	.54	.41	.46	0	R	.	M3022
33	1.4468	1	51826.0	19226.0	.0102	1.14	9.90	1.28	9.90	.0004	.26	1.00	68.0	72.0	.65	.08	.91	.37	.40	.46	0	R	.	202422
34	1.3859	1	51825.0	44706.0	.0091	.92	-9.90	.91	-9.90	.0009	.51	1.00	71.6	70.3	1.09	.00	2.00	.86	.44	.46	0	R	.	200109
35	2.1936	1	51825.0	18798.0	.0077	1.10	9.90	1.30	9.90	.0006	.40	1.00	73.3	74.6	.94	.02	2.00	.36	.44	.60	0	R	.	200225
36	-1.3862	1	51826.0	44197.0	.0134	1.03	3.24	1.10	5.46	-.0007	.29	1.00	86.0	85.9	.96	.00	.99	.85	.33	.33	0	R	.	200156
37	1.4872	1	51826.0	18841.0	.0103	1.11	9.90	1.21	9.90	.0004	.29	1.00	69.4	72.3	.74	.06	.95	.36	.40	.45	0	R	.	M3008
38	-.1714	1	51826.0	35221.0	.0105	1.00	.38	1.00	-.36	-.0002	.40	1.00	73.3	73.6	1.00	.02	1.00	.68	.40	.42	0	R	.	200323
39	-1.1546	1	51826.0	42835.0	.0126	.88	-9.90	.74	-9.90	-.0009	.46	1.00	84.4	83.6	1.15	.00	1.00	.83	.34	.33	0	R	.	200324
40	1.7022	1	51826.0	16850.0	.0105	1.10	9.90	1.28	9.90	.0005	.28	1.00	72.4	74.0	.76	.05	.97	.33	.39	.44	0	R	.	200534
41	-.9900	1	51826.0	41762.0	.0121	1.00	.23	1.06	4.17	-.0008	.35	1.00	82.4	81.8	.99	.00	1.00	.81	.35	.36	0	R	.	200130
42	-.3982	1	51826.0	37218.0	.0108	.98	-3.80	.92	-7.72	-.0007	.41	1.00	75.3	75.7	1.05	.02	1.00	.72	.39	.40	0	R	.	200093
43	.4825	1	51826.0	28897.0	.0100	1.07	9.90	1.11	9.90	-.0002	.35	1.00	67.3	69.9	.80	.06	.96	.56	.41	.46	0	R	.	200118
44	-.9694	1	51826.0	41622.0	.0121	.97	-3.85	.99	-.74	-.0009	.38	1.00	82.3	81.6	1.03	.00	1.00	.80	.35	.36	0	R	.	200054
45	-.6931	1	51826.0	39613.0	.0114	.87	-9.90	.75	-9.90	-.0008	.50	1.00	81.1	78.7	1.20	.00	1.00	.76	.37	.36	0	R	.	200243
46	-.6002	1	51826.0	38885.0	.0112	.96	-6.78	.94	-5.20	-.0006	.41	1.00	78.7	77.7	1.06	.00	1.00	.75	.38	.39	0	R	.	M3016
47	.4653	1	51825.0	57316.0	.0076	.87	-9.90	.87	-9.90	-.0005	.60	1.00	60.6	58.7	1.20	.00	1.99	1.11	.50	.54	0	R	.	M3090

Step parameters 2017 - Math Grade 3 (f03MAv0.CSF)

; STRUCTURE MEASURE ANCHOR FILE FOR D:\Data\Kentucky\KPREP2017\WINSTEP\f03MAv0.con Jul
20 9:03 2017

; ITEM CATEGORY Rasch-Andrich threshold MEASURE

1	0	.0000
1	1	.0000
2	0	.0000
2	1	.0000
3	0	.0000
3	1	.0000
4	0	.0000
4	1	.0000
5	0	.0000
5	1	.0000
6	0	.0000
6	1	.0000
7	0	.0000
7	1	.0000
8	0	.0000
8	1	.0000
9	0	.0000
9	1	.0000
10	0	.0000
10	1	.0000
11	0	.0000
11	1	.0000
12	0	.0000
12	1	.0000
13	0	.0000
13	1	.0000
14	0	.0000
14	1	.0000
15	0	.0000
15	1	.0000
16	0	.0000
16	1	.0000
17	0	.0000
17	1	.0000
18	0	.0000
18	1	.0000
19	0	.0000
19	1	.0000
20	0	.0000
20	1	.0000
21	0	.0000
21	1	.0000
22	0	.0000
22	1	.0000
23	0	.0000
23	1	.0000

24	0	.0000
24	1	.0000
25	0	.0000
25	1	.0000
26	0	.0000
26	1	.0000
27	0	.0000
27	1	.0000
28	0	.0000
28	1	.0000
29	0	.0000
29	1	.0000
30	0	.0000
30	1	.0000
31	0	.0000
31	1	.0000
32	0	.0000
32	1	.0000
33	0	.0000
33	1	.0000
34	0	.0000
34	1	-2.0522
34	2	2.0522
35	0	.0000
35	1	1.2711
35	2	-1.2711
36	0	.0000
36	1	.0000
37	0	.0000
37	1	.0000
38	0	.0000
38	1	.0000
39	0	.0000
39	1	.0000
40	0	.0000
40	1	.0000
41	0	.0000
41	1	.0000
42	0	.0000
42	1	.0000
43	0	.0000
43	1	.0000
44	0	.0000
44	1	.0000
45	0	.0000
45	1	.0000
46	0	.0000
46	1	.0000
47	0	.0000
47	1	-1.1765
47	2	1.1765

Appendix C – Winsteps Anchor File (Grade 3 Math)

Item Anchor File (F03MAv0anchors.txt IAF)

30 -1.2469
23 -.6402
28 -.8052
24 -.3949
26 -.8520
1 -.5881
10 .4559
32 .6463
17 .9736
18 -.1466
19 .2362

Step Parameter Anchor File (F03MAv0anchors.SAF)

3	0	0.0000
3	1	0.0000
5	0	0.0000
5	1	0.0000
6	0	0.0000
6	1	0.0000
10	0	0.0000
10	1	0.0000
12	0	0.0000
12	1	0.0000
14	0	0.0000
14	1	0.0000
15	0	0.0000
15	1	0.0000
16	0	0.0000
16	1	0.0000
17	0	0.0000
17	1	0.0000
22	0	0.0000
22	1	0.0000
24	0	0.0000
24	1	0.0000
25	0	0.0000
25	1	0.0000
29	0	0.0000
29	1	0.0000
30	0	0.0000
30	1	0.0000
34	0	0.0000
34	1	-2.1157
34	2	2.1157
37	0	0.0000
37	1	0.0000
40	0	0.0000
40	1	0.0000
42	0	0.0000
42	1	0.0000
44	0	0.0000
44	1	0.0000
46	0	0.0000
46	1	0.0000
47	0	0.0000
47	1	-1.3293
47	2	1.3293

Appendix D – Winsteps Score File (Grade 3 Math)

PERSON SCORE FILE FOR D:\Data\Kentucky\KPREP2017\WINSTEP\f03MAv0.con Jul 20 9:03 2017
 USCALE=1.00

SCORE	MEASURE	S.E.	INFO	NORMED	S.E.	FREQUENCY	%	CUM.FREQ.	%	PERCENTILE
0	-5.7087	2.0093	.25	-33	165	91	.2	91	.2	1
1	-4.2945	1.0185	.96	83	84	138	.3	229	.4	1
2	-3.5638	.7333	1.86	143	60	10	.0	239	.5	1
3	-3.1203	.6096	2.69	179	50	12	.0	251	.5	1
4	-2.7942	.5373	3.46	206	44	9	.0	260	.5	1
5	-2.5320	.4892	4.18	228	40	12	.0	272	.5	1
6	-2.3101	.4545	4.84	246	37	32	.1	304	.6	1
7	-2.1158	.4282	5.45	262	35	48	.1	352	.7	1
8	-1.9414	.4077	6.02	276	34	83	.2	435	.8	1
9	-1.7821	.3912	6.54	289	32	130	.3	565	1.1	1
10	-1.6344	.3777	7.01	301	31	217	.4	782	1.5	1
11	-1.4961	.3666	7.44	313	30	287	.6	1069	2.1	2
12	-1.3651	.3574	7.83	324	29	398	.8	1467	2.8	2
13	-1.2402	.3496	8.18	334	29	438	.8	1905	3.7	3
14	-1.1203	.3431	8.50	344	28	559	1.1	2464	4.8	4
15	-1.0045	.3376	8.77	353	28	679	1.3	3143	6.1	5
16	-.8921	.3331	9.01	362	27	751	1.4	3894	7.5	7
17	-.7825	.3293	9.22	371	27	827	1.6	4721	9.1	8
18	-.6750	.3263	9.39	380	27	950	1.8	5671	10.9	10
19	-.5694	.3238	9.54	389	27	1045	2.0	6716	13.0	12
20	-.4652	.3220	9.65	398	26	1164	2.2	7880	15.2	14
21	-.3620	.3206	9.73	406	26	1166	2.2	9046	17.5	16
22	-.2594	.3198	9.78	414	26	1343	2.6	10389	20.0	19
23	-.1573	.3194	9.80	423	26	1367	2.6	11756	22.7	21
24	-.0552	.3195	9.79	431	26	1434	2.8	13190	25.5	24
25	.0470	.3201	9.76	440	26	1460	2.8	14650	28.3	27
26	.1497	.3210	9.70	448	26	1632	3.1	16282	31.4	30
27	.2532	.3224	9.62	457	27	1707	3.3	17989	34.7	33
28	.3577	.3242	9.51	465	27	1729	3.3	19718	38.0	36
29	.4636	.3265	9.38	474	27	1839	3.5	21557	41.6	40
30	.5711	.3292	9.23	483	27	1912	3.7	23469	45.3	43
31	.6805	.3324	9.05	492	27	1949	3.8	25418	49.0	47
32	.7922	.3361	8.85	501	28	2040	3.9	27458	53.0	51
33	.9065	.3402	8.64	510	28	2025	3.9	29483	56.9	55
34	1.0238	.3449	8.41	520	28	2056	4.0	31539	60.9	59
35	1.1445	.3501	8.16	530	29	2130	4.1	33669	65.0	63
36	1.2691	.3559	7.89	540	29	1999	3.9	35668	68.8	67
37	1.3980	.3624	7.61	551	30	2014	3.9	37682	72.7	71
38	1.5320	.3698	7.31	562	30	1897	3.7	39579	76.4	75
39	1.6718	.3781	6.99	573	31	1770	3.4	41349	79.8	78
40	1.8183	.3878	6.65	585	32	1731	3.3	43080	83.1	81
41	1.9732	.3995	6.27	598	33	1692	3.3	44772	86.4	85
42	2.1384	.4139	5.84	612	34	1462	2.8	46234	89.2	88
43	2.3171	.4325	5.35	626	36	1259	2.4	47493	91.6	90
44	2.5145	.4572	4.78	643	38	1208	2.3	48701	94.0	93
45	2.7385	.4913	4.14	661	40	1005	1.9	49706	95.9	95
46	3.0033	.5406	3.42	683	44	785	1.5	50491	97.4	97
47	3.3348	.6160	2.64	710	51	633	1.2	51124	98.6	98
48	3.7903	.7449	1.80	747	61	399	.8	51523	99.4	99
49	4.5457	1.0348	.93	809	85	227	.4	51750	99.9	99
50	5.9913	2.0219	.24	928	166	76	.1	51826	100.0	99

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

All RSSS Differences – Math Grade 3

Obs	rs	theta_ diff	SS_diff	PL_diff
1	0	0.0000	0	0
2	1	0.0000	0	0
3	2	0.0000	0	0
4	3	0.0000	0	0
5	4	0.0000	0	0
6	5	0.0000	0	0
7	6	0.0000	0	0
8	7	0.0000	0	0
9	8	0.0000	0	0
10	9	0.0000	0	0
11	10	-.0001	0	0
12	11	0.0000	0	0
13	12	0.0000	0	0
14	13	0.0000	0	0
15	14	0.0000	0	0
16	15	0.0000	0	0
17	16	0.0000	0	0
18	17	0.0000	0	0
19	18	0.0000	0	0
20	19	0.0000	0	0
21	20	0.0000	0	0
22	21	0.0000	0	0
23	22	0.0000	0	0
24	23	0.0000	0	0
25	24	0.0000	0	0
26	25	0.0000	0	0
27	26	0.0000	0	0
28	27	0.0000	0	0
29	28	0.0000	0	0
30	29	0.0000	0	0
31	30	0.0000	0	0
32	31	.0000	0	0
33	32	.0001	0	0
34	33	.0000	0	0
35	34	.0001	0	0
36	35	.0000	0	0
37	36	.0000	0	0
38	37	.0000	0	0
39	38	.0000	0	0
40	39	.0000	0	0
41	40	.0000	0	0
42	41	.0000	0	0
43	42	.0000	0	0
44	43	.0000	0	0
45	44	.0000	0	0
46	45	.0000	0	0
47	46	.0000	0	0
48	47	.0000	0	0
49	48	.0000	0	0
50	49	.0000	0	0
51	50	.0000	0	0