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HUMAN RESOURCES RESEARCH ORGANIZATION

2024 No. 148

Third-Party Checking of 2024 Scaling and Equating for the Kentucky Summative Assessments (KSA)

Prepared for: Kentucky Department of Education
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Executive Summary

Pearson and the Human Resources Research Organization (HumRRO) independently calibrated, scaled, and equated the 2024 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 17, 2024 [writing]; July 16, 2024 [mathematics, reading, editing and mechanics, science, social studies]. Given that HumRRO's results were identical to Pearson's, we are assured that Pearson did not commit processing errors.

Third-Party Checking of 2024 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 2024, 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 in Grades 5, 8, and 11.

This report describes how student test responses for the 2024 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 and conference calls. The process was guided by a specifications document created by Pearson[1] 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 2024 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 2024 KSA consisted of multiple test forms. Grades 3-8 for reading included six forms, and Grade 10 had four forms. The number of operational items ranged from 32 – 36 per form. For mathematics, Grades 3, 5, 6, 7, and 8 had

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[1] KSA Spring 2024 Psychometric Analysis Specifications v1.0.

seven forms. Grades 4 and 10 had 10 and 9 forms, respectively. The number of operational items ranged from 32 – 35 per form. Science assessments in Grades 4, 7, and 11 consisted of 2 forms, with each form consisting of 24 operational items. Social studies assessments in Grades 5, 8, and 11 consisted of 10 forms, with the number of operational items ranging between 30 and 34 items per form. Editing and mechanics assessments in Grades 5, 8, and 11 consisted of 2 forms, with each form consisting of 26 operational items. Writing assessments in Grades 5, 8, and 11 consisted of 4 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. Anchored item calibration and equating analyses were then conducted for all KSA assessments. Finally, raw-score-to-scale (RSS) score tables were generated for all assessments. 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 2024 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 Winsteps[4] control files to read student responses and estimate item parameters. A sample control file is provided in Appendix A. HumRRO created specialized SAS and 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 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

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

[3] Kentucky Spring 2024 Psychometric Analysis Specifications v1.0.

[4] HumRRO used Winsteps version 4.8.0.0 for this project.

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. Form equating was necessary for all subject-grade tests.

For each assessment, we also equated the current year's scores to scores from prior years. 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 raw-score-to-scale-score tables.

Raw-score-to-Scale-Score Procedures

The item parameter estimates from the equating analyses for reading, mathematics, science, 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 all grade subjects. Performance levels (Novice, Apprentice, Proficient, and Distinguished [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 2024 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 2024 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

After operational items 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.

Pre-Equating Study

HumRRO also conducted third-party verification of pre-equating study results conducted by Pearson to evaluate the feasibility of implementing a pre-equated model in future KSA administrations. The full spring 2024 student sample was used to assess the difference in the results generated from the pre-equated and post-equated scoring tables. Pre-equated item parameter estimates used in the feasibility study were obtained from the item bank, whose item parameter estimates were updated from the most recent operational administration. HumRRO matched Pearson's results for 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 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 2024 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 2024 KSA reading and math (Grades 3-8, 10), social studies and writing (Grades 5, 8, 11), and science (Grades 4, 7, 11). 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 Pearson did not commit processing errors.

References

Huynh, H. (2000, June). *Guidelines for Rasch Linking for PACT.* Memorandum to Paul Sandifer on June 18, 2000. Available from 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). http://pareonline.net/getvn.asp?v=15&n=2

Huynh, H., & Rawls, A. (2009). A comparison between robust z and 0.3-logit difference procedures in assessing stability of linking items for the Rasch model. In E. V. Smith Jr. & G. E. Stone (Eds.), *Applications of Rasch measurement in criterion-referenced testing: Practice analysis to score reporting.* JAM Press.

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 (Science Grade 4)

; WINSTEPS Control File

; HumRRO

&INST

Item1 = 37

NI = 40

TABLES = 0010000000000100001000000001

CODES = 01234

CSV = N

FITP = 3.0

FITI = 3.0

XWIDE = 1

HLINES = Y

data = KDE_SC_04.dat

IFILE = KDE_SC_04.ITM

ISFILE = KDE_SC_04.ISF

SFILE = KDE_SC_04.CSF

SCFILE = KDE_SC_04.RSS

PFILE = KDE_SC_04.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 = *

SC041602_01

SC041602_02

SC041602_03b

SC041602_04

SC041602_05

SC041602_06

SC041602_07

SC041602_08

SC041614_01

SC041614_02

SC041614_09

SC041614_04

SC041614_05

SC041614_06

SC041614_07

SC041614_08

SC041609_01

SC041609_02

SC041609_03

SC041609_04

SC041609_05

SC041609_06

SC041609_07b

SC041609_08

SC041606_01

SC041606_02

SC041606_11

SC041606_04

SC041606_05

SC041606_06

SC041606_07

SC041606_08

SC041624_01

SC041624_02

SC041624_03

SC041624_04b

SC041624_05

SC041624_06b

SC041624_07

SC041624_08

*

&END

END NAMES

Appendix B – Winsteps Item Parameter Files (Science Grade 4)

Item parameters 2024 - Science Grade 4

; ITEM C:\Users\GVelasquez\OneDrive - Human Resources Research Organization\Documents\K Jul 7 2024 12:47

```
;ENTRY MEASURE ST   COUNT    SCORE MODLSE IN.MSQ INZSTD OUTMSQ OUTZST  DISPL   PBSX WEIGHT OBSMA EXPMA PBX-E  RMSR    WMLE INDF OUTDF G M R NAME

  1  .2483  1 22105.0  8362.0 .0147  1.01  2.77  1.08  9.90 .0017   .23  1.00 67.4 67.3  .25  .46  .2483 70641 32353 0 R . SC041602_01

  2 -.5366  1 22105.0 12133.0 .0144   .99 -1.45  1.02  3.75 .0014   .26  1.00 65.6 64.5  .25  .47 -.5366 98374 49336 0 R . SC041602_02

  3 -1.3590  1 22105.0 30272.0 .0117   .95 -6.33   .94 -6.69 .0005   .36  1.00 60.6 58.6  .30  .56 -1.3589 28785 26986 0 R . SC041602_03b

  4 -2.0746  1 22105.0 18302.0 .0187   .90 -9.36   .74 -9.90 .0013   .36  1.00 83.3 83.4  .20  .34 -2.0745 14971  7068 0 R . SC041602_04

  5  .0598  1 22105.0  9245.0 .0145  1.04  7.49  1.04  5.43 .0016   .21  1.00 63.1 65.6  .25  .47  .0598 85721 40735 0 R . SC041602_05

  6 -1.5915  1 22105.0 16726.0 .0165   .91 -9.90   .83 -9.90 .0009   .35  1.00 77.5 76.7  .22  .39 -1.5914 28362 13213 0 R . SC041602_06

  7 -.4077  1 22105.0 11508.0 .0143  1.04  7.86  1.04  5.85 .0015   .21  1.00 61.8 64.1  .25  .48 -.4077 103E3 51979 0 R . SC041602_07

  8 1.6392  1 22105.0 10987.0 .0103   .95 -4.08   .89 -8.02 .0058   .40  1.00 64.3 61.3  .34  .64 1.6392 12801  9541 0 R . SC041602_08

  9 -.5668  1 44297.0 24834.0 .0102   .96 -9.90   .94 -9.90 -.0007   .32  1.00 67.7 65.3  .27  .45 -.5667 177E3 90483 0 R . SC041614_01

 10 -1.3169  1 44297.0 61343.0 .0081   .87 -9.90   .85 -9.90 -.0020   .45  1.00 63.6 57.9  .32  .54 -1.3169 56379 49362 0 R . SC041614_02

 11 -.0139  1 44297.0 19511.0 .0102   .95 -9.90   .94 -9.90 -.0008   .33  1.00 68.4 65.5  .27  .45 -.0139 174E3 86347 0 R . SC041614_09

 12 -.1711  1 44297.0 42764.0 .0088  1.08  9.90  1.07  9.90 -.0007   .22  1.00 65.5 65.6  .31  .56 -.1711 46816 46433 0 R . SC041614_04

 13 1.1384  1 44297.0 43160.0 .0065   .91 -9.90   .90 -9.90 .0017   .45  1.00 52.7 49.2  .39  .70 1.1384 42832 42789 0 R . SC041614_05

 14  .7042  1 44297.0 13071.0 .0111  1.13  9.90  1.23  9.90 -.0002   .08  1.00 70.2 72.6  .26  .46  .7042 82413 34853 0 R . SC041614_06

 15  .1119  1 44297.0 18318.0 .0103  1.05  9.90  1.05  9.57 -.0003   .21  1.00 62.8 66.3  .27  .47  .1119 158E3 76168 0 R . SC041614_07

 16  .0499  1 44297.0 18904.0 .0103  1.04  9.90  1.05  9.65 -.0009   .22  1.00 64.5 65.9  .27  .47  .0499 166E3 81308 0 R . SC041614_08
```

17 .5868 1 22105.0 16471.0 .0127 1.23 9.90 1.23 9.90 .0022   .02 1.00 58.4 63.7 .29 .59 .5868 26790 25781 0 R . SC041609_01

18 1.0148 1 22105.0 11896.0 .0121 1.20 9.90 1.27 9.90 .0027   .07 1.00 47.5 60.1 .30 .61 1.0148 27662 22751 0 R . SC041609_02

19 .4900 1 22105.0 16376.0 .0120 1.15 9.90 1.15 9.90 .0024   .13 1.00 55.1 60.0 .30 .60 .4900 28314 27383 0 R . SC041609_03

20 -.6565 1 22105.0 24937.0 .0110   .97 -3.21   .98 -2.22 .0012   .33 1.00 55.9 56.7 .32 .60 -.6565 30293 29593 0 R . SC041609_04

21 1.3375 1 22105.0 16028.0 .0085   .82 -9.90   .74 -9.90 .0044   .52 1.00 55.8 49.3 .38 .71 1.3374 19660 11269 0 R . SC041609_05

22 .2795 1 22105.0 8219.0 .0148   .92 -9.90   .90 -9.90 .0018   .36 1.00 72.4 67.6 .25 .44 .2794 68151 31043 0 R . SC041609_06

23 .2012 1 22105.0 8580.0 .0147 1.07 9.90 1.09 9.90 .0017   .16 1.00 63.0 66.9 .25 .48 .2012 74412 34396 0 R . SC041609_07b

24 -.6045 1 22105.0 12460.0 .0144   .91 -9.90   .88 -9.90 .0016   .38 1.00 69.4 64.8 .25 .44 -.6045 94357 47050 0 R . SC041609_08

25 -.1293 1 22192.0 21231.0 .0118 1.08 9.45 1.11 9.90 -.0028   .26 1.00 59.9 61.2 .34 .59 -.1293 26888 26856 0 R . SC041606_01

26 .6623 1 22192.0 6867.0 .0155 1.05 6.69 1.14 9.90 -.0026   .21 1.00 71.1 71.8 .27 .44 .6623 44633 18711 0 R . SC041606_02

27 1.2986 1 22192.0 4504.0 .0176 1.19 9.90 1.56 9.90 -.0023 -.02 1.00 78.5 80.2 .25 .42 1.2985 20661 8079 0 R . SC041606_11

28 -1.3830 1 22192.0 16120.0 .0160   .88 -9.90   .82 -9.90 -.0033   .40 1.00 77.4 74.3 .26 .39 -1.3830 35558 15519 0 R . SC041606_04

29 -.9396 1 22192.0 14269.0 .0150   .96 -6.55   .95 -6.11 -.0034   .32 1.00 70.7 68.9 .27 .44 -.9396 59841 28270 0 R . SC041606_05

30 -.3059 1 22192.0 22486.0 .0122 1.21 9.90 1.21 9.90 -.0030   .10 1.00 62.3 64.2 .33 .61 -.3059 24646 24633 0 R . SC041606_06

31 2.0161 1 22192.0 2592.0 .0217 1.15 9.16 1.75 9.90 -.0022 -.05 1.00 88.2 88.4 .20 .33 2.0160 8687 3530 0 R . SC041606_07

32 .9138 1 22192.0 24852.0 .0076   .92 -8.57   .90 -9.90 -.0015   .51 1.00 43.7 41.4 .46 .85 .9138 24382 16817 0 R . SC041606_08

33 -.5725 1 22192.0 12582.0 .0146   .86 -9.90   .83 -9.90 -.0034   .46 1.00 73.0 66.0 .28 .43 -.5725 81494 42321 0 R . SC041624_01

34 .3617 1 22192.0 8171.0 .0149 1.08 9.90 1.10 9.90 -.0029   .19 1.00 64.9 68.5 .28 .47 .3616 61868 28069 0 R . SC041624_02

35 -.0387 1 22192.0 10031.0 .0145   .98 -3.43   .98 -3.11 -.0029   .31 1.00 66.9 65.8 .29 .46 -.0387 83939 43224 0 R . SC041624_03

36 -.7696 1 22192.0 13499.0 .0148   .87 -9.90   .82 -9.90 -.0030   .44 1.00 73.1 67.3 .28 .42 -.7696 70536 34847 0 R . SC041624_04b

37 -.3473 1 22192.0 22876.0 .0112   .92 -9.67   .92 -9.90 -.0030   .43 1.00 59.5 57.5 .35 .58 -.3473 29690 29413 0 R . SC041624_05

38 -.2099 1 22192.0 10850.0 .0144 1.00 -.04 .99 -1.70 -.0029 .29 1.00 65.1 65.4 .29 .46 -.2100 88505 47114 0 R . SC041624_06b

39 -.4345 1 22192.0 11927.0 .0145 .90 -9.90 .87 -9.90 -.0033 .41 1.00 70.1 65.5 .29 .44 -.4345 86723 46126 0 R . SC041624_07

40 1.3157 1 22192.0 17673.0 .0082 .81 -9.90 .73 -9.90 -.0009 .56 1.00 54.2 49.1 .43 .74 1.3157 20161 10710 0 R . SC041624_08

Step parameters 2024 - Science Grade 4 (g04SCv0.CSF)

; STRUCTURE-THRESHOLD MEASURE ANCHOR FILE FOR C:\Users\GVelasquez\OneDrive - Human Resources Research Organization\Documents\K Jul 7 2024 12:47

; ITEM CATEGORY Rasch-Andrich threshold MEASURE

1 0   .0000

1 1   .0000

2 0   .0000

2 1   .0000

3 0   .0000

3 1 -1.1437

3 2 1.1437

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 -1.1226

8 2 -.2126

8 3   .5026

8 4   .8326

9 0   .0000

9 1   .0000

10 0   .0000

10 1 -.9852

10 2   .9852

11 0   .0000

11 1   .0000

12 0   .0000

12 1 -1.5770

12 2 1.5770

13 0   .0000

13 1 -1.9328

13 2 -.4506

13 3 1.1366

13 4 1.2468

14 0 .0000

14 1 .0000

15 0 .0000

15 1 .0000

16 0 .0000

16 1 .0000

17 0 .0000

17 1 -1.6504

17 2 1.6504

18 0 .0000

18 1 -1.1363

18 2 1.1363

19 0 .0000

19 1 -1.3897

19 2 1.3897

20 0 .0000

20 1 -1.0896

20 2 1.0896

21 0 .0000

21 1 -.8450

21 2 -1.0340

21 3 .4538

21 4 1.4253

22 0 .0000

22 1 .0000

23 0 .0000

23 1 .0000

24 0 .0000

24 1 .0000

25 0 .0000

25 1 -1.3743

25 2 1.3743

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 -1.5175

30 2 1.5175

31 0   .0000

31 1   .0000

32 0   .0000

32 1 -1.0297

32 2 -.7200

32 3 -.1559

32 4 1.9056

33 0   .0000

33 1   .0000

34 0   .0000

34 1   .0000

35 0   .0000

35 1   .0000

36 0   .0000

36 1   .0000

37 0   .0000

37 1 -1.1661

37 2 1.1661

38 0   .0000

38 1   .0000

39 0 .0000

39 1 .0000

40 0 .0000

40 1 -.7791

40 2 -1.0098

40 3 .1315

40 4 1.6574

Appendix C – Winsteps Anchor File (Science Grade 4)

Item Anchor File

```
 1  0.6113

 2 -0.2181

 4 -1.7202

 5  0.3352

 6 -1.3771

 7 -0.0967

10 -1.0393

11  0.2601

14  0.9670

15  0.4568

16  0.4301

17  0.7948

19  0.8829

20 -0.4570

22  0.5371

23  0.4374

25  0.0953

26  0.8637

28 -1.1770

29 -0.7674

33 -0.3066

34  0.6715

35  0.2228

36 -0.5859

37 -0.0244

38  0.0639
```

39 -0.1602

Step Parameter Anchor File (g04SCv0anchors.SAF)

10 0 0.0000

10 1 -0.8536

10 2 0.8536

17 0 0.0000

17 1 -1.6292

17 2 1.6292

19 0 0.0000

19 1 -1.4246

19 2 1.4247

20 0 0.0000

20 1 -1.1665

20 2 1.1665

25 0 0.0000

25 1 -1.4395

25 2 1.4395

37 0 0.0000

37 1 -1.1658

37 2 1.1658

PERSON SCORE FILE FOR C:\Users\GVelasquez\OneDrive - Human Resources Research Organization\Documents Jul 7 2024 12:47 USCALE=1.00

```
 SCORE  MEASURE   S.E.  INFO NORMED S.E.  FREQUENCY %  CUM.FREQ. % PERCENTILE    1     2     3     4     5     6     7     8     9    10    11    12    13    14    15    16    17    18
 19    20    21    22    23    24    25    26    27    28    29    30    31    32    33    34    35    36    37    38    39    40
   0 -6.0077 2.0111   .25 -178 239   37  .1   37  .1      .1   .00   .00   .00   .00   .00   .00   .00   .00   .00   .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
 .00   .00   .00   .00   .00   .00   .00   .00   .00   .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
   1 -4.5879 1.0221   .96  -10 121    0  .0   37  .1      .1   .01   .02   .11   .07   .01   .05   .02   .01   .02   .09   .01   .06   .02   .01   .01   .01   .03   .01   .02   .06   .01
 .01   .01   .02   .04   .01   .00   .04   .03   .06   .00   .01   .02   .01   .01   .02   .04   .01   .02   .01
   2 -3.8502  .7379  1.84   78  88  103  .2  140  .3      .2   .02   .04   .22   .14   .02   .09   .03   .01   .04   .18   .02   .11   .05   .01   .02   .02   .06   .02   .05   .11   .01
 .02   .02   .04   .09   .01   .01   .08   .05   .12   .00   .02   .04   .01   .02   .04   .09   .03   .03   .01
   3 -3.4002  .6147  2.65  131  73   60  .1  200  .5      .4   .03   .05   .31   .21   .03   .14   .05   .02   .06   .27   .03   .16   .07   .02   .03   .03   .09   .04   .08   .17   .02
 .02   .03   .06   .13   .02   .01   .12   .08   .17   .00   .04   .06   .02   .03   .07   .14   .04   .05   .02
   4 -3.0680  .5426  3.40  171  64   66  .1  266  .6      .5   .04   .07   .40   .27   .04   .19   .07   .03   .08   .35   .05   .22   .10   .02   .04   .04   .12   .05   .10   .22   .03
 .03   .04   .08   .18   .02   .01   .16   .11   .23   .01   .05   .08   .03   .05   .09   .18   .05   .07   .03
   5 -2.8005  .4944  4.09  202  59  109  .2  375  .8      .7   .05   .09   .48   .33   .05   .23   .08   .04   .10   .43   .06   .27   .13   .03   .05   .05   .15   .07   .13   .28   .04
 .04   .05   .10   .22   .03   .02   .20   .13   .28   .01   .07   .10   .04   .06   .12   .23   .07   .09   .04
   6 -2.5738  .4594  4.74  229  55   34  .1  409  .9      .9   .06   .12   .55   .38   .07   .27   .10   .05   .12   .50   .07   .31   .15   .04   .06   .07   .18   .08   .16   .33   .05
 .05   .06   .12   .27   .04   .02   .23   .16   .33   .01   .09   .12   .05   .07   .14   .27   .09   .11   .05
   7 -2.3753  .4326  5.34  253  51   88  .2  497 1.1     1.0   .07   .14   .62   .43   .08   .31   .12   .05   .14   .57   .09   .36   .19   .04   .08   .08   .22   .10   .19   .38
 .06   .07   .07   .15   .31   .05   .02   .27   .19   .38   .01   .11   .14   .06   .09   .17   .32   .10   .13   .06
   8 -2.1975  .4114  5.91  274  49   75  .2  572 1.3     1.2   .08   .16   .68   .47   .09   .35   .14   .07   .16   .64   .10   .41   .22   .05   .09   .10   .25   .11   .22   .43
 .07   .08   .08   .17   .35   .05   .03   .31   .22   .43   .01   .13   .16   .07   .10   .19   .36   .12   .15   .07
   9 -2.0355  .3940  6.44  293  47  352  .8  924 2.1     1.7   .09   .18   .74   .51   .11   .39   .16   .08   .19   .70   .12   .45   .25   .06   .10   .11   .28   .13   .25   .48
 .09   .09   .10   .19   .39   .06   .03   .34   .25   .47   .02   .16   .19   .08   .12   .22   .41   .14   .17   .08
  10 -1.8861  .3796  6.94  311  45    0  .0  924 2.1     2.1   .11   .21   .80   .55   .13   .43   .19   .09   .21   .76   .13   .49   .29   .07   .12   .13   .31   .15   .28   .53
 .10   .10   .11   .22   .43   .07   .04   .38   .28   .52   .02   .18   .21   .10   .14   .25   .45   .16   .19   .10
  11 -1.7467  .3673  7.41  327  44  626 1.4 1550 3.5     2.8   .12   .23   .85   .58   .14   .46   .21   .10   .24   .82   .15   .53   .32   .08   .13   .14   .35   .17   .31   .58
 .12   .12   .12   .24   .47   .08   .05   .41   .31   .56   .02   .21   .24   .11   .15   .27   .49   .18   .21   .12
  12 -1.6157  .3568  7.86  343  42 1116 2.5 2666 6.0     4.8   .13   .25   .90   .61   .16   .49   .23   .12   .26   .87   .17   .57   .36   .09   .15   .16   .38   .19   .34   .63
 .14   .13   .14   .27   .51   .09   .05   .44   .34   .60   .03   .24   .26   .12   .17   .30   .54   .20   .23   .13
  13 -1.4917  .3476  8.28  358  41    0  .0 2666 6.0     6.0   .15   .28   .95   .64   .17   .52   .25   .13   .28   .93   .19   .61   .40   .10   .17   .18   .41   .21   .38   .67
 .16   .15   .16   .29   .55   .10   .06   .47   .37   .64   .03   .28   .29   .14   .19   .33   .58   .22   .26   .15
  14 -1.3737  .3395  8.68  372  40 1757 4.0 4423 10.0    8.0   .16   .30   .99   .67   .19   .55   .28   .15   .31   .98   .20   .64   .43   .11   .18   .19   .44   .23   .41   .72
 .18   .16   .17   .32   .59   .12   .06   .50   .39   .67   .03   .31   .31   .15   .21   .35   .62   .24   .28   .18
  15 -1.2609  .3323  9.05  385  39    0  .0 4423 10.0   10.0   .18   .33  1.04   .69   .21   .58   .30   .16   .33  1.02   .22   .68   .47   .12   .20   .21   .47   .26   .44   .76
 .21   .18   .19   .34   .62   .13   .07   .53   .42   .71   .04   .35   .33   .16   .23   .38   .66   .26   .30   .20
  16 -1.1526  .3259  9.41  398  39 2176 4.9 6599 14.9   12.4   .20   .35  1.08   .72   .23   .61   .32   .18   .36  1.07   .24   .71   .51   .14   .22   .23   .50   .28   .47
 .80   .23   .19   .21   .37   .66   .14   .08   .56   .45   .74   .04   .40   .36   .18   .25   .41   .70   .28   .33   .23
  17 -1.0483  .3201  9.76  410  38 2646 6.0 9245 20.9   17.9   .21   .37  1.12   .74   .25   .63   .35   .20   .38  1.11   .26   .74   .56   .15   .24   .25   .53   .30   .50
 .84   .26   .21   .22   .39   .69   .15   .09   .58   .47   .77   .04   .44   .38   .20   .27   .43   .73   .30   .35   .26
  18  -.9475  .3149 10.08  422  37    0  .0 9245 20.9   20.9   .23   .40  1.16   .76   .27   .66   .37   .22   .41  1.16   .28   .77   .60   .16   .26   .27   .56   .33   .53   .88
 .29   .23   .24   .42   .73   .17   .10   .61   .50   .80   .05   .49   .41   .21   .29   .46   .77   .32   .37   .29
  19  -.8498  .3102 10.39  434  37 2922 6.6 12167 27.5  24.2   .25   .42  1.20   .77   .29   .68   .39   .24   .43  1.20   .30   .80   .64   .17   .28   .29   .59   .35   .56
 .92   .33   .24   .26   .44   .76   .18   .10   .63   .52   .83   .05   .55   .43   .23   .31   .48   .81   .35   .40   .32
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20  -.7550  .3059  10.69  445  36    0   .0  12167  27.5     27.5   .27   .45  1.23   .79   .31   .70   .41   .27   .45  1.24   .32   .83   .68   .19   .30   .31   .62   .38   .59   .96
.37  .26   .28   .46   .79   .20   .11   .65   .55   .86   .06   .61   .45   .25   .33   .50   .84   .37   .42   .36
21  -.6626  .3020  10.96  456  36  3068  6.9  15235  34.4     30.9   .29   .47  1.27   .80   .33   .72   .44   .29   .48  1.27   .34   .86   .73   .20   .32   .33   .64   .40   .62
1.00  .41   .28   .30   .49   .82   .21   .12   .67   .57   .89   .06   .67   .48   .26   .35   .53   .88   .39   .44   .40
22  -.5724  .2985  11.22  467  35  3131  7.1  18366  41.5     37.9   .31   .49  1.30   .82   .35   .73   .46   .32   .50  1.31   .36   .88   .77   .22   .34   .35   .67   .43   .65
1.03  .45   .30   .32   .51   .85   .23   .13   .69   .59   .92   .07   .73   .50   .28   .37   .55   .91   .41   .47   .44
23  -.4843  .2953  11.47  477  35    0   .0  18366  41.5     41.5   .32   .51  1.33   .83   .37   .75   .48   .34   .52  1.34   .38   .91   .82   .23   .36   .37   .70   .46   .68  1.07
.49  .32   .34   .53   .88   .24   .14   .71   .61   .95   .08   .80   .52   .30   .39   .57   .95   .43   .49   .49
24  -.3980  .2924  11.70  488  35  3102  7.0  21468  48.5     45.0   .34   .53  1.36   .84   .39   .77   .50   .37   .54  1.38   .41   .93   .86   .25   .38   .39   .72   .48   .71
1.10  .54   .34   .35   .55   .91   .26   .15   .73   .63   .97   .08   .87   .54   .32   .41   .59   .98   .45   .51   .54
25  -.3133  .2898  11.91  498  34    0   .0  21468  48.5     48.5   .36   .56  1.39   .85   .41   .78   .52   .40   .56  1.41   .43   .96   .91   .27   .40   .41   .75   .51   .73  1.14
.60  .36   .37   .57   .94   .27   .17   .74   .65  1.00   .09   .94   .56   .34   .43   .61  1.01   .47   .53   .60
26  -.2300  .2875  12.10  508  34  2964  6.7  24432  55.2     51.8   .38   .58  1.42   .86   .43   .80   .54   .43   .58  1.44   .45   .98   .95   .28   .42   .43   .77   .54   .76
1.17  .65   .38   .39   .59   .97   .29   .18   .76   .67  1.02   .10  1.02   .58   .36   .45   .63  1.05   .49   .55   .65
27  -.1479  .2855  12.27  517  34  2837  6.4  27269  61.6     58.4   .40   .60  1.45   .87   .45   .81   .56   .47   .60  1.47   .47  1.01  1.00   .30   .44   .45   .79   .56   .79
1.20  .71   .39   .41   .61   .99   .31   .19   .77   .69  1.05   .10  1.10   .60   .38   .47   .65  1.08   .52   .57   .71
28  -.0668  .2838  12.41  527  34    0   .0  27269  61.6     61.6   .42   .62  1.48   .88   .47   .82   .58   .50   .62  1.50   .49  1.03  1.04   .32   .46   .47   .82   .59   .81
1.23  .77   .41   .43   .63  1.02   .33   .20   .79   .71  1.07   .11  1.18   .62   .39   .49   .67  1.11   .54   .59   .78
29  .0133  .2824  12.54  536  34  2644  6.0  29913  67.5     64.5   .44   .63  1.50   .89   .49   .83   .60   .54   .64  1.52   .51  1.05  1.09   .33   .48   .49   .84   .62   .84
1.27  .83   .43   .45   .65  1.05   .34   .22   .80   .72  1.10   .12  1.26   .64   .41   .51   .69  1.14   .56   .61   .85
30  .0928  .2813  12.64  546  33  1203  2.7  31116  70.2     68.9   .46   .65  1.53   .90   .51   .84   .62   .58   .66  1.55   .53  1.08  1.14   .35   .50   .51   .86   .65   .87
1.30  .90   .45   .47   .67  1.07   .36   .23   .81   .74  1.12   .13  1.35   .66   .43   .53   .70  1.17   .58   .63   .92
31  .1716  .2805  12.71  555  33  1191  2.7  32307  72.9     71.6   .48   .67  1.55   .90   .53   .85   .64   .62   .68  1.57   .55  1.10  1.19   .37   .51   .53   .88   .68   .89
1.33  .97   .47   .49   .68  1.10   .38   .24   .83   .75  1.15   .14  1.43   .68   .45   .55   .72  1.20   .59   .65   .99
32  .2502  .2800  12.76  565  33  2188  4.9  34495  77.9     75.4   .50   .69  1.58   .91   .55   .86   .66   .67   .69  1.60   .57  1.12  1.24   .39   .53   .55   .91   .71   .92
1.35  1.04   .49   .51   .70  1.13   .40   .26   .84   .77  1.17   .15  1.52   .69   .47   .57   .73  1.23   .61   .66  1.07
33  .3285  .2798  12.78  574  33    0   .0  34495  77.9     77.9   .52   .70  1.60   .92   .57   .87   .68   .71   .71  1.62   .58  1.15  1.29   .41   .55   .57   .93   .74   .95
1.38  1.11   .51   .53   .72  1.15   .42   .27   .85   .78  1.19   .16  1.61   .71   .49   .59   .75  1.26   .63   .68  1.15
34  .4067  .2798  12.77  583  33  1916  4.3  36411  82.2     80.0   .54   .72  1.62   .92   .59   .88   .69   .76   .73  1.64   .60  1.17  1.34   .43   .57   .59   .95   .76   .97
1.41  1.19   .53   .55   .73  1.18   .44   .29   .86   .79  1.22   .17  1.69   .73   .51   .61   .76  1.29   .65   .70  1.23
35  .4852  .2802  12.73  592  33   902  2.0  37313  84.2     83.2   .56   .74  1.64   .93   .60   .89   .71   .82   .74  1.66   .62  1.19  1.39   .45   .59   .61   .97   .79  1.00
1.44  1.26   .55   .57   .75  1.21   .46   .31   .87   .81  1.24   .18  1.78   .74   .53   .63   .78  1.31   .67   .71  1.31
36  .5639  .2809  12.67  602  33   775  1.7  38088  86.0     85.1   .58   .75  1.66   .93   .62   .90   .73   .87   .76  1.68   .64  1.22  1.44   .46   .61   .63   .99   .82  1.02
1.46  1.34   .57   .59   .76  1.23   .48   .32   .88   .82  1.27   .19  1.87   .76   .55   .65   .79  1.34   .68   .73  1.40
37  .6431  .2819  12.58  611  33   794  1.8  38882  87.8     86.9   .60   .76  1.68   .94   .64   .90   .74   .93   .77  1.70   .66  1.24  1.49   .48   .63   .64  1.02   .86  1.05
1.49  1.42   .59   .61   .78  1.26   .50   .34   .88   .83  1.29   .20  1.95   .77   .57   .66   .80  1.37   .70   .75  1.49
38  .7229  .2832  12.46  621  34   656  1.5  39538  89.3     88.5   .62   .78  1.70   .94   .66   .91   .76   .99   .78  1.72   .68  1.26  1.55   .50   .65   .66  1.04   .89  1.08
1.52  1.51   .61   .63   .79  1.29   .52   .36   .89   .84  1.32   .22  2.04   .79   .59   .68   .82  1.40   .72   .76  1.57
39  .8036  .2849  12.32  630  34  1235  2.8  40773  92.0     90.7   .64   .79  1.72   .95   .68   .92   .77  1.06   .80  1.74   .69  1.29  1.61   .52   .67   .68  1.06   .92  1.10
1.54  1.59   .63   .65   .80  1.31   .54   .38   .90   .85  1.34   .23  2.12   .80   .61   .70   .83  1.43   .73   .78  1.66
40  .8852  .2868  12.16  640  34   568  1.3  41341  93.3     92.7   .65   .81  1.74   .95   .70   .92   .78  1.13   .81  1.75   .71  1.31  1.66   .55   .68   .70  1.08   .95  1.13
1.57  1.67   .65   .66   .82  1.34   .56   .40   .91   .86  1.37   .24  2.20   .81   .63   .72   .84  1.45   .75   .79  1.75
41  .9681  .2890  11.98  650  34   425  1.0  41766  94.3     93.8   .67   .82  1.75   .95   .71   .93   .80  1.21   .82  1.77   .73  1.34  1.72   .57   .70   .71  1.11   .98  1.16
1.59  1.76   .67   .68   .83  1.37   .58   .42   .91   .87  1.39   .26  2.28   .82   .65   .73   .85  1.48   .76   .80  1.84
42  1.0523  .2915  11.77  660  35   449  1.0  42215  95.3     94.8   .69   .83  1.77   .96   .73   .93   .81  1.29   .83  1.79   .74  1.36  1.79   .59   .72   .73  1.13  1.01  1.19
1.62  1.84   .68   .70   .84  1.39   .60   .44   .92   .88  1.42   .28  2.36   .84   .67   .75   .86  1.51   .78   .82  1.93
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43 1.1381 .2943 11.55 670 35   309   .7 42524 96.0   95.6   .71   .84   1.79   .96   .75   .94   .82   1.37   .85   1.80   .76   1.39   1.85   .61   .74   .75   1.15   1.05   1.22
1.64 1.93   .70   .72   .85   1.42   .62   .46   .93   .89   1.44   .29   2.43   .85   .68   .76   .87   1.53   .79   .83   2.02
44 1.2256 .2974 11.31 680 35   604 1.4 43128 97.4   96.7   .73   .85   1.80   .96   .76   .94   .84   1.46   .86   1.82   .78   1.42   1.92   .63   .75   .76   1.18   1.08   1.24
1.66 2.01   .72   .74   .86   1.45   .64   .48   .93   .90   1.47   .31   2.51   .86   .70   .78   .88   1.56   .81   .84   2.11
45 1.3150 .3008 11.05 691 36   267   .6 43395 98.0   97.7   .74   .86   1.81   .97   .78   .95   .85   1.56   .87   1.83   .79   1.44   1.99   .65   .77   .78   1.20   1.12   1.27
1.68 2.10   .74   .75   .87   1.48   .66   .50   .94   .91   1.50   .33   2.58   .87   .72   .79   .89   1.59   .82   .85   2.20
46 1.4065 .3045 10.79 702 36   171   .4 43566 98.3   98.2   .76   .87   1.83   .97   .79   .95   .86   1.66   .88   1.84   .81   1.47   2.07   .67   .78   .80   1.23   1.15   1.30
1.71 2.19   .76   .77   .88   1.50   .68   .53   .94   .91   1.52   .35   2.65   .88   .74   .81   .90   1.61   .83   .86   2.28
47 1.5005 .3086 10.50 713 37   179   .4 43745 98.8   98.6   .78   .88   1.84   .97   .81   .96   .87   1.77   .89   1.86   .82   1.50   2.14   .69   .80   .81   1.26   1.19   1.33
1.73 2.27   .77   .79   .89   1.53   .70   .55   .95   .92   1.55   .37   2.71   .89   .76   .82   .91   1.64   .85   .87   2.37
48 1.5971 .3130 10.20 724 37   95   .2 43840 99.0   98.9   .79   .89   1.86   .98   .82   .96   .88   1.88   .90   1.87   .83   1.52   2.23   .71   .82   .82   1.29   1.23   1.37
1.75 2.36   .79   .80   .90   1.56   .72   .57   .95   .93   1.57   .40   2.78   .90   .77   .84   .91   1.66   .86   .88   2.45
49 1.6966 .3180 9.89 736 38   191   .4 44031 99.4   99.0   .81   .90   1.87   .98   .84   .96   .89   2.00   .91   1.88   .85   1.55   2.31   .73   .83   .84   1.32   1.26   1.40
1.77 2.45   .80   .82   .91   1.59   .74   .60   .96   .93   1.60   .42   2.84   .91   .79   .85   .92   1.69   .87   .89   2.54
50 1.7994 .3235 9.56 748 38   0   .0 44031 99.4   99.0   .83   .91   1.88   .98   .85   .97   .90   2.12   .91   1.89   .86   1.58   2.40   .75   .84   .85   1.35   1.30   1.43
1.79 2.53   .82   .83   .92   1.61   .76   .62   .96   .94   1.63   .45   2.91   .91   .81   .86   .93   1.71   .88   .90   2.62
51 1.9061 .3297 9.20 761 39   128   .3 44159 99.7   99.0   .84   .92   1.89   .98   .86   .97   .91   2.25   .92   1.90   .87   1.61   2.50   .77   .86   .86   1.38   1.34   1.46
1.80 2.62   .84   .85   .92   1.64   .78   .65   .96   .95   1.65   .47   2.97   .92   .82   .87   .94   1.73   .89   .91   2.70
52 2.0171 .3368 8.82 774 40   71   .2 44230 99.8   99.0   .85   .93   1.90   .98   .88   .97   .92   2.39   .93   1.91   .88   1.63   2.60   .79   .87   .88   1.41   1.38   1.50
1.82 2.71   .85   .86   .93   1.67   .79   .67   .97   .95   1.68   .50   3.03   .93   .84   .89   .94   1.76   .90   .92   2.78
53 2.1332 .3449 8.41 788 41   0   .0 44230 99.8   99.0   .87   .94   1.91   .99   .89   .98   .93   2.52   .94   1.92   .90   1.66   2.70   .81   .88   .89   1.44   1.42   1.53
1.84 2.80   .86   .87   .94   1.70   .81   .70   .97   .96   1.71   .53   3.09   .94   .85   .90   .95   1.78   .91   .93   2.86
54 2.2554 .3544 7.96 803 42   40   .1 44270 99.9   99.0   .88   .94   1.92   .99   .90   .98   .93   2.66   .94   1.93   .91   1.69   2.81   .83   .90   .90   1.48   1.46   1.57
1.86 2.89   .88   .89   .95   1.72   .83   .72   .97   .96   1.73   .56   3.15   .94   .87   .91   .95   1.80   .92   .94   2.94
55 2.3849 .3658 7.47 818 43   7   .0 44277 100.0   99.0   .89   .95   1.93   .99   .91   .98   .94   2.80   .95   1.94   .92   1.72   2.92   .84   .91   .91   1.51   1.50   1.60
1.87 2.98   .89   .90   .95   1.75   .85   .75   .98   .97   1.76   .59   3.22   .95   .88   .92   .96   1.82   .93   .94   3.02
56 2.5236 .3794 6.95 834 45   7   .0 44284 100.0   99.0   .91   .96   1.94   .99   .92   .98   .95   2.94   .96   1.94   .93   1.75   3.03   .86   .92   .92   1.55   1.55   1.64
1.89 3.08   .90   .91   .96   1.78   .87   .77   .98   .97   1.78   .62   3.28   .96   .90   .93   .96   1.84   .94   .95   3.10
57 2.6737 .3961 6.37 852 47   6   .0 44290 100.0   99.0   .92   .96   1.95   .99   .93   .99   .96   3.08   .96   1.95   .94   1.78   3.15   .88   .93   .93   1.59   1.59   1.67
1.90 3.17   .92   .92   .96   1.80   .88   .80   .98   .97   1.81   .66   3.34   .96   .91   .94   .97   1.86   .95   .96   3.19
58 2.8387 .4170 5.75 872 50   5   .0 44295 100.0   99.0   .93   .97   1.95   .99   .94   .99   .96   3.22   .97   1.96   .95   1.80   3.27   .89   .94   .94   1.63   1.64   1.71
1.92 3.27   .93   .93   .97   1.83   .90   .82   .99   .98   1.83   .69   3.41   .97   .92   .95   .97   1.88   .95   .96   3.27
59 3.0235 .4437 5.08 894 53   0   .0 44295 100.0   99.0   .94   .97   1.96   .99   .95   .99   .97   3.35   .97   1.97   .95   1.83   3.39   .91   .95   .95   1.68   1.68   1.75
1.93 3.37   .94   .94   .97   1.85   .91   .85   .99   .98   1.86   .73   3.47   .97   .93   .96   .98   1.90   .96   .97   3.36
60 3.2357 .4791 4.36 919 57   2   .0 44297 100.0   99.0   .95   .98   1.97   1.00   .96   .99   .97   3.48   .98   1.97   .96   1.86   3.51   .93   .96   .96   1.72   1.73   1.79
1.94 3.47   .95   .95   .98   1.88   .93   .87   .99   .98   1.88   .77   3.55   .98   .95   .96   .98   1.92   .97   .98   3.45
61 3.4881 .5283 3.58 949 63   0   .0 44297 100.0   100.0   .96   .98   1.98   1.00   .97   .99   .98   3.60   .98   1.98   .97   1.89   3.62   .94   .97   .97   1.77   1.78   1.83
1.95 3.57   .96   .96   .98   1.90   .94   .90   .99   .99   1.91   .81   3.62   .98   .96   .97   .99   1.93   .98   .98   3.55
62 3.8047 .6018 2.76 987 71   0   .0 44297 100.0   100.0   .97   .99   1.98   1.00   .98   1.00   .99   3.71   .99   1.98   .98   1.92   3.73   .96   .98   .98   1.83   1.83   1.87
1.97 3.68   .97   .97   .99   1.93   .96   .92   .99   .99   1.93   .86   3.71   .99   .97   .98   .99   1.95   .98   .99   3.65
63 4.2390 .7272 1.89 1038 86   0   .0 44297 100.0   100.0   .98   .99   1.99   1.00   .98   1.00   .99   3.82   .99   1.99   .99   1.94   3.83   .97   .98   .99   1.88   1.89   1.91
1.98 3.78   .98   .98   .99   1.95   .97   .95   1.00   .99   1.95   .90   3.79   .99   .98   .99   .99   1.97   .99   .99   3.76
64 4.9611 1.0145 .97 1124 120   0   .0 44297 100.0   100.0   .99   1.00   1.99   1.00   .99   1.00   1.00   3.91   1.00   1.99   .99   1.97   3.92   .99   .99   .99   1.94   1.94
1.96 1.99   3.89   .99   .99   1.00   1.98   .99   .97   1.00   1.00   1.98   .95   3.89   1.00   .99   .99   1.00   1.98   .99   1.00   3.87
65 6.3694 2.0074 .25 1291 238   0   .0 44297 100.0   100.0   1.00   1.00   2.00   1.00   1.00   1.00   1.00   4.00   1.00   2.00   1.00   2.00   4.00   1.00   1.00   1.00   2.00   2.00
2.00 2.00   4.00   1.00   1.00   1.00   2.00   1.00   1.00   1.00   1.00   2.00   1.00   4.00   1.00   1.00   1.00   1.00   2.00   1.00   1.00   4.00

Appendix E – Comparison of Files Output (Science Grade 4)

All RSSS Differences – Science Grade 4

subject	grade	form	rs	pearson_theta	pearson_se	humrro_theta	humrro_se	theta_diff	se_diff
SC	04	01	0	-5.3314	2.0182	-5.3314	2.0182	0	0
SC	04	01	1	-3.89	1.0362	-3.89	1.0362	0	0
SC	04	01	2	-3.123	0.7576	-3.123	0.7576	0	0
SC	04	01	3	-2.6434	0.6384	-2.6434	0.6384	0	0
SC	04	01	4	-2.2813	0.5696	-2.2813	0.5696	0	0
SC	04	01	5	-1.9836	0.524	-1.9836	0.524	0	0
SC	04	01	6	-1.7266	0.4913	-1.7266	0.4913	0	0
SC	04	01	7	-1.4977	0.4665	-1.4977	0.4665	0	0
SC	04	01	8	-1.2894	0.4471	-1.2894	0.4471	0	0
SC	04	01	9	-1.0967	0.4314	-1.0967	0.4314	0	0
SC	04	01	10	-0.9162	0.4185	-0.9162	0.4185	0	0
SC	04	01	11	-0.7456	0.4079	-0.7456	0.4079	0	0
SC	04	01	12	-0.583	0.3989	-0.583	0.3989	0	0
SC	04	01	13	-0.4269	0.3915	-0.4269	0.3915	0	0
SC	04	01	14	-0.2761	0.3852	-0.2761	0.3852	0	0
SC	04	01	15	-0.1298	0.38	-0.1298	0.38	0	0
SC	04	01	16	0.0129	0.3758	0.0129	0.3758	0	0
SC	04	01	17	0.1529	0.3725	0.1529	0.3725	0	0
SC	04	01	18	0.2906	0.37	0.2906	0.37	0	0
SC	04	01	19	0.4269	0.3684	0.4269	0.3684	0	0
SC	04	01	20	0.5623	0.3676	0.5623	0.3676	0	0
SC	04	01	21	0.6973	0.3676	0.6973	0.3676	0	0
SC	04	01	22	0.8327	0.3684	0.8327	0.3684	0	0
SC	04	01	23	0.9689	0.3699	0.9689	0.3699	0	0
SC	04	01	24	1.1066	0.3722	1.1066	0.3722	0	0
SC	04	01	25	1.2461	0.3751	1.2461	0.3751	0	0
SC	04	01	26	1.3881	0.3787	1.3881	0.3787	0	0

subject	grade	form	rs	pearson_theta	pearson_se	humrro_theta	humrro_se	theta_diff	se_diff
SC	04	01	27	1.5331	0.383	1.5331	0.383	0	0
SC	04	01	28	1.6816	0.388	1.6816	0.388	0	0
SC	04	01	29	1.8344	0.394	1.8344	0.394	0	0
SC	04	01	30	1.9924	0.4012	1.9924	0.4012	0	0
SC	04	01	31	2.157	0.4104	2.157	0.4104	0	0
SC	04	01	32	2.3301	0.4222	2.3301	0.4222	0	0
SC	04	01	33	2.5148	0.438	2.5148	0.438	0	0
SC	04	01	34	2.7156	0.4595	2.7156	0.4595	0	0
SC	04	01	35	2.9401	0.4897	2.9401	0.4897	0	0
SC	04	01	36	3.2007	0.534	3.2007	0.534	0	0
SC	04	01	37	3.5212	0.6031	3.5212	0.6031	0	0
SC	04	01	38	3.9548	0.7252	3.9548	0.7252	0	0
SC	04	01	39	4.6716	1.0107	4.6716	1.0107	0	0
SC	04	01	40	6.0728	2.0046	6.0728	2.0046	0	0
SC	04	02	0	-5.1237	2.0161	-5.1237	2.0161	0	0
SC	04	02	1	-3.6885	1.0323	-3.6885	1.0323	0	0
SC	04	02	2	-2.9294	0.7527	-2.9294	0.7527	0	0
SC	04	02	3	-2.457	0.633	-2.457	0.633	0	0
SC	04	02	4	-2.1017	0.5639	-2.1017	0.5639	0	0
SC	04	02	5	-1.8103	0.5182	-1.8103	0.5182	0	0
SC	04	02	6	-1.5592	0.4854	-1.5592	0.4854	0	0
SC	04	02	7	-1.336	0.4605	-1.336	0.4605	0	0
SC	04	02	8	-1.1332	0.4409	-1.1332	0.4409	0	0
SC	04	02	9	-0.946	0.4249	-0.946	0.4249	0	0
SC	04	02	10	-0.7712	0.4116	-0.7712	0.4116	0	0
SC	04	02	11	-0.6064	0.4004	-0.6064	0.4004	0	0
SC	04	02	12	-0.4499	0.3909	-0.4499	0.3909	0	0
SC	04	02	13	-0.3004	0.3828	-0.3004	0.3828	0	0
SC	04	02	14	-0.1565	0.3759	-0.1565	0.3759	0	0
SC	04	02	15	-0.0174	0.3702	-0.0174	0.3702	0	0
SC	04	02	16	0.1179	0.3657	0.1179	0.3657	0	0

subject	grade	form	rs	pearson_theta	pearson_se	humrro_theta	humrro_se	theta_diff	se_diff
SC	04	02	17	0.2503	0.3623	0.2503	0.3623	0	0
SC	04	02	18	0.3807	0.3601	0.3807	0.3601	0	0
SC	04	02	19	0.5099	0.359	0.5099	0.359	0	0
SC	04	02	20	0.6388	0.3592	0.6388	0.3592	0	0
SC	04	02	21	0.7683	0.3607	0.7683	0.3607	0	0
SC	04	02	22	0.8993	0.3634	0.8993	0.3634	0	0
SC	04	02	23	1.0328	0.3675	1.0328	0.3675	0	0
SC	04	02	24	1.1698	0.3729	1.1698	0.3729	0	0
SC	04	02	25	1.3113	0.3796	1.3113	0.3796	0	0
SC	04	02	26	1.4584	0.3878	1.4584	0.3878	0	0
SC	04	02	27	1.6125	0.3974	1.6125	0.3974	0	0
SC	04	02	28	1.7748	0.4086	1.7748	0.4086	0	0
SC	04	02	29	1.9471	0.4217	1.9471	0.4217	0	0
SC	04	02	30	2.1313	0.4372	2.1313	0.4372	0	0
SC	04	02	31	2.3305	0.456	2.3305	0.456	0	0
SC	04	02	32	2.5491	0.4798	2.5491	0.4798	0	0
SC	04	02	33	2.794	0.5116	2.794	0.5116	0	0
SC	04	02	34	3.0779	0.5565	3.0779	0.5565	0	0
SC	04	02	35	3.4244	0.6257	3.4244	0.6257	0	0
SC	04	02	36	3.8876	0.7467	3.8876	0.7467	0	0
SC	04	02	37	4.6386	1.0288	4.6386	1.0288	0	0
SC	04	02	38	6.0695	2.0151	6.0695	2.0151	0	0
SC	07	01	0	-5.4784	2.0197	-5.4784	2.0197	0	0
SC	07	01	1	-4.0331	1.0383	-4.0331	1.0383	0	0
SC	07	01	2	-3.2626	0.7594	-3.2626	0.7594	0	0
SC	07	01	3	-2.7811	0.6393	-2.7811	0.6393	0	0
SC	07	01	4	-2.4186	0.5694	-2.4186	0.5694	0	0
SC	07	01	5	-2.1218	0.5227	-2.1218	0.5227	0	0
SC	07	01	6	-1.8668	0.4887	-1.8668	0.4887	0	0
SC	07	01	7	-1.6409	0.4628	-1.6409	0.4628	0	0
SC	07	01	8	-1.4365	0.4422	-1.4365	0.4422	0	0

subject	grade	form	rs	pearson_theta	pearson_se	humrro_theta	humrro_se	theta_diff	se_diff
SC	07	01	9	-1.2485	0.4255	-1.2485	0.4255	0	0
SC	07	01	10	-1.0735	0.4116	-1.0735	0.4116	0	0
SC	07	01	11	-0.9089	0.4001	-0.9089	0.4001	0	0
SC	07	01	12	-0.7528	0.3904	-0.7528	0.3904	0	0
SC	07	01	13	-0.6036	0.3823	-0.6036	0.3823	0	0
SC	07	01	14	-0.4602	0.3755	-0.4602	0.3755	0	0
SC	07	01	15	-0.3213	0.3698	-0.3213	0.3698	0	0
SC	07	01	16	-0.1863	0.3653	-0.1863	0.3653	0	0
SC	07	01	17	-0.0543	0.3616	-0.0543	0.3616	0	0
SC	07	01	18	0.0754	0.3589	0.0754	0.3589	0	0
SC	07	01	19	0.2035	0.3569	0.2035	0.3569	0	0
SC	07	01	20	0.3304	0.3558	0.3304	0.3558	0	0
SC	07	01	21	0.4568	0.3554	0.4568	0.3554	0	0
SC	07	01	22	0.5833	0.3559	0.5833	0.3559	0	0
SC	07	01	23	0.7104	0.3573	0.7104	0.3573	0	0
SC	07	01	24	0.8388	0.3597	0.8388	0.3597	0	0
SC	07	01	25	0.9693	0.3632	0.9693	0.3632	0	0
SC	07	01	26	1.1029	0.3681	1.1029	0.3681	0	0
SC	07	01	27	1.2407	0.3745	1.2407	0.3745	0	0
SC	07	01	28	1.384	0.383	1.384	0.383	0	0
SC	07	01	29	1.5348	0.394	1.5348	0.394	0	0
SC	07	01	30	1.6954	0.4082	1.6954	0.4082	0	0
SC	07	01	31	1.8693	0.4267	1.8693	0.4267	0	0
SC	07	01	32	2.0616	0.4514	2.0616	0.4514	0	0
SC	07	01	33	2.28	0.4849	2.28	0.4849	0	0
SC	07	01	34	2.5374	0.5324	2.5374	0.5324	0	0
SC	07	01	35	2.858	0.6047	2.858	0.6047	0	0
SC	07	01	36	3.2955	0.7294	3.2955	0.7294	0	0
SC	07	01	37	4.0208	1.0161	4.0208	1.0161	0	0
SC	07	01	38	5.4319	2.0084	5.4319	2.0084	0	0
SC	07	02	0	-5.5267	2.0217	-5.5267	2.0217	0	0

subject	grade	form	rs	pearson_theta	pearson_se	humrro_theta	humrro_se	theta_diff	se_diff
SC	07	02	1	-4.0757	1.0418	-4.0757	1.0418	0	0
SC	07	02	2	-3.2987	0.7632	-3.2987	0.7632	0	0
SC	07	02	3	-2.8123	0.6425	-2.8123	0.6425	0	0
SC	07	02	4	-2.4466	0.5714	-2.4466	0.5714	0	0
SC	07	02	5	-2.1484	0.5231	-2.1484	0.5231	0	0
SC	07	02	6	-1.8937	0.4877	-1.8937	0.4877	0	0
SC	07	02	7	-1.6694	0.4604	-1.6694	0.4604	0	0
SC	07	02	8	-1.4677	0.4386	-1.4677	0.4386	0	0
SC	07	02	9	-1.2832	0.4211	-1.2832	0.4211	0	0
SC	07	02	10	-1.112	0.4067	-1.112	0.4067	0	0
SC	07	02	11	-0.9515	0.395	-0.9515	0.395	0	0
SC	07	02	12	-0.7993	0.3855	-0.7993	0.3855	0	0
SC	07	02	13	-0.6537	0.3779	-0.6537	0.3779	0	0
SC	07	02	14	-0.5132	0.372	-0.5132	0.372	0	0
SC	07	02	15	-0.3766	0.3675	-0.3766	0.3675	0	0
SC	07	02	16	-0.2427	0.3644	-0.2427	0.3644	0	0
SC	07	02	17	-0.1107	0.3625	-0.1107	0.3625	0	0
SC	07	02	18	0.0204	0.3617	0.0204	0.3617	0	0
SC	07	02	19	0.1512	0.362	0.1512	0.362	0	0
SC	07	02	20	0.2826	0.3632	0.2826	0.3632	0	0
SC	07	02	21	0.4153	0.3654	0.4153	0.3654	0	0
SC	07	02	22	0.5498	0.3685	0.5498	0.3685	0	0
SC	07	02	23	0.6871	0.3726	0.6871	0.3726	0	0
SC	07	02	24	0.8277	0.3777	0.8277	0.3777	0	0
SC	07	02	25	0.9726	0.3839	0.9726	0.3839	0	0
SC	07	02	26	1.1229	0.3915	1.1229	0.3915	0	0
SC	07	02	27	1.2797	0.4007	1.2797	0.4007	0	0
SC	07	02	28	1.4447	0.4121	1.4447	0.4121	0	0
SC	07	02	29	1.6201	0.4262	1.6201	0.4262	0	0
SC	07	02	30	1.8092	0.4442	1.8092	0.4442	0	0
SC	07	02	31	2.0167	0.4677	2.0167	0.4677	0	0

subject	grade	form	rs	pearson_theta	pearson_se	humrro_theta	humrro_se	theta_diff	se_diff
SC	07	02	32	2.2498	0.4994	2.2498	0.4994	0	0
SC	07	02	33	2.5209	0.5445	2.5209	0.5445	0	0
SC	07	02	34	2.8533	0.6135	2.8533	0.6135	0	0
SC	07	02	35	3.2999	0.7342	3.2999	0.7342	0	0
SC	07	02	36	4.0296	1.0168	4.0296	1.0168	0	0
SC	07	02	37	5.4397	2.0073	5.4397	2.0073	0	0
SC	11	01	0	-6.1119	2.0245	-6.1119	2.0245	0	0
SC	11	01	1	-4.654	1.0454	-4.654	1.0454	0	0
SC	11	01	2	-3.8713	0.7658	-3.8713	0.7658	0	0
SC	11	01	3	-3.3818	0.6442	-3.3818	0.6442	0	0
SC	11	01	4	-3.0143	0.5728	-3.0143	0.5728	0	0
SC	11	01	5	-2.7144	0.5249	-2.7144	0.5249	0	0
SC	11	01	6	-2.4575	0.4903	-2.4575	0.4903	0	0
SC	11	01	7	-2.2302	0.4642	-2.2302	0.4642	0	0
SC	11	01	8	-2.0243	0.4439	-2.0243	0.4439	0	0
SC	11	01	9	-1.8346	0.4279	-1.8346	0.4279	0	0
SC	11	01	10	-1.6571	0.415	-1.6571	0.415	0	0
SC	11	01	11	-1.4892	0.4048	-1.4892	0.4048	0	0
SC	11	01	12	-1.3288	0.3966	-1.3288	0.3966	0	0
SC	11	01	13	-1.1741	0.3902	-1.1741	0.3902	0	0
SC	11	01	14	-1.0238	0.3854	-1.0238	0.3854	0	0
SC	11	01	15	-0.8767	0.3818	-0.8767	0.3818	0	0
SC	11	01	16	-0.7319	0.3795	-0.7319	0.3795	0	0
SC	11	01	17	-0.5884	0.3782	-0.5884	0.3782	0	0
SC	11	01	18	-0.4455	0.378	-0.4455	0.378	0	0
SC	11	01	19	-0.3024	0.3788	-0.3024	0.3788	0	0
SC	11	01	20	-0.1584	0.3805	-0.1584	0.3805	0	0
SC	11	01	21	-0.0127	0.3831	-0.0127	0.3831	0	0
SC	11	01	22	0.1354	0.3867	0.1354	0.3867	0	0
SC	11	01	23	0.2867	0.3913	0.2867	0.3913	0	0
SC	11	01	24	0.442	0.397	0.442	0.397	0	0

subject	grade	form	rs	pearson_theta	pearson_se	humrro_theta	humrro_se	theta_diff	se_diff
SC	11	01	25	0.6023	0.404	0.6023	0.404	0	0
SC	11	01	26	0.7689	0.4125	0.7689	0.4125	0	0
SC	11	01	27	0.9432	0.4227	0.9432	0.4227	0	0
SC	11	01	28	1.1269	0.4351	1.1269	0.4351	0	0
SC	11	01	29	1.3227	0.4504	1.3227	0.4504	0	0
SC	11	01	30	1.5339	0.4695	1.5339	0.4695	0	0
SC	11	01	31	1.7655	0.494	1.7655	0.494	0	0
SC	11	01	32	2.0252	0.5267	2.0252	0.5267	0	0
SC	11	01	33	2.3259	0.5725	2.3259	0.5725	0	0
SC	11	01	34	2.6917	0.6419	2.6917	0.6419	0	0
SC	11	01	35	3.1769	0.7621	3.1769	0.7621	0	0
SC	11	01	36	3.9526	1.0415	3.9526	1.0415	0	0
SC	11	01	37	5.4039	2.0221	5.4039	2.0221	0	0
SC	11	02	0	-5.7847	2.0362	-5.7847	2.0362	0	0
SC	11	02	1	-4.2961	1.0614	-4.2961	1.0614	0	0
SC	11	02	2	-3.489	0.776	-3.489	0.776	0	0
SC	11	02	3	-2.9911	0.6456	-2.9911	0.6456	0	0
SC	11	02	4	-2.6269	0.5662	-2.6269	0.5662	0	0
SC	11	02	5	-2.3377	0.5121	-2.3377	0.5121	0	0
SC	11	02	6	-2.0957	0.4735	-2.0957	0.4735	0	0
SC	11	02	7	-1.8854	0.4451	-1.8854	0.4451	0	0
SC	11	02	8	-1.697	0.4239	-1.697	0.4239	0	0
SC	11	02	9	-1.5242	0.408	-1.5242	0.408	0	0
SC	11	02	10	-1.3629	0.396	-1.3629	0.396	0	0
SC	11	02	11	-1.2098	0.3869	-1.2098	0.3869	0	0
SC	11	02	12	-1.0629	0.38	-1.0629	0.38	0	0
SC	11	02	13	-0.9206	0.3749	-0.9206	0.3749	0	0
SC	11	02	14	-0.7815	0.3712	-0.7815	0.3712	0	0
SC	11	02	15	-0.6448	0.3687	-0.6448	0.3687	0	0
SC	11	02	16	-0.5094	0.3672	-0.5094	0.3672	0	0
SC	11	02	17	-0.3748	0.3667	-0.3748	0.3667	0	0

subject	grade	form	rs	pearson_theta	pearson_se	humrro_theta	humrro_se	theta_diff	se_diff
SC	11	02	18	-0.2403	0.3672	-0.2403	0.3672	0	0
SC	11	02	19	-0.105	0.3685	-0.105	0.3685	0	0
SC	11	02	20	0.0316	0.3709	0.0316	0.3709	0	0
SC	11	02	21	0.1703	0.3742	0.1703	0.3742	0	0
SC	11	02	22	0.3119	0.3786	0.3119	0.3786	0	0
SC	11	02	23	0.4573	0.3842	0.4573	0.3842	0	0
SC	11	02	24	0.6075	0.3912	0.6075	0.3912	0	0
SC	11	02	25	0.7638	0.3999	0.7638	0.3999	0	0
SC	11	02	26	0.9279	0.4105	0.9279	0.4105	0	0
SC	11	02	27	1.1017	0.4237	1.1017	0.4237	0	0
SC	11	02	28	1.288	0.4401	1.288	0.4401	0	0
SC	11	02	29	1.4905	0.4607	1.4905	0.4607	0	0
SC	11	02	30	1.7146	0.4872	1.7146	0.4872	0	0
SC	11	02	31	1.9685	0.5222	1.9685	0.5222	0	0
SC	11	02	32	2.2658	0.5707	2.2658	0.5707	0	0
SC	11	02	33	2.6311	0.6428	2.6311	0.6428	0	0
SC	11	02	34	3.119	0.7651	3.119	0.7651	0	0
SC	11	02	35	3.9008	1.0452	3.9008	1.0452	0	0
SC	11	02	36	5.3587	2.0245	5.3587	2.0245	0	0