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Intra and Inter-Local Item Dependence of Mathematics Items

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ABSTRACT
Local Item Dependence (LID) is a desecration of Local Item Independence (LII) which can lead to overestimating or underestimating a candidate's ability in mathematics items and create validity problems. The study investigated the intra and inter-LID of mathematics items. The study made use of ex-post facto research. The population encompassed all 26,086 Senior Secondary School Students three (SSS 3) in Osun State, Nigeria, and 14,936 SSS 3 students were randomly picked as the sample. National Examinations Council (NECO) mathematics items from June/July 2017 served as the research instrument. The calibrated data were subjected to Yen Q3 statistic. Using a multidimensional three-parameter logistic model, the Yen Q3 statistic is the residual correlation of the items calibrated by Jmetrik software. Results revealed that intra-LID was spotted between Item 8 and Item 7, Item 47 and Item 18, Item 28 and Item 21, Item 47 and Item 29, Item 39 and Item 38, Item 60 and Item 47, Item 52 and Item 51, Item 59 and Item 58 with a Q3 index greater than 0.2 rule of thumb. Similarly, inter-LID revealed bundles 3, 6, 7, 13, and 15 with a Yen Q3 index greater than 0.2. The study concluded that intra and inter-LID was discovered in the NECO mathematics item. It was recommended that NECO should consider intra and inter-LID to ensure more credible questions.

KEYWORDS
Local item dependence; local item independence; Yen Q3 statistic; mathematics items; item response theory.

INTRODUCTION

Students' mathematics performance in the Senior Secondary Certificate Examination (SSCE) has been relatively poor recently (Owolade et al., 2022; Perelah et al., 2023). Several factors have alluded to this problem, including school, student, and teacher factors, as well as Differential Item Functioning (Aryadoust, 2018; Ip, 2001; Ip, 2002), Differential Bundle Functioning (Opesemowo et al., 2023), but a possible emerging factor is the Local Item Dependence (LID). The LID is the item dependence in a test in which examinees adequately answer a question or item based on prior knowledge of another question in the test. The examinee is supposed to have separate knowledge to respond appropriately to different items in the examination. Items should be developed so that examinees have different abilities to answer questions one and two correctly and vice versa.

Consequently, LID undermines Local Item Independence (LII), one of the assumptions of Item Response Theory (IRT); others are unidimensionality, monotonicity, and item invariance. According to the LII assumption, an examinee's answering probability of an item should be completely free of his/her response to another item in the same test. In this case, the chances that an examinee will provide a specific response to an item is a function of two components: the examinee's ability; and item parameters affecting the examinee's response to the items such as difficulty and discrimination parameters, pseudo-chance parameter (Dirlik, 2019). The psychometric properties of tests may be jeopardized when LID is ignored, which may result in inaccurate test score interpretation and application (Koğar, 2021). The LID is the defilement of the local independence assumption through multidimensionality, and it affects the estimations of item and ability parameters. In addition, this violation may create substantial consequences, such as misleading item discrimination parameters. The occurrence of LID has various implications for test score interpretation and analysis, such as item bias – if there is LID, the estimated item parameters may be biased, compromising the accuracy of the scores and creating problems when comparing individuals or groups based on test outcomes (Reynolds et al., 2021; Ryser, 2021). Dimensionality evaluation – LID might be an indicator of potential multidimensionality in the test such that the test is assessing more than one underlying construct and, by implication, impacting the validity and interpretation of the test results (Bullinger & Quitmann, 2014). Item selection – in computerized adaptive testing (CAT), items are chosen depending on the individual's estimated ability. LID can influence item selection, potentially leading to less efficient and precise ability estimates (Opesemowo & Ndlovu, 2023). Test equating – LID can impact test equating, which is the process of linking scores from several forms of a test. LID may affect the comparability of scores across different test versions (Hori et al., 2022). It is typically seen for instruments composed of items or groups of items that measure various facets of the latent variable or different domains of an underlying construct. The extent to which the items in a test depend on one another, after which the trait(s) underlying the test has been conditioned, can be measured using the Yen Q3 statistic. The Yen Q3 statistic has been proven to assess LID; however, other statistical forms

can be used to detect LID. These are X^2 statistics (Chen & Thissen, 1997), G^2 statistics (Chen & Thissen, 1997), standardized ϕ coefficient difference, and standardized log-odds ratio difference.

Nevertheless, no statistical indicator is considered the best or appropriate for detecting LID, but the Yen Q3 statistic is extensively adopted. Yen Q3 statistic is computed as the linear correlation among the residuals of pairs of items in a test. The item and person parameters on the mathematics items were first obtained to achieve this in the current data set. The LII stipulates that test items should not provide any form of clue to the next item or any other items in the test (i.e., item 1 must not provide a lead to item 2 or any other items available in the test), meaning that the result of an item should not in any way give or lead answer to the next item or any other items in the test. In this case, each item in the test should be autonomous from each other. The LII assumption can be breached by response reliance and multidimensionality, and these breaches are frequently referred to as LID (Christensen et al., 2016). In addition, response reliance may arise when items are related in some way, such that responding to a specific item provides an answer to another due to connections or similarities in the test.

Christensen et al. (2016) argued that LII violations on a unidimensional scale would influence the estimation of person parameters, resulting in an inflated reliability coefficient and construct validity issues. Consequently, when LID is disregarded in mathematics test items, it will result in over-bloated reliability leading to wrong interpretations or judgments about candidates' mathematics ability and competence. It becomes necessary to ascertain that examination test items should be free from any form of LID. There are two categories of LID, and these are: intra and inter-LID. The intra-LID is also known as LID within the item group. This is the relationship between items in a group. It is otherwise known as intra-LID. Similarly, intra-LID is the association of items within the same group, i.e., the association of items in group A or group B. On the other hand, LID across item groups indicates the connection between one item group and another item group. It is also called inter-LID. In other words, it is the relationship between the item in group A and another item in group B and vice visa.

Thus, various studies have been conducted on LII (Debelak & Koller, 2020; Dirlik, 2019; Finch & Jeffers, 2016; Mislevy & Chang, 2000; Rajlic, 2019) and LID (Alade et al., 2020; Chen & Thissen, 1997; Christensen et al., 2016; Liu & Maydeu-Olivares, 2013), but little attention has been focused on intra and inter-LID to the best knowledge of the researcher. The overall goal of the current study was to investigate the intra and inter-LID of mathematics items.

Research questions

The following research questions were raised for the study

- To what extent does intra-LID occur in 2017 NECO Mathematics?
- To what extent does inter-LID exist in 2017 NECO Mathematics?

THEORETICAL FRAMEWORK

This study is premised on Item Response Theory (IRT; Lord, 1980). It is an effective paradigm for modelling and analyzing test item responses (Rusch et al., 2017). It also helps to build more precise and successful assessments by providing essential insights into individuals' abilities and test item characteristics. Researchers and practitioners can utilize IRT in various fields, including education, psychology, and other areas, to enhance the validity, reliability, and fairness of tests and evaluations. IRT focuses on how particular test items function in surveying constructs (Alade et al., 2020). The general framework of IRT is the probabilistic models that provide specific structures to explain variation in observed item response data. IRT aims to develop a technique to evaluate candidates without depending on the same items included in the test (Hambleton & Jodoin, 2003; Hambleton & Jones, 1993; Ojerinde, 2013). Therefore, IRT evolved from classical measurement theory intending to overcome many limitations (Hambleton, 1994). The framework suggests two distinct and separable entities that, when considered jointly, are responsible for the precise pattern of responses in a given psychological test.

The first entity is the set of unobserved values (or relative standing) on each candidate's latent traits or abilities, denoted by ϑ. These latent traits provide a rank ordering of candidates along one or more unobserved continua and represent meaningful constructs that the test attempts to quantify (Reckase, 2009). For instance, the locations along a continuum may indicate item proficiency in educational settings, such as mastery of a mathematical subject matter, or may represent the psychological intensity in the context of measuring psychopathologies (e.g., depression).

The second and often more technical entity from the IRT paradigm is the characteristics inherent in the item-level stimuli. Such properties may reflect how difficult or extreme the items are, how well they discriminate individuals along the unobserved continua, whether the item response probability is monotonically related to the latent trait, etc. Given some functional relationship specifying how these two entities interact, a probabilistic response model can often be constructed to model or explain an individual's overt response behaviour.

IRT uses the latent trait variable of individuals and items as predictors of observed responses. According to Hambleton and Jones (1993), IRT is based on two hypotheses. These are the latent trait variable that can predict the candidate's performance on a test item; a monotonically increasing function called item characteristic curve describes the association between the candidate's performance on a test item and the test's ability. IRT is undoubtedly based on the following assumptions.

IRT Assumptions

Some studies opined unidimensionality and local independence as the assumption of IRT, but few studies added monotonicity and item invariance to the earlier stated assumptions (Harrison et al., 2023; Nguyen et al., 2014). This study aligns with the later assumptions of IRT.

Unidimensionality indicates that items in the test should measure one construct; that is, a set of items are described as unidimensional when all the items measure the same latent construct. Unidimensionality can be investigated using several methods. Some researchers argued that using factor analysis is widely employed for data reduction method that draws upon correlation among items to derive a smaller set of factors or domains. In IRT, factor analysis can be utilized to determine unidimensionality which will reveal one-factor structure (Ojerinde et al., 2012; Reeve & Fayers, 2005; Reckase, 1979; Hattie, 1985), and the model fit has been tested to determine unidimensionality (Edelen, & Reeve, 2007; Gessaroli & De Champlain, 1996; Stout, 1987).

Local item independence means that each item in the test should be statistically independent of responses to all other test items; that is, items in the test should not be associated with one another. The Yen Q3 residual correlation statistic with a threshold greater than 0.20 revealed an undesirable LID (Harrison et al., 2023).

Monotonicity – the assumption states that as the trait level advances, so does a candidate's likelihood to respond correctly to the item. This indicates that an examinee with a good understanding of an item is more likely to respond appropriately to the item.

Measurement invariance entails estimating item parameters from any point on the item response curve. As a result, examiners can estimate an item parameter from any set of candidates who have answered the item.

METHOD

The study is a quantitative research that employs an ex-post facto research design, and the research was conducted after variation in the independent variable had been determined in the natural course of events. In ex-post facto design, the researcher has no direct control over the independent variables because the manifestation had directly occurred, meaning that the researcher can only conduct the analysis based on the existing data.

Population

The population for this study was all the twenty-six thousand and eight-six senior secondary school students who wrote the June/July 2017 national examinations council (NECO) mathematics items in Osun State, Nigeria. The population consisted of all the 497 secondary schools that participated in the June/July 2017 NECO senior secondary certificate examination Mathematics Multiple-Choice Item (MCI) in Osun State. There were 63.98% (n =318) private schools and 36.02% (n = 179) public schools across the three senatorial districts in the State registered examinees for the June/July 2017 NECO Senior Secondary Certificate Examination (SSCE) Mathematics items. The location includes urban and rural areas. The urban area accounted for 57.7% (n = 15,048), while the rural area accounted for 42.3% (n = 11,038). From the 26,086 SS3 students, 13,120 male participants represented 50.3%, while 12,966 female examinees accounted for 49.7% registered for the 2017 NECO Mathematics Paper III examination.

Sample and Sampling Technique

A total of 14,936 senior secondary school three students were selected using a purposive sampling method based on those examinees who completed all the 60 Multiple Choice Items (MCIs) in the NECO (June/July 2017) mathematics items constituted the sample for this study. In this regard, the male examinees were 48.7% (n = 7,272), while the female counterpart consisted of 51.3% (n= 7,664) from the three senatorial districts in Osun State. These include Osun West, Osun Central, and Osun East Senatorial Districts. Hence, each senatorial district has 10 Local Government Areas (LGAs), making 30 LGAs in Osun State.

Research Instrument

The June/July 2017 NECO SSCE Mathematics items were used as the study's instrument. It was a dichotomous MCI consisting of 60 items with a key and four distracters, making five alternative responses. The items are based on the Senior Secondary School Mathematics Curriculum. The response options range from letter A to E. The SSCE is usually administered in Nigeria at the end of the third year of senior secondary school (SSS). The examination serves as a tool to qualify examinees that will proceed to the next level of education: tertiary institutions. Similarly, the examination is an assessment mechanism that measures the extent to which essential competencies and skills have been acquired.

Validation of Research Instrument

The research instrument was the 2017 NECO Mathematics items. The NECO Mathematics items comprised sixty multiple-choice questions covering various topics in the SSS syllabus. The instrument’s reliability and validity were not addressed because the researcher believed that NECO, as an examination body, had ascertained the psychometric properties before administering the mathematics items, which indicated a 0.89 reliability estimate.

Procedure for Data Collection

The data used for the study represented the responses of examinees who wrote June/July 2017 NECO SSCE Mathematics items in Osun State, Nigeria. These data were obtained from the Optical Mark Recorder (OMR) sheets, and OMR sheets containing the candidates' responses were collected from the NECO head office, Minna, Niger State, Nigeria. The NECO is an examination body in Nigeria saddled to conduct a public examination for SSS3. NECO awards certificates to candidates based on the individual candidate’s performance in the examination. The SSCE is typically taken annually by school-bound examinees in SSS 3.

Sixty multiple-choice Mathematics questions were administered to SSS three students in their various schools under the supervision of NECO representatives appointed supervisors and school invigilators in each school. Each candidate’s demographic data, such as name, Centre number, Candidate number, Sex, school type, and State, were printed on the OMR sheet to ensure proper coding for computer analysis. For this study, only sex, school type, and location was extracted.

Data Analysis

Data were analyzed using Yen Q3 statistic. The Yen Q3 statistic is the residual correlations or covariances among the item responses after estimating the examinee's ability using the IRT model (Yen, 1984). The residual correlation of items was calibrated using a multidimensional 3-parameter logistic model that fitted the data set in JMetrik software.

Ethical Approval

Secondary data were analyzed for this study which involved obtaining pre-existing data that had been collected before the research, and the researcher followed ethical norms during the investigation. There was no direct contact with participants, and personal details were withheld. The researcher compiled all relevant legislation, including institutional and national guidelines for data sharing and research ethics.

RESULT

Table 1.

Frequency Distribution of Demographic Variables

Variables		N	%	$\overline{X}$	SD	Skewness	Kurtosis
Sex	Male	7,272	48.7	1.51	0.50	-0.05	-2.00
	Female	7,664	51.3				
School type	Private	9,422	63.1	1.37	0.48	0.54	-1.71
	Public	5,514	36.9				
Location	Urban	8,668	58.0	1.42	0.49	0.33	-1.89
	Rural	6,268	42.0				

Table 1 presents the demographic variables of students in the 2017 NECO Mathematics. It showed that the male and female students accounted for 7,272 (48.7%) and 7,664 (51.3%), with a mean and standard deviation of 1.51 and 0.50, respectively. The schools which were owned by private and public (Government) represented 9 422 (63.1%) and 9,422 (36.9%), with a mean and standard deviation of 1.37 and 0.48, respectively. The urban and rural locations accounted for 8,668 (58%) and 6,268 (42%), with a mean and standard deviation of 1.42 and 0.49 respectively.

Research Question One: To what extent does intra-LID occur in 2017 NECO Mathematics?

To ascertain the extent of intra-LID of the 2017 NECO Mathematics, items were calibrated using a multidimensional three-parameter logistic model that fitted the data set in JMetrik software. From the preliminary analysis result, it was shown that the 2017 NECO Mathematics item violated the assumption of unidimensionality.

Based on the item and person parameter estimates, a residual was calculated for each student’s response to each item. The residual of an item is the difference between an individual’s observed response and the candidate’s anticipated response to the item. The

observed response was dichotomously scored (i.e., wrong = 0 and correct = 1). Yen (1984) suggested that the Q3 value of a pair of items greater than 0.2 indicates LID meaning that the item violates the assumption of local independence. The Yen Q3 is the most often reported in published Rasch analyses because it incorporates the residual correlation matrix in widely used software (Christensen, Makransky, & Horton, 2016). The abridge and summary of the result of the LID of the 2017 NECO Mathematics items are presented in Table 2.

Table 2.

Abridge Table of the LID

IT1	IT2	IT3	IT4	IT5	IT6	IT7	IT8	IT9	IT10	
IT1	1.00									
IT2	0.07	1.00								
IT3	0.08	0.02	1.00							
IT4	0.00	0.00	-0.05	1.00						
IT5	-0.04	0.14	0.03	0.04	1.00					
IT6	0.03	0.02	0.07	0.02	0.17	1.00				
IT7	0.02	0.03	0.08	0.04	0.10	0.03	1.00			
IT8	-0.06	0.03	0.04	0.02	0.15	**0.22**	0.09	1.00		
IT9	0.09	0.03	0.08	-0.07	0.03	0.01	0.11	0.08	1.00	
IT10	-0.08	-0.01	0.00	0.07	0.05	0.05	0.02	0.09	0.09	1.00
IT11	-0.04	-0.12	-0.03	0.11	-0.04	0.00	0.02	0.05	-0.02	0.10
IT+	+	+	+	+	+	+	+	+	+	+
IT+	+	+	+	+	+	+	+	+	+	+
+	+	+	+	+	+	+	+	+	+	+
IT59	0.10	-0.01	0.02	-0.06	0.01	0.02	-0.02	-0.08	0.06	-0.14
IT60	0.04	0.07	-0.07	-0.06	0.06	0.04	0.06	-0.07	0.06	-0.05

Table 2 is the abridged table of pairs of items. Yen (1984) suggested a rule of thumb that states that any pair of items greater than 0.2 disclosed LID. From the abridged table, it was discovered that items 8 and 7 violated Yen's rule of thumb, meaning that both items (items 8 and 7) produced clues to one another. It could further be interpreted that both items are locally dependent. The complete intra-LID of the 2017 NECO mathematics item is presented in Table 3.

Table 3 presented that the 2017 NECO Mathematics had eight pairs of items with a correlation matrix residual above 0.2 (Yen, 1984), meaning that the items are locally dependent on one another. This could also be interpreted that the items provide a clue to each other. Similarly, the following items that showed a correlation are Item 8 and Item 7, Item 47 and Item 18, Item 28 and Item 21, Item 47 and Item 29, Item 39 and Item 38, Item 60

and Item 47, Item 52 and Item 51, Item 59 and Item 58 with a Q3 value of 0.22, 0.27, 0.25, 0.26, 0.23, 0.29, 0.24, and 0.22 respectively.

Table 3.

Intra LID of 2017 NECO Mathematics

	Pairs of NECO Mathematics Items	Yen Q3 Value
1	Item 8 and Item 7	0.22
2	Item 47 and Item 18	0.27
3	Item 28 and Item 21	0.25
4	Item 47 and Item 29	0.26
5	Item 39 and Item 38	0.23
6	Item 60 and Item 47	0.29
7	Item 52 and Item 51	0.24
8	Item 59 and Item 58	0.22

Research Question Two: To what extent does inter-LID exist in 2017 NECO Mathematics?

To answer this research question, items in the 2017 NECO mathematics measuring the same construct were grouped and calibrated. It indicated fifteen groups or bundles emerged and were calibrated using IRT to fit the model in Jmetrik software. The result is presented in Table 4.

Table 4.

Inter LID of 2017 NECO Mathematics

Bundle	Pairs of NECO Mathematics Items	Yen Q3 Value
Bundle 3	Item 8 and Item 7	0.22
Bundle 6	Item 39 and Item 38	0.23
Bundle 7	Item 27 and Item 26	0.38
Bundle 13	Item 52 and Item 51	0.24
Bundle 15	Item 59 and Item 58	0.22

Table 4 demonstrates the inter-LID of the NECO Mathematics items. Out of the fifteen bundles presented in the 2017 NECO Mathematics item, bundles 1, 2, 4, 5, 8, 9, 10, 11, 12, and 14 had items that did not violate the assumption on Local Item Independence (LII). However, bundles 3, 6, 7, 13, and 15 had only one pair of items, i.e., item 8 and item 7, Item 39 and Item 38, Item 27 and Item 26, Item 52 and Item 51 and 59 and 58, respectively were locally dependent with Yen Q3 index greater than 0.2. Bundles 3, 6, 7, 13, and 15 yielded Q3 indexes of 0.22, 0.23, 0.38, 0.24 and 0.22 respectively. The pair of an item in bundles 3, 6, 7, 13, and 15 violated the assumptions of LII through the response dependency and multidimensionality, and these violations are regarded as LID.

DISCUSSION

The quality of an item can never be overemphasized in educational assessment. The item's quality may then affect students' performance in the assessment, and the dismal performance of students in mathematics may be attributed to LID. Based on the result of research questions, which was to ascertain the intra and inter-LID of the 2017 NECO Mathematics MCIs, it was discovered that the NECO Mathematics items showcase LID, which violated the IRT assumption of LII. This result was supported in the study conducted by Alade et al. (2020), assessing the dimensionality and local independence of West African Senior School Certificate Examination (WASSCE) 2018 mathematics objective test scores in Lagos State, Nigeria. They presented that twenty-eight out of fifty items of the 2018 WASSCE mathematics multiple choice test violated the assumption of local independence. Koğar (2021) reported that variances of testlet effects range from 0.10 to 0.43. When the item and ability parameter estimation results of the models were compared, it was determined that the item and ability parameters estimated from the two approaches were highly correlated with each other. He further stated that when the local dependency assumption is not met, it was observed that the standard error values of the two-parameter model for the ability parameter were underestimated. This was also confirmed in the study of Behlagha and Hemrit (2018). Contrarily, the findings of this study were not in tandem with Jimoh and Abdulsalam-Nuhu (2022). In their study calibration of mathematics and geography items for joint command schools promotion examination for Nigerian Army Education Corps in Nigeria found that LII in selection examination in Nigeria, the implications for assessment of regional education, utilizing Yen Q3 statistics, findings presented that Unified Tertiary Matriculation Examination (UTME) mathematics items for 2000, 2001, and 2003 years were as locally independent. Again, the result of this study negates the result of Okwilagwe and Ogunrinde (2017), who submitted that the relationship between an examinee's abilities and LII ensures that the likelihood of an examinee getting a test item right should not be subject to the response given to different items in the test.

Also, it was demonstrated that eight item pairs had intra-LID, i.e., LID within a group, and five bundles out of the fifteen bundles created based on the confirmatory approach (Douglas et al., 1996) had LID. These imply that items within and across item bundles correlated with each other. Whenever such correlation occurs, it invariably means that items provide a clue to each other, which is a clear violation of the assumption of IRT (i.e., LII assumption). In the submission of Christensen et al. (2016), a breach of the assumption of local independence can result from response dependency and multidimensionality, often referred to as LID.

Response dependency may occur when items are related somewhere such that the response on one item provides a clue to another. According to Li et al., (2012), LID can be caused by administering a set of items based on a familiar stimulus. LID may lead to an inappropriate judgment on the variance estimate of examinees' ability and produce biased

proficiency estimates leading to wrong selection and decision-making about the students. Yen (1993) proposed the causes of correlation between intra and inter-LID, including independent items, fatigue, practice, item or response format, and speediness. Other relevant causes are the content of items, item chaining (i.e., organisation of items in steps) and explanation arising out of previous answers, and stimulus dependence. However, the results of the research questions were supported by Yen (1984) that the unidimensional trait is a combination of correlated underlying characteristics is consistent with the fact that with the multiple-choice data, the more complicated items tended to have higher discriminations.

Conclusion and Recommendation

Intra and inter-LID are paramount in IRT since they might affect test scores' accuracy and validity. When analyzing test data, researchers must look for evidence of intra and inter-LID and take the necessary steps to address or account for it in the analyses and interpretations. Also, comprehensive evaluation of intra and inter-LID is critical to ensuring that IRT model findings appropriately reflect the examinee's ability while maintaining the test reliability and validity. Again, in any standardized examination, such as NECO, which determines candidates' academic future, the issue of LID should not be taken with flippancy because it can lead to overestimation or underestimation of a candidate's ability in a specific subject (mathematics) area - after that, jeopardizing the validity and reliability of the mathematics items. It was then suggested that testing bodies such as NECO consider intra and inter-LID, among other variables or factors that could hamper item quality.

Limitations of the study

Considering the data analyzed were responses from candidates from Osun State, Nigeria, the study's findings on LID may be restricted. Limited sample size may have insignificant statistical power to reliably discover significant correlations between item responses. Large and more diversified samples might improve the study capacity to identify LID consistently. In addition, the implications of LID should also be carefully considered by researchers, and measures should be taken to mitigate biases and improve item quality. Replicating the study with different samples, test formats, and IRT models can improve the findings' generalizability and contribute to a better understanding of LID in psychometric assessments.

Conflict of interest

The author declared no potential conflict of interest with respect to the research.

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APPENDIX

Correlation Matrix of the Residual of 2017 NECO Mathematics Items

IT1	IT2	IT3	IT4	IT5	IT6	IT7	IT8	IT9	IT10
IT1	1.00								
IT2	0.07	1.00							
IT3	0.08	0.02	1.00						
IT4	0.00	0.00	-0.05	1.00					
IT5	-0.04	0.14	0.03	0.04	1.00				
IT6	0.03	0.02	0.07	0.02	0.17	1.00			
IT7	0.02	0.03	0.08	0.04	0.10	0.03	1.00		
IT8	-0.06	0.03	0.04	0.02	0.15	0.09	**0.22**	1.00	
IT9	0.09	0.03	0.08	-0.07	0.03	0.01	0.11	0.08	1.00
IT10	-0.08	-0.01	0.00	0.07	0.05	0.05	0.02	0.09	0.09	1.00
IT11	-0.04	-0.12	-0.03	0.11	-0.04	0.00	0.02	0.05	-0.02	0.10
IT12	-0.01	-0.02	0.02	0.13	0.02	-0.03	-0.01	0.01	-0.07	0.09
IT13	-0.04	0.05	-0.08	-0.04	0.03	-0.02	0.01	0.01	0.00	-0.04
IT14	0.01	0.01	0.00	-0.09	-0.06	0.01	0.01	0.05	0.09	0.03
IT15	-0.06	0.01	-0.02	-0.03	0.01	-0.05	-0.02	-0.08	-0.02	-0.01
IT16	0.00	0.12	0.09	-0.09	0.06	0.02	0.01	0.04	0.05	0.01
IT17	-0.07	0.01	-0.04	0.03	0.01	-0.06	-0.10	-0.03	-0.08	0.08
IT18	0.02	0.02	-0.02	-0.01	0.07	0.03	0.04	-0.07	0.03	0.06
IT19	0.05	0.02	0.09	-0.01	0.03	0.07	0.02	0.02	0.07	0.08
IT20	0.06	0.00	0.02	-0.02	-0.04	0.00	0.03	0.00	0.02	-0.09
IT21	-0.03	-0.07	0.01	0.04	-0.07	-0.01	-0.05	0.01	-0.01	-0.03
IT22	0.02	0.00	-0.03	0.03	0.00	-0.04	0.03	0.03	0.01	-0.09
IT23	0.00	-0.09	0.05	0.06	-0.03	0.01	0.05	-0.06	-0.04	0.07
IT24	-0.01	0.03	0.08	-0.06	0.06	0.03	0.10	0.10	0.03	0.07
IT25	-0.03	-0.03	-0.05	0.02	-0.04	-0.02	-0.03	-0.08	-0.05	-0.01
IT26	-0.01	0.02	0.00	-0.03	0.05	0.04	0.06	0.00	0.02	-0.03
IT27	0.01	0.06	0.01	-0.07	0.02	0.02	0.05	-0.03	-0.01	-0.05
IT28	-0.05	-0.08	0.01	-0.01	-0.09	0.00	-0.04	0.02	0.02	0.09
IT29	-0.05	-0.03	-0.10	0.03	0.01	0.02	-0.04	0.00	0.02	0.04
IT30	-0.05	0.10	0.03	-0.06	0.12	0.04	-0.02	0.07	-0.04	0.03
IT31	-0.05	-0.06	-0.11	0.02	-0.09	-0.05	-0.06	-0.03	-0.09	0.04
IT32	0.04	0.08	-0.04	-0.17	0.00	-0.05	-0.03	-0.07	0.00	-0.13

IT33	0.00	0.06	0.03	-0.12	0.00	-0.06	-0.01	0.02	0.02	-0.11
IT34	-0.08	-0.06	-0.07	0.09	-0.05	-0.03	-0.08	-0.08	-0.09	0.03
IT35	-0.03	0.03	0.00	-0.06	0.07	0.04	0.00	0.00	0.00	-0.08
IT36	-0.02	-0.01	0.00	-0.10	-0.02	0.00	0.01	-0.03	0.00	-0.08
IT37	-0.03	-0.03	-0.09	-0.02	-0.10	-0.07	-0.06	-0.12	-0.05	-0.07
IT38	0.00	0.07	0.05	-0.17	0.05	0.02	-0.03	0.08	0.01	-0.07
IT39	-0.01	0.02	0.02	-0.05	0.09	0.04	0.03	0.04	0.03	-0.05
IT40	-0.04	-0.05	-0.06	-0.02	-0.08	-0.02	-0.08	-0.09	-0.13	-0.02
IT41	0.03	0.02	0.10	-0.11	0.03	-0.01	-0.03	0.06	0.04	-0.01
IT42	-0.02	-0.04	-0.05	-0.01	-0.02	-0.04	-0.09	-0.07	-0.14	-0.06
IT43	-0.12	-0.06	-0.03	0.09	-0.08	-0.07	-0.03	0.00	-0.09	0.00
IT44	0.07	-0.01	0.11	-0.10	0.03	0.03	-0.01	-0.02	0.04	-0.07
IT45	0.05	0.01	0.06	-0.09	0.00	0.02	-0.02	-0.08	0.01	-0.15
IT46	-0.09	-0.09	-0.03	0.06	-0.01	-0.05	-0.12	-0.06	-0.13	0.03
IT47	-0.11	0.01	-0.13	0.03	0.12	0.01	-0.04	-0.01	-0.01	0.07
IT48	-0.04	-0.04	0.07	0.01	0.04	0.04	-0.07	-0.02	-0.07	0.06
IT49	-0.04	0.05	0.12	-0.07	0.02	0.02	0.03	0.03	-0.01	-0.03
IT50	-0.03	-0.08	-0.02	-0.01	-0.06	-0.02	-0.12	-0.06	-0.10	0.00
IT51	0.00	-0.04	-0.02	-0.05	-0.01	0.01	-0.04	-0.01	0.00	-0.08
IT52	0.05	-0.02	0.00	-0.06	-0.02	0.02	-0.08	-0.09	-0.05	-0.08
IT53	-0.07	-0.05	-0.06	0.07	-0.01	0.02	-0.06	-0.02	-0.13	0.06
IT54	-0.01	0.09	-0.05	-0.11	0.01	-0.05	-0.05	-0.03	-0.01	-0.07
IT55	0.04	-0.01	0.04	-0.06	0.04	0.03	0.01	-0.05	0.06	-0.09
IT56	0.01	0.04	0.01	-0.12	0.01	0.00	-0.02	0.03	0.00	0.00
IT57	-0.02	0.05	-0.04	-0.08	0.03	0.00	-0.02	-0.03	0.00	-0.07
IT58	-0.01	0.01	-0.04	-0.08	0.03	0.02	-0.07	-0.02	-0.03	-0.11
IT59	0.10	-0.01	0.02	-0.06	0.01	0.02	-0.02	-0.08	0.06	-0.14
IT60	0.04	0.07	-0.07	-0.06	0.06	0.04	0.06	-0.07	0.06	-0.05

	IT11	IT12	IT13	IT14	IT15	IT16	IT17	IT18	IT19	IT20
IT11	1.00									
IT12	0.11	1.00								
IT13	-0.03	0.01	1.00							
IT14	0.03	-0.08	0.01	1.00						
IT15	-0.01	0.02	0.04	-0.02	1.00					
IT16	-0.05	-0.08	-0.04	0.11	0.02	1.00				
IT17	0.04	0.18	0.01	-0.05	0.05	0.00	1.00			
IT18	0.04	-0.02	0.07	-0.04	0.06	0.01	-0.03	1.00		
IT19	-0.01	-0.01	-0.05	0.01	-0.01	0.09	0.01	0.03	1.00	
IT20	-0.03	0.02	0.02	0.08	-0.01	0.00	0.01	-0.02	0.04	1.00
IT21	0.01	-0.09	-0.03	0.05	0.01	0.03	-0.02	-0.05	-0.03	-0.03
IT22	0.03	-0.05	0.03	0.03	-0.03	-0.04	-0.10	0.00	-0.02	0.02
IT23	0.01	-0.01	0.05	-0.08	0.02	-0.07	0.04	0.06	0.03	0.05
IT24	-0.01	-0.05	0.00	0.05	-0.07	0.08	-0.08	0.02	0.05	0.02
IT25	0.04	0.03	0.01	0.02	0.06	-0.02	-0.05	0.05	-0.06	-0.04
IT26	-0.01	0.00	0.02	-0.02	-0.02	-0.03	-0.04	0.15	0.01	0.02
IT27	-0.03	-0.04	0.02	-0.04	-0.01	0.02	-0.07	0.10	0.04	0.03

IT28	-0.02	-0.11	0.00	0.07	-0.04	0.04	-0.04	-0.11	-0.01	-0.03
IT29	0.03	-0.04	-0.01	-0.04	0.03	-0.06	-0.04	0.15	0.00	-0.05
IT30	-0.07	-0.01	0.01	0.00	-0.03	0.10	-0.02	0.09	0.06	-0.01
IT31	-0.05	-0.06	0.01	-0.08	-0.04	-0.12	0.04	-0.01	-0.04	-0.07
IT32	-0.15	-0.07	0.03	0.10	0.00	0.02	-0.07	-0.07	-0.03	0.05
IT33	-0.12	-0.04	0.06	0.02	-0.02	-0.02	-0.05	-0.05	-0.03	0.03
IT34	0.07	-0.01	0.06	-0.09	-0.02	-0.11	0.10	0.03	-0.06	-0.02
IT35	-0.07	-0.05	0.00	-0.01	-0.08	0.00	-0.07	0.01	0.01	-0.02
IT36	-0.15	-0.12	-0.01	0.00	-0.01	0.01	-0.08	-0.11	-0.03	0.02
IT37	-0.02	-0.09	0.01	-0.12	0.06	-0.01	0.00	0.01	-0.06	-0.07
IT38	-0.13	-0.11	0.00	0.06	-0.05	0.12	-0.05	-0.09	-0.01	-0.03
IT39	-0.08	-0.06	0.00	0.01	-0.08	0.09	-0.13	-0.03	0.03	-0.03
IT40	-0.04	-0.03	-0.02	-0.08	0.00	0.00	-0.02	0.00	-0.04	-0.06
IT41	-0.09	-0.05	-0.07	0.12	-0.04	0.04	-0.11	-0.01	0.03	-0.01
IT42	-0.12	0.05	-0.05	-0.10	0.02	-0.09	0.01	-0.05	-0.06	-0.12
IT43	0.04	0.01	-0.03	-0.07	-0.03	-0.12	-0.11	0.00	-0.08	-0.09
IT44	-0.07	-0.04	0.02	0.00	-0.01	-0.02	0.01	-0.02	-0.01	0.06
IT45	-0.14	-0.13	-0.01	0.02	-0.07	-0.01	-0.15	-0.03	0.05	0.05
IT46	0.05	-0.02	0.03	-0.15	-0.01	-0.05	0.05	0.05	-0.05	-0.16
IT47	0.02	-0.04	0.06	-0.07	0.01	-0.06	-0.02	**0.27**	-0.02	-0.05
IT48	-0.01	-0.05	-0.07	-0.13	-0.04	0.01	-0.03	0.06	0.02	-0.14
IT49	-0.12	-0.08	-0.07	-0.03	0.00	0.08	-0.12	0.01	0.07	-0.09
IT50	-0.01	-0.01	0.04	-0.10	-0.10	-0.04	-0.02	-0.08	-0.04	-0.10
IT51	-0.03	-0.06	-0.01	-0.05	-0.04	-0.08	0.01	0.01	0.02	-0.03
IT52	-0.09	-0.05	-0.02	-0.01	-0.08	-0.03	-0.07	-0.05	-0.01	-0.03
IT53	0.09	0.03	0.03	-0.07	-0.04	-0.06	-0.02	0.00	0.01	-0.10
IT54	-0.12	-0.03	-0.01	0.04	-0.05	-0.04	-0.03	-0.05	-0.03	0.00
IT55	-0.10	-0.05	-0.02	-0.11	0.04	-0.03	-0.10	0.06	0.06	0.09
IT56	-0.04	-0.05	0.00	0.06	-0.12	0.04	0.00	-0.09	0.04	-0.02
IT57	-0.12	-0.04	0.03	-0.06	-0.06	-0.05	-0.10	-0.01	-0.02	0.00
IT58	-0.05	-0.08	0.00	0.05	-0.08	0.00	-0.06	-0.04	-0.01	0.02
IT59	-0.02	-0.04	-0.07	0.03	-0.10	0.02	-0.14	-0.10	0.02	0.04
IT60	-0.08	-0.09	0.02	0.04	0.03	-0.01	-0.08	0.15	0.04	0.05

	IT21	IT22	IT23	IT24	IT25	IT26	IT27	IT28	IT29	IT30
IT21	1.00									
IT22	0.07	1.00								
IT23	0.05	-0.01	1.00							
IT24	-0.06	0.14	0.00	1.00						
IT25	0.02	-0.03	-0.01	-0.06	1.00					
IT26	-0.08	0.11	0.06	0.15	-0.04	1.00				
IT27	-0.15	0.03	0.04	0.09	-0.02	0.38	1.00			
IT28	**0.25**	-0.01	0.15	0.05	-0.02	-0.09	-0.12	1.00		
IT29	-0.15	0.00	-0.04	0.02	-0.03	0.10	0.01	-0.04	1.00	
IT30	-0.03	0.01	-0.05	0.11	-0.02	0.10	0.12	0.02	-0.06	1.00
IT31	0.05	-0.06	0.04	-0.05	0.00	-0.05	-0.10	0.05	0.06	-0.05
IT32	-0.04	-0.01	-0.06	-0.01	0.03	-0.05	0.02	-0.05	-0.08	0.03

IT33	-0.09	0.06	-0.05	0.07	0.03	-0.04	-0.02	-0.06	-0.06	0.02
IT34	0.04	0.01	0.07	-0.05	0.02	-0.01	-0.01	-0.02	0.06	-0.07
IT35	-0.03	0.02	-0.04	0.01	0.00	0.06	0.06	-0.06	-0.03	0.09
IT36	-0.09	-0.05	-0.07	-0.01	-0.05	-0.05	0.08	0.01	0.05	-0.03
IT37	-0.01	-0.08	-0.12	-0.16	0.04	-0.12	0.00	-0.03	-0.06	-0.03
IT38	0.02	-0.04	-0.19	0.02	-0.05	-0.08	-0.12	0.00	-0.04	0.09
IT39	-0.07	-0.05	-0.03	0.03	-0.03	0.02	0.04	-0.04	-0.05	0.06
IT40	0.00	-0.12	-0.03	-0.09	0.03	-0.03	0.07	-0.01	0.07	0.03
IT41	0.02	-0.01	-0.09	0.05	-0.02	-0.04	-0.09	-0.06	-0.07	0.03
IT42	-0.06	-0.11	-0.05	-0.10	0.06	-0.10	-0.06	-0.07	0.03	-0.05
IT43	0.02	0.03	0.02	-0.04	0.04	-0.07	-0.14	0.05	0.04	-0.12
IT44	0.09	-0.02	0.16	-0.02	-0.02	-0.01	-0.03	0.10	-0.13	-0.03
IT45	-0.05	-0.02	0.04	-0.03	-0.04	-0.03	0.01	0.01	-0.05	-0.01
IT46	0.00	-0.08	0.11	-0.07	0.01	-0.07	-0.09	0.00	-0.02	-0.07
IT47	-0.14	-0.02	0.04	0.05	0.01	0.15	0.03	-0.11	**0.26**	0.01
IT48	0.02	-0.07	0.07	0.03	-0.02	-0.01	-0.02	0.00	0.04	-0.01
IT49	-0.01	-0.01	-0.07	0.07	-0.02	0.03	0.00	-0.02	0.03	0.03
IT50	0.03	-0.07	-0.01	-0.10	0.01	-0.08	-0.09	0.06	0.02	-0.07
IT51	0.00	-0.01	0.00	-0.04	-0.04	0.02	0.04	-0.03	0.03	-0.01
IT52	-0.06	-0.04	-0.01	-0.06	0.01	-0.01	-0.01	-0.06	0.01	-0.04
IT53	-0.06	-0.11	-0.01	-0.05	-0.01	-0.06	-0.03	-0.04	0.00	-0.03
IT54	-0.06	-0.03	-0.10	-0.06	0.02	-0.06	-0.05	-0.08	-0.07	0.02
IT55	-0.08	0.01	0.10	0.02	-0.01	0.16	0.16	-0.08	0.11	-0.04
IT56	-0.05	-0.07	-0.09	0.01	-0.05	-0.06	-0.02	-0.02	-0.01	-0.02
IT57	-0.06	-0.01	-0.01	-0.03	0.02	0.01	0.05	-0.03	-0.01	0.03
IT58	0.01	-0.01	-0.09	-0.05	0.00	-0.02	-0.02	-0.06	-0.03	0.03
IT59	-0.04	0.01	-0.03	-0.02	0.00	-0.01	-0.01	-0.06	-0.05	-0.04
IT60	-0.16	-0.02	-0.02	0.00	0.01	0.12	0.13	-0.14	0.15	0.00

	IT31	IT32	IT33	IT34	IT35	IT36	IT37	IT38	IT39	IT40
IT31	1.00									
IT32	-0.01	1.00								
IT33	-0.06	0.20	1.00							
IT34	0.06	-0.10	-0.10	1.00						
IT35	-0.04	0.06	0.01	-0.03	1.00					
IT36	-0.03	0.05	0.01	-0.05	0.10	1.00				
IT37	0.03	0.00	0.00	-0.01	-0.06	0.11	1.00			
IT38	-0.04	0.08	0.08	-0.14	0.00	0.13	0.04	1.00		
IT39	-0.09	0.00	-0.01	-0.11	0.05	0.10	-0.01	**0.23**	1.00	
IT40	0.01	-0.04	-0.19	0.07	-0.02	0.12	0.07	-0.07	0.02	1.00
IT41	-0.10	0.14	0.11	-0.15	-0.02	-0.01	-0.05	0.13	0.13	-0.03
IT42	0.00	-0.02	0.00	-0.04	-0.07	-0.02	0.04	0.00	-0.05	0.11
IT43	0.00	-0.16	-0.04	0.05	-0.08	-0.14	0.02	-0.12	-0.06	0.00
IT44	-0.01	0.00	-0.04	-0.07	0.05	0.04	-0.08	0.00	0.02	-0.11
IT45	-0.06	0.04	0.06	-0.09	0.02	0.04	-0.10	-0.01	0.02	-0.09
IT46	0.01	-0.15	-0.10	0.06	-0.09	-0.14	-0.07	-0.13	-0.08	0.01

IT47	0.02	-0.09	-0.08	0.04	0.01	-0.10	-0.09	-0.04	-0.01	-0.04
IT48	-0.04	-0.15	-0.13	0.04	-0.06	-0.08	-0.08	-0.07	0.01	0.06
IT49	-0.08	0.01	0.04	-0.10	-0.01	-0.02	-0.07	0.09	0.07	-0.10
IT50	0.05	-0.09	-0.15	0.01	-0.07	-0.02	-0.04	-0.05	-0.08	0.02
IT51	0.00	-0.02	-0.03	-0.06	0.03	-0.02	-0.04	-0.04	-0.03	-0.06
IT52	-0.03	-0.02	-0.01	-0.09	-0.03	-0.06	-0.08	-0.03	-0.01	-0.04
IT53	0.04	-0.17	-0.16	0.04	-0.04	-0.08	0.02	-0.07	-0.03	0.05
IT54	-0.10	0.12	0.09	-0.09	-0.02	-0.07	0.01	0.03	-0.03	-0.13
IT55	-0.03	0.04	-0.01	-0.02	0.09	0.10	-0.08	-0.08	0.03	0.00
IT56	0.01	0.01	0.03	-0.05	0.02	0.01	-0.06	0.10	0.01	-0.11
IT57	-0.05	-0.02	-0.05	-0.04	0.06	-0.01	-0.09	-0.05	-0.04	-0.05
IT58	-0.08	0.10	0.07	-0.14	-0.01	-0.07	-0.04	0.06	0.01	-0.10
IT59	-0.10	0.06	0.04	-0.11	0.00	-0.01	-0.08	0.05	0.09	-0.04
IT60	-0.05	0.08	0.03	-0.11	0.05	0.02	0.00	-0.02	0.01	-0.06

	IT41	IT42	IT43	IT44	IT45	IT46	IT47	IT48	IT49	IT50
IT41	1.00									
IT42	0.03	1.00								
IT43	0.03	0.09	1.00							
IT44	-0.01	-0.07	-0.03	1.00						
IT45	0.02	-0.03	-0.06	0.10	1.00					
IT46	-0.05	0.06	0.16	0.04	0.00	1.00				
IT47	-0.09	0.00	0.01	-0.06	-0.04	0.18	1.00			
IT48	0.05	0.01	0.06	0.01	-0.03	0.19	0.12	1.00		
IT49	0.10	-0.02	-0.02	-0.02	0.09	0.00	-0.03	0.16	1.00	
IT50	-0.11	0.01	0.04	-0.02	0.00	0.11	0.00	0.11	0.01	1.00
IT51	-0.06	-0.07	-0.07	0.05	0.03	-0.02	-0.01	-0.06	0.00	0.03
IT52	-0.02	-0.05	-0.03	0.00	0.08	-0.02	-0.05	-0.03	0.08	0.05
IT53	-0.07	-0.02	0.07	-0.04	-0.08	0.10	-0.01	0.12	0.00	0.09
IT54	0.05	0.01	-0.03	0.01	0.01	-0.05	0.02	-0.10	0.03	-0.03
IT55	-0.02	-0.02	-0.13	0.20	0.06	-0.05	0.15	0.02	0.07	-0.12
IT56	0.00	-0.06	-0.16	0.01	0.01	-0.06	-0.09	0.00	0.04	0.03
IT57	-0.04	-0.05	-0.09	0.02	0.05	-0.02	0.04	-0.06	0.00	0.03
IT58	0.05	-0.06	-0.06	-0.01	0.05	-0.11	0.07	-0.10	-0.02	-0.04
IT59	0.05	0.04	-0.08	-0.06	0.06	-0.16	-0.08	-0.06	0.01	-0.05
IT60	-0.01	-0.02	-0.10	-0.02	0.06	-0.12	**0.29**	-0.07	-0.01	-0.10

	IT51	IT52	IT53	IT54	IT55	IT56	IT57	IT58	IT59	IT60
IT51	1.00									
IT52	**0.24**	1.00								
IT53	0.03	0.14	1.00							
IT54	0.04	0.08	-0.02	1.00						
IT55	0.08	0.08	-0.03	0.06	1.00					
IT56	0.03	0.06	0.07	0.08	0.03	1.00				
IT57	0.03	0.11	0.01	0.10	0.10	0.16	1.00			
IT58	0.04	0.07	-0.10	0.15	0.01	0.05	0.16	1.00		
IT59	0.03	0.06	-0.08	0.04	0.03	0.07	0.09	**0.22**	1.00	
IT60	0.03	0.03	-0.09	0.12	0.16	0.04	0.09	0.18	0.11	1.00