



LNAT

Technical Report
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Prepared by:
Stefan Bondorowicz. DPhil.

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Scope of Work

This technical report provides statistical information regarding the administration of the LNAT examination. The dates of administration were 1st September 2014 – 30th June 2015. A summary of the statistical analyses for candidates, exam results and items are presented in this report.

Executive Summary

The LNAT examination was completed by 6,992 candidates during the period of 1st September 2014 – 30th June 2015. Item calibration and form equating were carried out in October 2014 with a sample size of 622 candidates who had sat the examination between 1st September 2014 and 4th October 2014. After calibrating the items and equating the forms based on the results of this sample, Scale Score tables were prepared to provide comparable Standard Scores for each candidate.

On completion of the 2014–2015 examination, analysis was carried out on the data from all candidates who had sat the examination during this period. The report that follows gives a detailed analysis of candidate, examination and item data. Arising out of this analysis, the following conclusions are drawn:-

- The results of the equating were successful.
- Reliability of the LNAT examination was moderately good, ranging between 0.64 and 0.76, given the small number of items on each form.
- Some items did not perform as well as expected. These items will be discussed with the item writers to help improve the item writing process.

Background

The LNAT examination is a Critical Thinking test administered to candidates applying to study law at universities that comprise the LNAT consortium. Pearson VUE has been administering the LNAT examination since 2005. The examination is administered from September 1st – June 30th each year via the Pearson VUE CBT platform. The 2014–2015 examination was a 2-part examination with the first section consisting of 5 examination forms consisting of 12 passages of text with 6 passages consisting of 3 multiple-choice items each and 6 passages consisting of 4 multiple-choice items - a total of 42 items per form. The examination length for this section was 80 minutes. The second part of the examination consisted of an essay question for which 40 minutes was allowed. The essay question is not marked and therefore this report pertains solely to the multiple-choice section of the examination.

Demographics

Tables 11–16 in Appendix 1 provide a breakdown of the total cohort of 6,992 candidates into the various demographic groupings. Over 60% of the candidates were female with the majority of candidates aged 18 or under. In terms of education, over half of candidates (57.4%) were educated in the UK and the largest educational establishment group (18.3%) was for Sixth Form Colleges.

Examination Statistics

The LNAT examination consists of 12 passages of text, 6 passages with 3 multiple-choice items per passage and 6 with 4 multiple-choice passages. This means that the raw score range for the examination is 0–42. To maintain examination security, 5 different examination forms are randomly selected for presentation to candidates. Table 1 below gives descriptive statistics for the raw scores on each of these 5 forms.

Table 1: Raw Score Descriptive Statistics

ExamForm	Mean	SD	Minimum	Maximum	SEM	Alpha	N
FormA1	24.12	5.68	0	38	2.8	0.76	1380
FormB1	21.50	5.40	6	38	2.85	0.72	1375
FormC1	22.46	4.73	4	34	2.83	0.64	1402
FormD1	22.72	5.34	7	38	2.85	0.71	1424
FormE1	24.22	5.70	8	37	2.85	0.75	1411

As can be seen from the above table, the average raw scores on these forms ranged from 21.50–24.22.

Test Score Reliability

Table 1 also displays the Alpha coefficient, indicating the reliability of the test scores, for each form. Reliability indicates how stable or consistent a test score is. Because of the inherent variation in human performance, test scores will always reflect some degree of measurement error. Reliability indices quantify how much measurement error the test scores contain. Coefficient Alpha, the most widely used measure of internal reliability, is given by:

$$\alpha = \frac{k}{k - 1} \left(1 - \frac{\sum \sigma_i^2}{\sigma_x^2} \right)$$

:

Where:

k = the number of items in the test

σ_i^2 = the variance of item i

σ_x^2 = the total variance of the test

The valid range of Coefficient Alpha is from -1.0 to +1.0. Larger alpha values indicate a more reliable test. Reliability values over 0.80 are generally regarded as sufficiently reliable.

The LNAT exam reliability coefficients were moderate with a Coefficient Alpha range of 0.64 to 0.76. Reliability coefficients above 0.8 are desirable for these types of examinations. One of the main reasons for the moderate reliability of the LNAT examination is the small number of items; all things being equal, longer examinations will be more reliable.

Scale Scores

Table 1 demonstrates that there is a difference in difficulty between the 5 LNAT forms with candidates finding Form B1 more difficult than Form E1 (an average difference of 2.7 raw score points). To ensure no candidate is disadvantaged by sitting a harder test form than other candidates, it is necessary to equate the scores on the 5 examination forms. For LNAT this takes the form of a 2-step process: first, all of the examination items are calibrated by means of Rasch scaling using the Winsteps software application. Once all items are calibrated onto the same scale, the scores are equated across forms and the individual raw scores are translated to a new scale score.

Table 2: Scale Scores per Form

Form	Mean	SD	Min	Max	N
FormA1	22.37	5.46	0	37	1380
FormB1	22.24	5.12	6	38	1375
FormC1	22.46	4.73	4	34	1402
FormD1	22.71	5.32	7	37	1424
FormE1	22.33	5.50	7	35	1411

Table 2 above shows the descriptive statistics for the new scaled scores. As can be seen the calibration/equating procedures have resulted in each examination form being of approximately equal difficulty, with just a difference of 0.47 scale score points between the two extreme forms.

Impact Analysis

It is important that a test is fair to all candidates and is not biased against a sub-set of the candidate population. Test bias can result from a particular test measuring factors that are irrelevant to the construct being measured. This section provides details on the average score for various demographic breakdowns of the LNAT candidate population. It should be stressed that differences between demographic groups do not necessarily indicate test bias but may be due to factors important to the construct being measured e.g. lack of knowledge.

Table 3: Scale Score by Gender

Gender	Mean	SD	Minimum	Maximum	SE	N
Female	21.94	5.13	4	38	0.08	4389
Male	23.24	5.31	0	37	0.10	2603

The above table shows a small difference in average scores with males slightly outperforming females.

Table 4: Scale Score by Age Group

Candidate Age Group	Mean	SD	Minimum	Maximum	SE	N
16–21	22.39	5.15	4	38	0.06	6558
22–34	23.15	6.39	0	37	0.34	363
35–65	20.61	6.66	10	33	0.98	46
Missing	24.56	4.73	15	36	0.95	25

Table 4 shows small differences between candidate age groups with the 22–34 group scoring slightly higher on average.

Table 5: Scale Score by Education

Education Group	Mean	SD	Minimum	Maximum	SE	N
Educated in the UK	22.16	5.08	0	37	0.08	4011
Educated outside the UK	22.65	5.39	4	38	0.11	2282
Not in Education	23.87	5.71	4	35	0.37	242
Missing	22.89	5.27	8	35	0.25	457

Only small scale score differences are evident between where candidates were educated.

Table 6: Scale Score by Educational Establishment

UK Education	Mean	SD	Minimum	Maximum	SE	N
Academy or City College	21.97	5.27	8	36	0.30	305
College of Further Education	20.35	5.41	7	34	0.28	384
Comprehensive	22.74	4.76	7	37	0.19	607
Grammar	23.74	4.61	0	36	0.20	529
Independent	23.48	5.01	6	36	0.19	722
Sixth Form College	21.18	5.08	8	36	0.14	1283
Other	21.61	5.27	6	34	0.33	260
Missing	22.79	5.34	4	38	0.10	2902

Table 6 shows that candidates from Grammar Schools scored highest on the LNAT, while candidates from Colleges of Further Education scored lowest.

Table 7: Scale Score by Householder Occupation

Occupation Group	Mean	SD	Minimum	Maximum	SE	N
Administrative or Service	21.79	4.91	8	36	0.19	658
Manual or Trade	21.19	5.38	4	35	0.25	471
Professional or Technician	22.97	4.96	8	38	0.19	712
Senior Manager or Official	22.42	5.03	6	36	0.14	1300
Senior Professional	23.39	5.28	0	36	0.15	1304
Not Currently Employed	20.89	5.41	6	34	0.22	627
Missing	22.58	5.26	6	36	0.12	1920

Table 7 shows that the lowest scoring candidates are those who indicate Not Currently Employed for their household, while the highest scoring candidates are from Senior Professional households.

Table 8: Scale Score by Ethnicity

Ethnic Group	Mean	SD	Minimum	Maximum	SE	N
Asian	21.92	5.38	8	36	0.12	2003
Black	20.11	5.23	4	35	0.25	455
Mixed	22.63	5.12	8	34	0.29	309
Other	20.01	5.25	8	35	0.34	235
White	23.07	4.95	0	38	0.09	3359
No Information	22.09	6.19	7	33	0.67	85
Missing	23.19	5.26	7	36	0.23	546

Table 8 shows that candidates from the Other category were the lowest scorers, while white candidates were the highest scorers.

Item Statistics

This section of the report looks at the LNAT examination at the item level.

Table 9: Average Item Difficulty per Form

	Mean	SD	Min	Max	N
Form A	0.58	0.21	0.05	0.95	42
Form B	0.51	0.21	0.14	0.95	42
Form C	0.54	0.23	0.10	0.89	42
Form D	0.54	0.21	0.25	0.86	42
Form E	0.58	0.19	0.24	0.96	42

The above table shows the average item difficulty for each of the forms. Item difficulty values indicate the proportion of candidates who answered an item correctly. Table 9 shows that Form B had the hardest average item difficulty with a mean value of 0.51 (51%), whilst Forms A & E had the easiest average difficulty of 0.58 (58%). With an average difficulty across the 5 forms of 0.55, candidates found this examination fairly difficult and the exam might benefit from a better spread of item difficulties.

Table 10: Item-Total Correlation per Form

	Mean	SD	Min	Max	N
Form A	0.22	0.11	-0.06	0.39	42
Form B	0.20	0.11	-0.17	0.38	42
Form C	0.16	0.10	-0.04	0.36	42
Form D	0.20	0.11	-0.16	0.37	42
Form E	0.22	0.13	-0.11	0.48	42

Table 10 displays the corrected item-total correlation statistics for each form. The item-total correlation ranges between -1 & +1 with a high positive value indicating that candidates answering an item correctly are also scoring highly on the overall test, while low or negative values indicate there was little relationship between the response to an item and the overall score achieved by the candidate.

Tables 17–21 in Appendix 2 provide item analysis statistics for each of the 5 LNAT forms. For each item the tables show the item difficulty, the proportion of candidates answering the item correctly and the corrected item-total correlation, the correlation between answering the item correctly and the candidates' overall score on the test.

Appendix 1 – Demographic Breakdown of Candidate Totals

Table 11: Gender

	Frequency	Proportion
Female	4389	0.63
Male	2603	0.37

Table 12: Age Group

	Frequency	Proportion
16–21	6558	0.94
22–34	363	0.05
35–65	46	0.01
Missing	25	0.00

Table 13: Education

	Frequency	Proportion
Educated in the UK	4011	0.57
Educated outside the UK	2282	0.33
Not in Education	242	0.03
Information Not Supplied	457	0.07

Table 14: Educational Establishment

	Frequency	Proportion
Academy or City College	305	0.04
College of Further Education	384	0.05
Comprehensive	607	0.09
Grammar	529	0.08
Independent	722	0.10
Sixth Form College	1283	0.18
Other	260	0.04
Missing	2902	0.42

Table 15: Householder Occupation

	Frequency	Proportion
Administrative or Service	658	0.09
Manual or Trade	471	0.07
Professional or Technician	712	0.10
Senior Manager or Official	1300	0.19
Senior Professional	1304	0.19
Not Currently Employed	627	0.09
Missing	1920	0.27

Table 16: Ethnicity

	Frequency	Proportion
Asian	2003	0.29
Black	455	0.07
Mixed	309	0.04
Other	235	0.03
White	3359	0.48
Information Refused	85	0.01
Missing	546	0.08

Appendix 2 – Item Analysis by Forms

Table 17: Form A Item Analysis

	N	P-Value	Item-Total Correlation
pas157i1	1376	0.54	0.32
pas157i2	1375	0.38	-0.05
pas157i3	1374	0.60	0.27
pas157i4	1372	0.56	0.25
pas227i1	1375	0.34	0.22
pas227i2	1374	0.53	0.33
pas227i3	1374	0.46	0.34
pas227i4	1373	0.33	0.23
pas238i1	1374	0.48	0.17
pas238i2	1371	0.33	0.21
pas238i3	1371	0.71	0.34
pas275i1	1375	0.83	0.22
pas275i2	1372	0.95	0.21
pas275i3	1370	0.68	0.10
pas275i4	1370	0.80	0.28
pas276i1	1377	0.55	0.37
pas276i2	1372	0.85	0.27
pas276i3	1368	0.47	0.25
pas276i4	1368	0.35	0.15
pas278i1	1377	0.70	0.39
pas278i2	1376	0.10	-0.06
pas278i3	1375	0.89	0.31
pas278i4	1375	0.21	0.14
pas281i1	1378	0.60	0.01
pas281i2	1377	0.52	0.27
pas281i3	1375	0.51	0.11
pas286i1	1377	0.73	0.21
pas286i2	1374	0.70	0.22
pas286i3	1370	0.66	0.21
pas290i1	1377	0.69	0.33
pas290i2	1371	0.67	0.34
pas290i3	1370	0.75	0.27
pas293i1	1373	0.57	0.23
pas293i2	1373	0.05	-0.01
pas293i3	1372	0.79	0.32
pas295i1	1376	0.67	0.19
pas295i2	1374	0.74	0.22
pas295i3	1374	0.41	0.22
pas295i4	1373	0.72	0.12
pas313i1	1375	0.78	0.14
pas313i2	1374	0.28	0.26
pas313i3	1371	0.75	0.33

Table 18: Form B Item Analysis

	N	P-Value	Item-Total Correlation
pas169i1	1370	0.47	0.31
pas169i2	1367	0.36	0.34
pas169i3	1367	0.64	0.28
pas169i4	1364	0.47	0.08
pas227i1	1374	0.38	0.18
pas227i2	1373	0.55	0.32
pas227i3	1372	0.42	0.31
pas227i4	1371	0.31	0.21
pas230i1	1373	0.82	0.19
pas230i2	1373	0.86	0.22
pas230i3	1372	0.44	0.12
pas277i1	1373	0.84	0.26
pas277i2	1372	0.26	0.21
pas277i3	1372	0.48	0.19
pas277i4	1368	0.44	0.24
pas285i1	1371	0.85	0.18
pas285i2	1370	0.64	0.33
pas285i3	1365	0.52	0.02
pas296i1	1372	0.40	0.17
pas296i2	1371	0.38	0.25
pas296i3	1369	0.76	0.32
pas299i1	1372	0.47	0.30
pas299i2	1372	0.14	-0.17
pas299i3	1372	0.68	0.15
pas299i4	1372	0.30	0.15
pas301i1	1373	0.72	0.19
pas301i2	1372	0.30	0.18
pas301i3	1371	0.24	0.11
pas301i4	1369	0.42	0.22
pas302i1	1373	0.39	0.18
pas302i2	1371	0.47	0.27
pas302i3	1371	0.24	0.31
pas307i1	1371	0.95	0.19
pas307i2	1370	0.86	0.14
pas307i3	1368	0.65	0.16
pas316i1	1372	0.52	0.36
pas316i2	1370	0.66	0.17
pas316i3	1369	0.31	-0.05
pas319i1	1372	0.79	0.38
pas319i2	1369	0.69	0.24
pas319i3	1369	0.19	0.16
pas319i4	1367	0.26	0.06

Table 19: Form C Item Analysis

	N	P-Value	Item-Total Correlation
pas176i1	1400	0.76	0.24
pas176i2	1400	0.52	0.26
pas176i3	1400	0.19	0.14
pas176i4	1399	0.62	0.08
pas230i1	1398	0.85	0.18
pas230i2	1396	0.86	0.20
pas230i3	1394	0.43	0.14
pas239i1	1402	0.84	0.05
pas239i2	1401	0.53	0.34
pas239i3	1400	0.43	0.21
pas239i4	1398	0.68	0.16
pas279i1	1400	0.60	0.17
pas279i2	1399	0.38	0.06
pas279i3	1396	0.41	0.15
pas280i1	1399	0.11	-0.04
pas280i2	1397	0.80	0.23
pas280i3	1395	0.61	0.29
pas280i4	1393	0.42	0.05
pas284i1	1397	0.71	0.28
pas284i2	1397	0.66	0.15
pas284i3	1397	0.73	0.36
pas288i1	1400	0.82	0.15
pas288i2	1398	0.50	0.20
pas288i3	1396	0.62	0.12
pas297i1	1399	0.10	0.04
pas297i2	1399	0.38	0.08
pas297i3	1396	0.58	0.22
pas297i4	1394	0.39	0.18
pas298i1	1399	0.89	0.23
pas298i2	1399	0.44	0.01
pas298i3	1396	0.40	0.15
pas300i1	1401	0.37	0.09
pas300i2	1400	0.84	0.30
pas300i3	1398	0.15	0.01
pas300i4	1398	0.37	0.08
pas311i1	1398	0.59	0.16
pas311i2	1396	0.39	0.00
pas311i3	1393	0.10	-0.01
pas318i1	1400	0.75	0.28
pas318i2	1399	0.88	0.30
pas318i3	1399	0.34	0.10
pas318i4	1398	0.47	0.23

Table 20: Form D Item Analysis

	N	P-Value	Item-Total Correlation
pas139i1	1421	0.35	0.16
pas139i2	1419	0.29	0.10
pas139i3	1418	0.30	0.22
pas139i4	1412	0.86	0.27
pas239i1	1420	0.84	0.08
pas239i2	1419	0.54	0.32
pas239i3	1419	0.45	0.24
pas239i4	1418	0.66	0.28
pas242i1	1418	0.71	0.33
pas242i2	1417	0.85	0.35
pas242i3	1417	0.40	0.29
pas282i1	1421	0.72	0.21
pas282i2	1421	0.28	0.06
pas282i3	1418	0.56	0.10
pas287i1	1417	0.43	0.15
pas287i2	1416	0.40	-0.16
pas287i3	1415	0.31	0.08
pas289i1	1421	0.72	0.13
pas289i2	1419	0.36	0.18
pas289i3	1418	0.34	0.01
pas289i4	1412	0.28	0.10
pas304i1	1417	0.47	0.34
pas304i2	1413	0.78	0.28
pas304i3	1410	0.70	0.32
pas305i1	1421	0.72	0.17
pas305i2	1420	0.82	0.16
pas305i3	1418	0.81	0.12
pas306i1	1420	0.84	0.36
pas306i2	1417	0.86	0.32
pas306i3	1415	0.35	0.13
pas306i4	1415	0.84	0.15
pas308i1	1421	0.51	0.15
pas308i2	1418	0.61	0.17
pas308i3	1414	0.39	0.15
pas309i1	1421	0.33	0.27
pas309i2	1421	0.25	0.15
pas309i3	1420	0.46	0.34
pas309i4	1416	0.60	0.21
pas315i1	1422	0.28	0.14
pas315i2	1417	0.26	0.22
pas315i3	1416	0.61	0.29
pas315i4	1414	0.65	0.37

Table 21: Form E Item Analysis

	N	P-Value	Item-Total Correlation
pas142i1	1409	0.44	0.15
pas142i2	1408	0.67	0.28
pas142i3	1407	0.56	0.15
pas142i4	1407	0.33	0.12
pas238i1	1410	0.50	0.13
pas238i2	1409	0.31	0.22
pas238i3	1406	0.69	0.35
pas242i1	1409	0.68	0.35
pas242i2	1408	0.86	0.39
pas242i3	1408	0.38	0.30
pas274i1	1409	0.78	0.12
pas274i2	1408	0.81	0.37
pas274i3	1407	0.31	0.21
pas274i4	1404	0.66	0.19
pas283i1	1406	0.62	0.31
pas283i2	1405	0.68	0.18
pas283i3	1400	0.80	0.27
pas291i1	1409	0.53	0.23
pas291i2	1409	0.56	0.38
pas291i3	1408	0.55	0.21
pas291i4	1407	0.60	0.47
pas292i1	1408	0.24	0.03
pas292i2	1407	0.34	0.14
pas292i3	1405	0.51	0.07
pas292i4	1404	0.26	0.07
pas294i1	1409	0.61	-0.11
pas294i2	1408	0.48	0.27
pas294i3	1407	0.71	0.35
pas294i4	1406	0.89	0.27
pas303i1	1409	0.63	0.23
pas303i2	1409	0.43	0.01
pas303i3	1408	0.24	0.12
pas310i1	1408	0.60	0.26
pas310i2	1405	0.32	0.22
pas310i3	1399	0.96	0.18
pas312i1	1411	0.76	0.48
pas312i2	1410	0.46	0.37
pas312i3	1409	0.63	0.40
pas312i4	1406	0.60	0.22
pas317i1	1409	0.62	0.12
pas317i2	1407	0.95	0.13
pas317i3	1406	0.71	0.16

