



**Evidence for
Excellence in
Education**

Report

Renaissance Learning Star Reading norming

Technical report

**National Foundation for Educational
Research (NFER)**

Restricted



Sampling for Star Reading norming

1 – Data preparation

The initial dataset included 6,959,105 cases from the whole of the United Kingdom, with the vast majority (91%) from England. The tests reported in the data were taken during the academic years 2014/15, 2015/16 and 2016/17, with more than 2 million cases in each year.

Table 1 - Number and percentage of cases by nation in original dataset

Nation	No. Cases	%
England	6,347,088	91%
Northern Ireland	341,649	5%
Scotland	178,641	3%
Wales	91,727	1%
TOTAL	6,959,105	

In order to account for age differences as well as differences related to the length of schooling, the sample was split by year group and term, and norming was carried out individually for each year group and term. In order to correctly allocate each case, the following steps were taken:

- based on the reported age at the time of the test, each case was cross-checked against the reported year groups
- students whose age was outside the normal range for their corresponding year group were dropped; this was carried out accounting for the different age ranges for the different school systems within the UK (48,101 cases were dropped at this stage)
- each case was allocated to a year group comparable across the four nations, with the numbering following the English and Welsh system (table 2 shows the correspondence between year groups for the different school systems)

Furthermore, in order to account for gender, and maintain a balance between males and females in the norming samples, all cases with unreported gender were dropped (849,050 cases across all year groups and terms).

Lastly, in order to limit potential effects due to students taking the test multiple times within a short period, only the first attempt by each student in each term was included. This means that students can have multiple records only if they are from different terms or school years. This resulted in the exclusion of 1,636,622 cases, across all year groups and terms.

Table 2 - Correspondence between year groups across nations

England/Wales	Scotland	Northern Ireland
Reception	Primary 1	Year 1
Year 1	Primary 2	Year 2
Year 2	Primary 3	Year 3
Year 3	Primary 4	Year 4
Year 4	Primary 5	Year 5
Year 5	Primary 6	Year 6
Year 6	Primary 7	Year 7
Year 7	Secondary 1	Year 8
Year 8	Secondary 2	Year 9
Year 9	Secondary 3	Year 10
Year 10	Secondary 4	Year 11
Year 11	Secondary 5	Year 12
Year 12	Secondary 6	Year 13
Year 13		Year 14

Table 3 shows the correspondence between calendar months and school terms across the four nations. Note that this is an approximation, as the end of spring term and beginning of summer term change year on year depending on when the Easter holydays fall each year. Additionally, because the Academic Year in Scotland Starts in August, while it Starts in September for the other three nations, August is part of the autumn term for Scotland, and part of the summer term for the other nations.

Table 3 - Correspondence between calendar months and terms

Term	Months
Autumn	August (Scotland only) September October November December
Spring	January February March April
Summer	May June July August (England, Wales and Northern Ireland)

The resulting distribution of cases by year group and term in the final set of records, from which the norming samples were drawn, is reported in table 4. Table 5 shows the distribution of cases by year group and nation.

Table 4 - Distribution of cases in final dataset by year group and term

Year Group	Autumn Term	Spring Term	Summer Term	TOTAL
1	8,972	14,363	11,374	34,709
2	51,877	53,853	32,841	138,571
3	125,854	115,478	65,229	306,561
4	142,125	127,494	69,427	339,046
5	155,679	137,437	71,892	365,008
6	147,618	117,672	66,443	331,733
7	590,949	448,926	266,740	1,306,615
8	449,895	352,139	199,644	1,001,678
9	219,665	162,386	91,410	473,461
10	45,350	30,394	19,310	95,054
11	22,128	9,197	1,441	32,766
12	2,694	1,088	509	4,291
13	1,214	525	171	1,910
TOTAL	1,964,020	1,570,952	896,431	4,431,403

Table 5 - Distribution of cases in final dataset by year group and nation

Year Group	England	Wales	Scotland	Northern Ireland	TOTAL
1	28,761	130	4,071	1,747	34,709
2	111,663	657	11,974	14,277	138,571
3	252,346	1,413	18,781	34,021	306,561
4	273,985	1,588	20,534	42,939	339,046
5	301,727	2,077	19,538	41,666	365,008
6	269,547	2,682	22,166	37,338	331,733
7	1,233,604	27,924	13,456	31,631	1,306,615
8	951,751	21,204	7,118	21,605	1,001,678
9	452,111	11,163	878	9,309	473,461
10	94,072	411	87	484	95,054
11	32,486	159	7	114	32,766
12	4,160	54	4	73	4,291
13	1,856	54	0	0	1,910
TOTAL	4,008,069	69,516	118,614	235,204	4,431,403

2 – Sample selection and weighting

The age standardisation was performed separately for each year group and term shown in table 4, with the exception of years 12 and 13, for which a random sample across the three terms was drawn. Sample sizes were different for each year group, depending on the overall number of cases, as well as their distribution across the four nations. Table 6 shows the target sample for each year group and term.

Table 6 - Target sample sizes by year group and term

Year Group	Autumn Term	Spring Term	Summer Term
1	5,000	5,000	5,000
2	8,000	8,000	8,000
3	8,000	8,000	8,000
4	8,000	8,000	8,000
5	8,000	8,000	8,000
6	8,000	8,000	8,000
7	9,000	9,000	9,000
8	9,000	9,000	9,000
9	8,000	8,000	8,000
10	4,000	4,000	4,000
11	2,000	2,000	1,000
12		1,000	
13		1,000	

The cases were selected randomly from the dataset described above, based on the following stratifiers:

- nation (where possible)
- gender
- ability (Total Score)

The nation stratification was applied in accordance to the number of cases available for each year group and term. Specifically:

- England and Wales were grouped together for the primary year groups, with Scotland and Northern Ireland as separate independent strata
- Four independent strata, one for each nation, for years 7 and 8
- No stratification by nation from year 9 onwards

An equal number of males and females were selected across all year groups and terms.

Stratification by Total Score was applied to ensure the range of abilities in each sample is representative of the full set of cases for the corresponding year group and term. For each year group and term, the following steps were taken:

- Total Score was standardised, based on the actual mean and standard deviation for each group
- The standardised total score was rounded to the nearest 0.5, to create discrete intervals for the ability distribution
- The relative frequency of each interval in the final sample was calculated based on a hypothetical standard normal distribution
- The actual number of cases to be drawn for each interval was calculated based on the relative frequency of each interval and the overall sample size, after accounting for the distribution of the other strata
- Where the number of observations available in an interval was less than the target number required, all available cases were drawn, and each was

assigned a weight larger than 1, to reach the precise proportion of cases in each interval implied by the normal distribution.

It is important to note that there are significant differences in the age ranges covered by each year group and term across the four nations. In particular, Scotland is substantially different from the rest of the UK, with its pupils being generally older at comparable stages of their education.

Figures 1 and 2 show the distribution of ages in year 1 autumn term, and year 7 autumn term, for England and Scotland separately. These are just two examples, but the pattern is consistent across all year groups and terms. While there is some overlap, the age range in Scotland is wider, and pupils who can be more than two years apart in age might have experienced comparable length of schooling.

Figure 1 - Distribution of age at time of test for England and Scotland, year 1 autumn term (proportions for national sample)

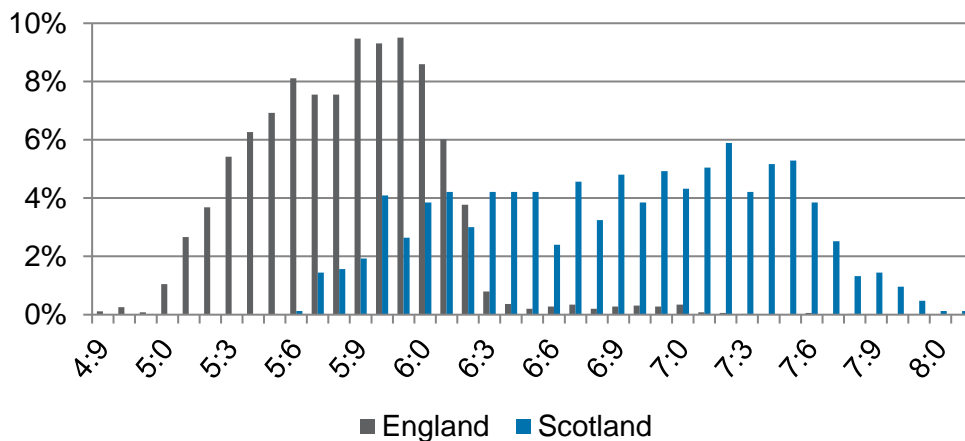
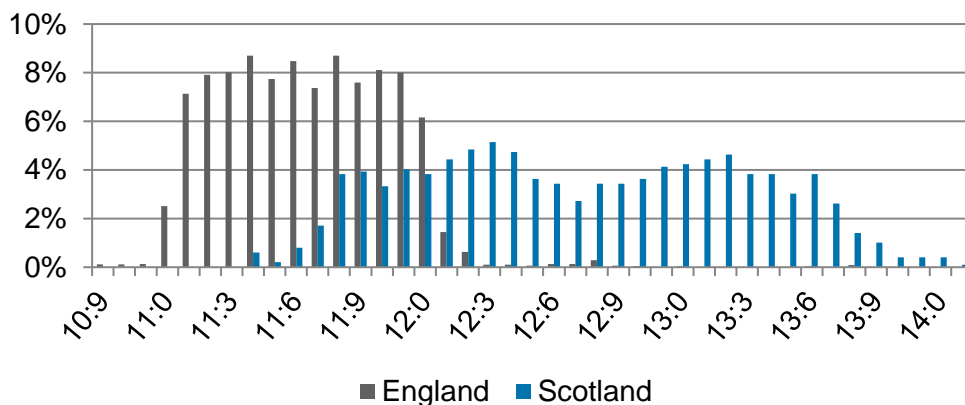


Figure 2 - Distribution of age at time of test for England and Scotland, year 7 autumn term (proportion in national sample)



This has implications for the norming, as the relationship between age and scores in the UK-wide sample might not be linear. However, the choice was made to produce UK-wide norms.

To allow for the wide age range across the UK, the norms were calculated over a 36-month window for each year group and term. Given the large proportion of cases from England, the norms are more reliable for the first half of the 36-month window, which represent between 80% and 90% of cases in each sample.

3 – Sample description

Table 7 shows the final sample sizes for each year group and term. The total number of cases used across all samples is 229,210. Of these, 177,896 are from England, 7,250 from Wales, 21,989 from Scotland and 22,075 from Northern Ireland. It is important to note that Scotland and Northern Ireland are well represented up to year 8, but the number of available cases drops significantly from year 9 onwards (see table 5). This implies that norms from later year groups are almost entirely based on English cases.

Table 7 - Final sample sizes by year group and term

Year Group	Autumn	Spring	Summer
1	4,738	4,880	4,850
2	7,934	7,968	7,968
3	7,977	7,979	7,974
4	7,979	7,979	7,973
5	7,980	7,979	7,976
6	7,980	7,979	7,966
7	8,968	8,968	8,961
8	8,474	8,476	8,468
9	7,995	7,997	7,999
10	3,994	3,987	3,983
11	1,996	1,984	953
12		979	
13		969	

Gender

Gender differences in standardised scores are very small and not statistically significant.

Table 8 - Average standardised score by gender

Year Group	Female	Male
1	101.1	100.6
2	100.3	100.0
3	100.1	99.9
4	100.1	100.0
5	100.2	100.0
6	100.1	100.0
7	100.1	100.0
8	100.1	100.0
9	100.1	100.0
10	99.9	99.9
11	100.0	100.0
12	99.4	99.2
13	98.5	98.2

Regional Distribution

Table 9 shows the regional distribution of the cases in the samples. A large proportion of primary tests come from the South and East of England, with very few tests from Wales. On the other hand, the proportion of secondary tests is more evenly distributed across England, with very few tests from the other nations, except for years 7 and 8.

Table 9 - Distribution of students in final samples by region

Year Group	London	South and East	Midlands	North	Wales	Scotland	Northern Ireland
1	8.4	38.1	9.5	20.1	0.3	18.4	5.1
2	9.1	39.5	9.3	16.6	0.5	12.5	12.6
3	8.2	40.3	11.2	14.8	0.4	12.5	12.5
4	8.6	38.6	12.1	15.2	0.4	12.6	12.6
5	7.8	36.0	14.9	15.8	0.5	12.5	12.5
6	7.8	33.6	16.2	16.4	0.9	12.6	12.5
7	7.2	24.4	13.9	21.1	11.1	11.1	11.1
8	8.5	25.6	14.2	22.3	11.8	5.9	11.8
9	12.6	33.0	19.2	30.9	2.2	0.2	1.9
10	17.3	27.8	25.0	28.9	0.5	0.1	0.5
11	12.7	34.9	21.6	29.8	0.7	0.1	0.4
12	21.5	19.5	43.6	12.1	1.5	0.1	1.8
13	12.7	24.8	33.3	26.6	2.5	0.0	0.0
Overall	9.3	33.6	14.6	20.0	3.2	9.7	9.7

Table 10 – National distribution of students by region

	London	South and East	Midlands	North	Wales	Scotland	Northern Ireland
Primary	14	30	17	25	5	7	3
Secondary	12	31	17	23	5	8	4
Overall	13	30	17	24	5	7	3

Comparing table 9 with table 10, we can see that the overall distribution of tests within England is relatively close to the national distribution of pupils. We can also see that Scotland and Northern Ireland are well represented in the primary phase, but substantially under-represented in the secondary phase. Wales, on the other hand, is substantially under-represented across all year groups, except for years 7 and 8.

The regional distribution of cases outside England is largely a reflection of the sampling strategy. Where enough observations were available, stratification by nation ensured a good number of cases outside England. Where stratification by nation was not possible, the distribution reflects the dominant proportion of tests from English schools.

However, it is important to note that in the original split by market sectors, Wales was included partially within the Midlands and partially within the North West, and its under-representation might be a result of this grouping.

Disadvantage

Table 11 shows the distribution of tests by quintiles of school disadvantage levels (as measured by the percentage of pupils on roll that are eligible for Free School Meals), and the national distribution of pupils by the same measure. We can see that the cases in the sample are more likely to come from schools with higher levels of disadvantage. The table shows the distribution is skewed for secondary schools, while it is reasonably representative for primary schools. This might be due, at least in part, to the fact that the sample shows a higher proportion of schools in urban areas, and of large schools. However, given the large number of schools in the sample, and their widespread geographical distribution, we believe the sample to be sufficiently representative of schools in the UK.

In consideration of the fact that we cannot directly identify pupils that are eligible for FSM in our sample, and that stratification by total score ensures representativeness of pupil ability, we do not believe it to be necessary to apply school-level weights to account for disadvantage.

Table 11 - Percentage of cases by school-level quintile of disadvantage and region

	Q1	Q2	Q3	Q4	Q5
<i>Primary year groups</i>					
London	10.1	6.7	18.9	30.1	34.3
South and East	12.8	18.7	28.7	26.8	13.1
Midlands	12.0	18.5	23.9	23.5	22.1
North	12.6	11.2	17.1	26.5	32.7
Wales	7.0	17.6	16.0	21.7	37.8
Scotland	15.7	30.0	21.5	20.3	12.5
Northern Ireland	13.3	21.1	21.8	22.3	21.5
Total in sample	12.8	18.1	23.6	25.2	20.2
National distribution	16.9	18.8	20.1	21.9	22.3
<i>Secondary year groups</i>					
London	2.8	4.8	14.8	47.6	30.0
South and East	9.7	21.6	38.3	20.3	10.2
Midlands	3.0	14.3	23.7	31.3	27.8
North	2.2	16.2	24.0	31.9	25.7
Wales	7.7	13.1	34.5	18.2	26.5
Scotland	97.4	2.2	0.2	0.1	0.0
Northern Ireland	22.1	15.5	14.6	18.5	29.3
Total in sample	10.8	15.2	25.8	26.9	21.2
National distribution	21.0	21.4	20.6	19.3	17.8

4 – Percentile rank

Table 12 below shows how standardised scores are transformed into percentile ranks.

Table 12 - Standardised scores and corresponding percentile ranks

Standardised Score	Percentile Rank	Standardised Score	Percentile Rank
69	1	106	66
70	2	107	68
71	3	108	70
72	3	109	72
73	4	110	74
74	4	111	77
75	5	112	78
76	6	113	80
77	6	114	82
78	7	115	84
79	8	116	86
80	9	116	86
81	11	117	87
82	12	118	89
83	13	119	90
84	14	120	91
85	16	121	92
86	18	122	93
87	20	123	94
88	22	124	94
89	24	125	95
90	26	126	96
91	28	127	96
92	30	128	97
93	32	129	97
94	34	130	98
95	37	131	98
96	40	132	98
97	42	133	99
98	45	134	99
99	48	135	99
100	50	136	99
101	52	137	99
102	55	138	99
103	58	139	99+
104	60	140	99+
105	63	141	99+

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