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## Lucid Exact - Understanding results

### Types of report

Lucid Exact creates four A4 pages of results for each student, each of which contains various sections. These are outlined below.

#### **Results profile (Report, Page 1)**

This shows the standard scores for the six different measures (word recognition, reading comprehension accuracy, reading comprehension speed, spelling, typing speed and handwriting speed) in forms in both **graphical** and **tabular form**. The key data needed for JCQ Form 8 may be extracted from these. The summary table of results also shows centile scores for each test. Note that on the chart the average score range (standard score 85 – 115) is shaded grey. To aid speedy identification of areas of difficulty, the bars on the chart are coloured blue if the standard score is 85 or above (i.e. within the normal range or better), and red if below 85 (i.e. below the normal range, indicating that the result is a matter of concern). An example is shown in Figure 1. For explanations of the meaning of 'standard scores' and 'centile scores' see Sections below.

#### **Cautionary warning regarding dubious reading speeds (Report, Page 1)**

The program checks whether the student has devoted a reasonable amount of time to the reading comprehension passages. If a student has completed the reading comprehension test in **less than eight minutes** the results should be regarded as '**doubtful**', i.e. it is unlikely that proper consideration has been given to the answers, and hence the scores will be unreliable and should not (on their own) be used as meaningful evidence for exam access arrangements. If a student completes the reading comprehension test in **less than five minutes**, the results should be regarded as '**impossible**', i.e. the student has answered the comprehension passages so quickly that it is impossible for them to have given proper consideration to the answers, and hence the scores are not safe to be used as evidence for any purpose.

When the program detects doubtful or impossible performance a warning is given in red underneath the summary table of results on page 1 of the report, and the bars relating to that performance are shown in coloured hatching rather than solid block colour. Since this outcome necessarily places limitations on the use that can be made of the results of the reading comprehension test, assessors may wish to repeat this test having provided appropriate guidance to the student regarding how the test should properly be attempted (see Section 3.2 in the manual for further advice on this matter). When re-testing, the alternate form of the test (A or B, as appropriate) should be employed (see Section 3.8 in the manual for guidance on this).

### ***Assessor's comments (Report, Page 1)***

There is a space at the foot of page 1 for assessor's comments, which can be typed into the computer as shown in Section 2.5.2 in the manual. As a rough guide, about 250 words may be included in the comment. The report will not check the length of the text entered, so it may overflow the page if too many words are entered. Alternatively, comments may be typed separately, printed out and pasted in, or written directly on to the Lucid Exact print-out.

### ***Results breakdown (Report, Page 2)***

This gives a complete breakdown of all the test scores in several tables, including comparison of ability to read and spell regular and irregular words, and the complete passage as typed to dictation by the student. An example is shown in Figure 2. Results on this page are shown in the following principal formats: standard scores (for explanation see Sections below) confidence intervals (for explanation see Sections below) centile scores and age equivalents (for explanation see Sections below). In addition, this page includes raw scores (or, in the case of word recognition, transformed score – see Sections 1.4 and 3.1 of the manual for explanation regarding this) and (where appropriate) times.

When the program detects doubtful or impossible performance on the reading comprehension test a warning is given in red underneath the results breakdown for that test (for further information see Sections below).

### ***Checking the scores from the dictation tests (Report, Page 2)***

The raw scores for the dictation tests (i.e. the number of words typed and handwritten) are estimated by the computer based on the typed text saved and the number of phrases listened to by the student for the handwriting task. In about 95% of cases these figures are sufficient accurate to be safely used in the report. However, in a few cases where the student has not followed the instructions properly the computer's estimates can be significantly different to the true figures.

Administrators should therefore carry out a visual inspection of the number of words typed and handwritten and if a discrepancy is suspected, the administrator can manually count the number of words and enter the figures into the computer as shown in Section 2.5.3 of the manual. The manually entered figures will then replace the computer's estimated figures in the report.

This page will also show the number and percentages of spelling errors in handwriting and typing if the raw data for these have been entered. The computer does not count or estimate the number of spelling errors made in the dictation tasks and hence if this information is required on the report, the administrator must manually enter the relevant data. The procedure for this is shown in Section 2.5.4 of the manual. The program will then calculate the percentages of spelling errors and display these on the report. If the relevant data are not manually entered, the number and percentages of spelling errors in handwriting and typing will be shown as zeros on the report.

### ***Itemised responses (Report, Page 3)***

This gives the student's responses for all items in reading comprehension and spelling. This information can be useful for diagnostic purposes. An example is shown in Figure 3. Note that as the spelling test is adaptive not all items are administered; skipped items are shown as a dash but are credited to the score as if passed correctly.

### ***Handwriting to dictation (Report, Page 4)***

The fourth and final page of the Report is reserved for incorporating and displaying a scanned image of the student's handwriting to dictation. The procedure for this is described in Section 2.5.5 of the manual. This facility is optional, and if an image is not available, page 4 will remain blank, but a copy of the handwriting work may, if desired, be glued on to the fourth report page after printing it. An example is shown in Figure 4.

## Types of scores

All raw scores on Lucid Exact are saved automatically to a single data file on completion of each test. The data saved also includes the date and time the test was completed, as well as the registered details of the student. If a test has been abandoned before completion, then no results will be saved for that test. Reports are calculated in real time (at the moment of access or viewing) so that if ever any information has changed it will be incorporated in the current displays. This is important, for example, where errors have been made in entering the student's date of birth, in which case the wrong norms may have been used by the program. Therefore if any mistakes of this nature were made then it is important to recalculate the results by generating new reports after any corrections have been made.

The program then refers to the standardised norms in order to convert raw scores to the following three types of score.

- Standard scores (and Confidence intervals)
- Centile scores
- Age equivalents

The first of these is shown in graphical (bar graph) format as well as numerical format, while the remaining two are shown only in numerical format. These different types of score formats are explained in the following sections.

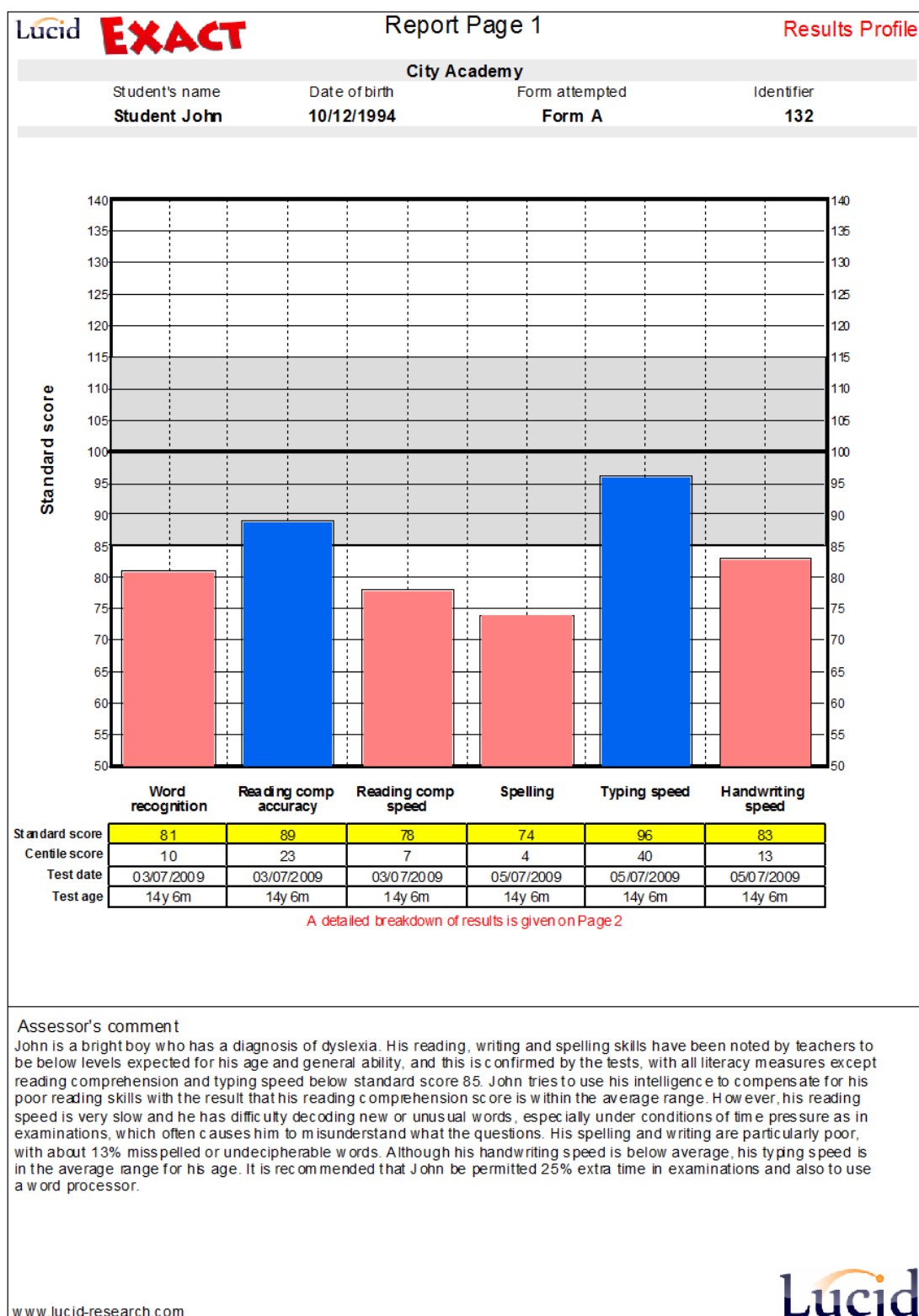


Figure 1. Example of Results profile (Reports page 1)

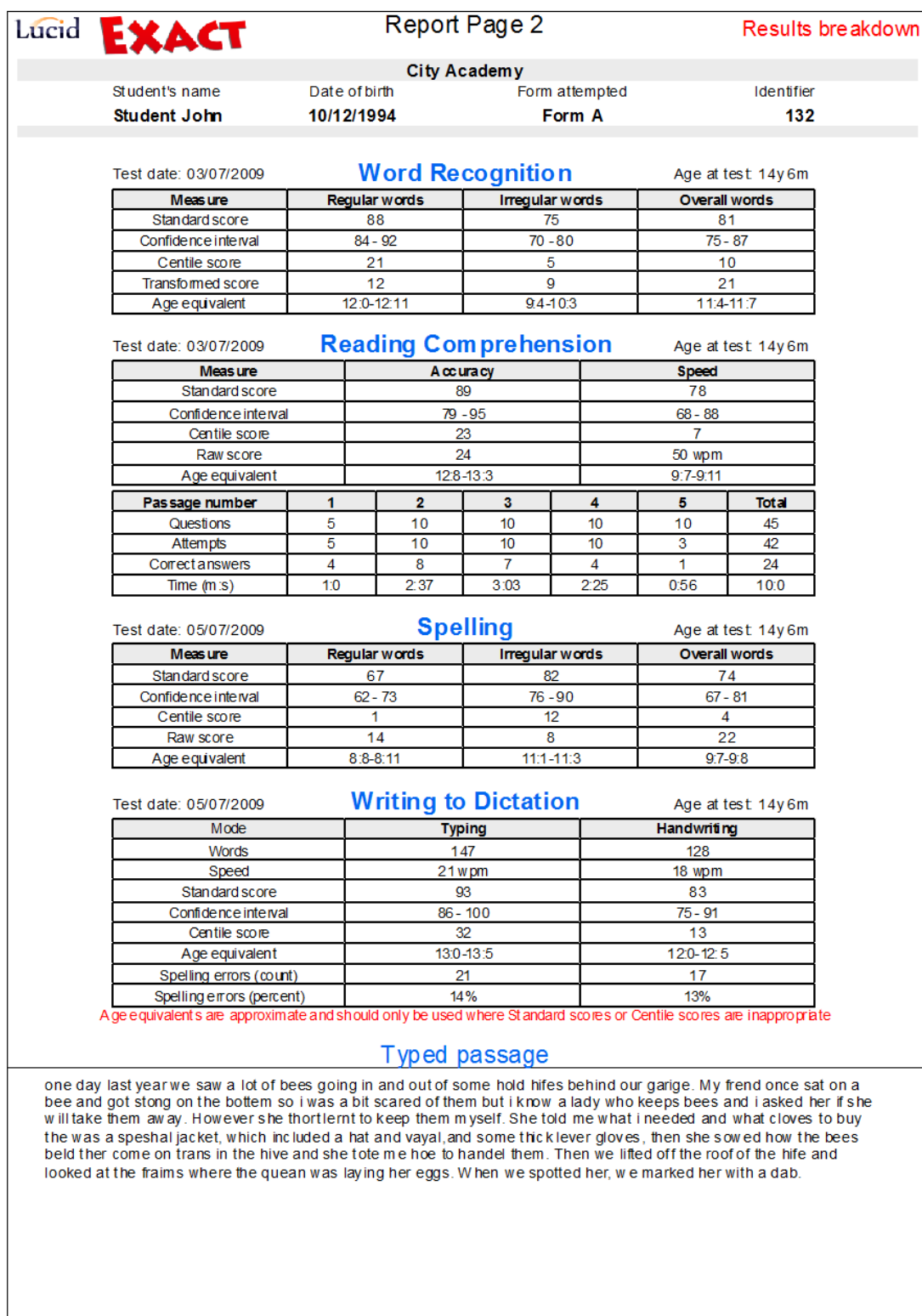


Figure 2. Example of Results breakdown (Reports page 2)

Lucid <b>EXACT</b>		Report Page 3		Itemised responses	
City Academy					
Student's name		Date of birth	Form attempted		Identifier
Student John		10/12/1994	Form A		132

### Reading Comprehension Accuracy

**Passage 1**

	Correct	Response	Score
1	no	no	1
2	yes	yes	1
3	no	no	1
4	can't tell	can't tell	1
5	18	12	0

**Passage 2**

	Correct	Response	Score
1	yes	yes	1
2	no	no	1
3	can't tell	can't tell	1
4	yes	yes	1
5	no	no	1
6	yes	yes	1
7	no	no	1
8	yes	can't tell	0
9	yes	can't tell	0
10	no	no	1

**Passage 4**

	Correct	Response	Score
1	no	yes	0
2	yes	yes	1
3	no	no	1
4	no	no	1
5	can't tell	can't tell	1
6	no	can't tell	0
7	yes	no	0
8	can't tell	yes	0
9	yes	no	0
10	can't tell	no	0

**Passage 3**

	Correct	Response	Score
1	yes	yes	1
2	no	yes	0
3	can't tell	can't tell	1
4	no	no	1
5	yes	can't tell	0
6	no	no	1
7	can't tell	can't tell	1
8	yes	yes	1
9	can't tell	yes	0
10	no	no	1

**Passage 5**

	Correct	Response	Score
1	no	yes	0
2	yes	can't tell	0
3	yes	yes	1
4	no	not attempt'd	0
5	no	not attempt'd	0
6	can't tell	not attempt'd	0
7	no	not attempt'd	0
8	no	not attempt'd	0
9	no	not attempt'd	0
10	yes	not attempt'd	0

### Spelling Accuracy (test is adaptive)

**Passage 1**

Item	Correct	Spelt as
P1	bed	bed
P2	nose	nose
P3	juice	joos
P4	increase	--
P5	crumb	--
6	foot	--
7	name	--
8	top	--
9	day	--
10	man	--
11	pan	--
12	egg	--
13	ice	--
14	sea	--
15	kick	--
16	girl	--
17	goal	--


**Passage 2**

Item	Correct	Spelt as
18	web	w eb
19	knife	knife
20	pair	pear
21	nature	nature
22	diagram	diergam
23	infection	infeckon
24	engine	engine
25	ghost	ghost
26	captain	captain
27	acrobat	akrobat
28	festival	festeval
29	height	height
30	physics	pysics
31	theatre	theatre
32	sphere	sfer e
33	anchor	--
34	referee	--

**Passage 3**

Item	Correct	Spelt as
35	orchestra	--
36	aquarium	--
37	mysterious	--
38	mosquito	--
39	binoculars	--
40	observatory	--
41	literature	--
42	photosynthesis	--
43	environment	--
44	architecture	--
45	circumference	--
46	necessary	--
47	rhythm	--
48	hygienic	--
49	catastrophe	--

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Figure 3. Example of Itemised responses (Reports page 3)

Lucid <b>EXACT</b>		Report Page 4		Handwriting to dictation
City Academy				
Student's name	Date of birth	Form attempted	Identifier	
Student John	10/12/1994	Form A	132	

Sam was fourteen and he knew it all. When the family went on the river on a long boat, Sam told them what to do even Mum and Dad. He told Rose and Jamie not to fall in the water, and Mum how to push off the boat. He so even told Dad were to steer when they got to the first lock, Sam knew how to work it. They tied up just below it, with Sam and Mum opened the gates and Dad took the boat to the lock, then they closed the stoppers on the lower gates and opened the upper ones. Sam told Rose how to work up the lock with the big handle from the top of the gate. He stayed back to watch her.

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Figure 4. Example of Handwriting to dictation (Reports page 4)



## Standard scores

Standard scores are provided in 3-month age bands from 11:0 to 18:11 and in 12-month age bands from 19:0 to 24:11. Standard scores have a mean (average) 100 and a standard deviation of 15.<sup>1</sup> They are distributed in a normal (bell shaped) curve as shown in Figure 5. Approximately two-thirds of the population will have scores that fall between plus or minus one standard deviation of the mean (i.e. score range 85 – 115, which is the area shaded blue on the graph in Figure 5). In some scoring systems the range 85 – 115 is regarded as the 'average range', while other systems treat 90 – 110 as the 'average range'; in the latter case, 50% of the population will fall into the average band. The more extreme the score the fewer individuals are found in that category, so that only about 2% of the population have very low scores (less than 70) and about 2% have very high scores (130+). This distribution of scores is a characteristic of all human attributes (height, weight, strength, sociability, etc.), i.e. most people tend to cluster around a central point and as one approaches the extremes (known as the 'tails' of the distribution) fewer people are found.

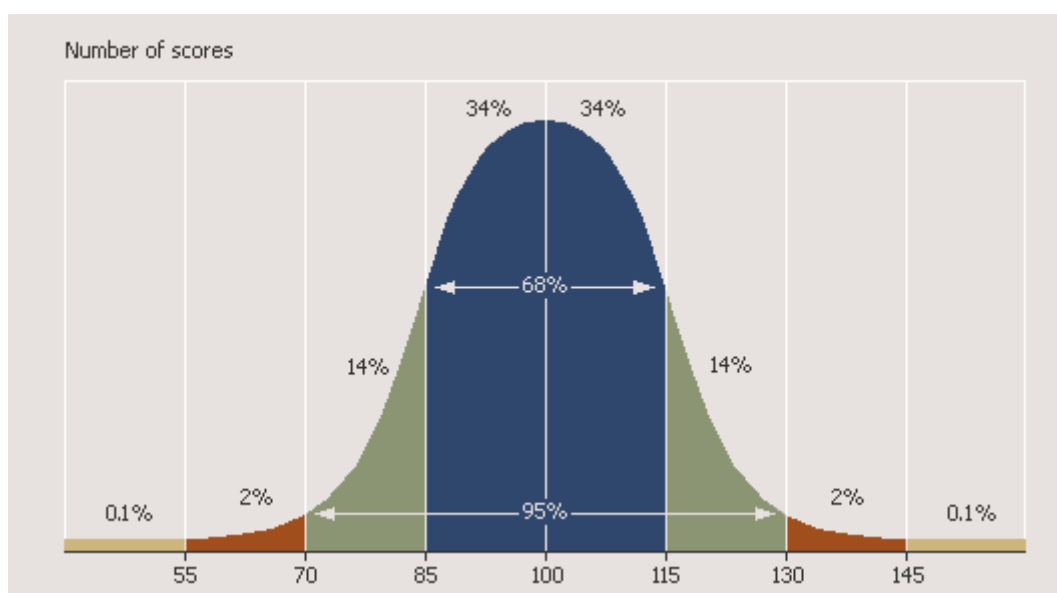


Figure 5. Distribution of Lucid Exact scores on a normal curve (for explanation see Section 0).

## Confidence intervals

When reporting a standard score, it is good practice also to report the *confidence interval* attached to that score. The reason for this is that all psychological and educational tests scores give only *estimates* of ability, based on a sample of behaviour at a given point in time. If you were to assess a student on several occasions you would not expect him or her to obtain exactly the same score each time – there would be a spread of scores and somewhere within that spread we would expect the (hypothetical) *true score* to lie. The amount of spread or variation of actual

<sup>1</sup> The standard deviation is a measure of the variation of scores in a distribution.

scores obtained by an individual is dependent on the *reliability* of the test. The confidence interval is the zone around the standard score in which we are reasonably confident the *true score* lies. Different confidence intervals may be set: for Lucid Exact we have set a confidence level of 90%, which means that there is a 90% probability that the true standard score lies within the stated confidence interval. Put another way, if the student was retested 100 times, on 90 out of 100 occasions the score would lie within the stated confidence interval.

Confidence intervals are calculated on the basis of the *Standard Error of Measurement* (SEM) of a test which, in turn, is determined by the reliability of the test and the standard deviation of test scores (see Section 1.6 of the manual). Confidence intervals are shown on page 2 of the Lucid Exact report.

### **Centile scores**

Centile scores are provided in 3-month age bands from 11:0 to 18:11 and in 12-month age bands from 19:0 to 24:11. Centile scores (sometimes referred to as 'percentile' scores) represent the student's performance in comparison with the population norms in centile units which range (roughly) from 1 to 99. A centile score of 63, for example, means that the students' score lay at the point where 63% of the population scored less, and 37% scored more. A centile score of 50 indicates that the student's score lay exactly on the median (middle point) of the distribution, with half the age group scoring higher and half lower. As will be obvious from Figure 5, centile scores have a strict relationship with standard scores as shown in Table 1.

*Table 1. Relationship between standard scores and centile scores.*

<b>Standard score</b>	70	80	85	90	100	110	115	120	130
<b>Centile score</b>	2	9	16	25	50	75	84	91	98

### ***Age equivalents***

Age equivalents are provided for the age range 6:0 to 18:11 (over this age, age equivalents become meaningless). Age equivalents may be defined as the average chronological age of students who would be expected to achieve a given raw score on the test. The most common type of age equivalent in educational testing is the 'reading age'. For example, to say that a student has a reading age of 14 means that they read like an average 14-year-old, regardless of their chronological age. Note that age equivalents, by their very nature, are not as precise as standard scores or centile scores; age equivalents are approximations and hence are often given in bands. Age equivalents should be used with caution and only in cases where standard scores or centile scores would be inappropriate or unhelpful. It is embarrassing and demotivating for a teenager or adult to be told (for example) that they have a spelling age of a 7-year-old! However, some teachers working in special education prefer to use age equivalents rather than centile scores, because age equivalents enable them to conceptualise the ability level of the student they are teaching, and so pitch the work at the correct level.

## Using Lucid Exact with LASS or LADS Plus

Lucid Exact is designed to provide measures of literacy skills and although these measures may in some cases suggest dyslexia or other learning problems, Lucid Exact is not a diagnostic test as such. Administrators who require a test that will identify dyslexia should consider using LASS 11-15 (for the age range 11:0 – 15:11) or LADS Plus (for ages 15 and upwards). In fact, a combination of Lucid Exact with either LASS 11-15 or LADS Plus, is a very powerful toolset not only for *identifying* dyslexia or other learning problems but also for determining the extent to which dyslexia or other learning problems are impairing the student's capacity to learn, and for determining appropriate remedial intervention. For further information about these programs, please visit the Lucid website [www.lucid-research.com](http://www.lucid-research.com)

### **LASS 11-15**

LASS 11-15 is a fully computerised multifunctional assessment system for use with students in the age range 11 years 0 months to 15 years 11 months ('LASS' stands for 'Lucid Assessment System for Schools'). The suite comprises eight different tests that assess the following skills:

- single word reading
- sentence reading
- spelling
- reasoning (nonverbal intelligence)
- auditory memory ('Mobile')
- visual memory ('Cave')
- phonic skills ('Nonwords')<sup>2</sup>
- phonological processing ('Segments')

Unlike Lucid Exact, none of the tests in LASS 11-15 is speeded. The full LASS 11-15 suite takes about 45–60 minutes to administer. However, if LASS 11-15 is administered after Lucid Exact, the tests of single word reading, sentence reading and spelling may be omitted as this information will already have been provided by Lucid Exact. By omitting these three tests, administration of LASS 11-15 is generally reduced to less than 30 minutes. Results can be viewed on screen or printed out immediately.

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<sup>2</sup> Nonwords are sequences of letters that are not real words but which nevertheless conform to the orthographic rules of the language (e.g. 'sploff', 'blust', 'goster') and so can be decoded and pronounced as though they were real words. Since nonwords will not have been encountered by the reader previously, the person can normally only use phonological rules in order to decode them (visual, semantic or contextual strategies are of no help in decoding isolated nonwords). Nonwords thus provide a pure test of a person's competence in phonological decoding or what is often referred to in education as 'phonics'.

LASS 11-15 enables teachers to:

- identify students with dyslexia (specific learning difficulty) or who have related learning problems
- obtain a reasonable estimate of the student's intelligence
- identify students who are under-performing in literacy compared with their intelligence
- identify underlying weaknesses in memory or phonological processing skills that could be the cause of literacy difficulties
- identify students with poor phonic decoding skills that may require remedial intervention
- assess improvements in memory, phonological and phonic decoding skills brought about by appropriate training or intervention

## **LADS and LADS Plus**

LADS Plus is a computerised test designed to screen for dyslexia in persons of 15 years and older ('LADS' stands for **L**ucid **A**dult **D**yslexia **S**creening). LADS Plus comprises five assessment modules, which measure:

- Nonverbal Reasoning (matrix reasoning)
- Verbal Reasoning (verbal conceptual reasoning, suitable for readers and non-readers)
- Word Recognition (lexical decoding involving speeded recognition of real word from non-words).
- Word Construction (speeded lexical encoding of non-words from syllables)
- Working Memory (backwards digit span)

The last three of the tests in the list are *dyslexia sensitive* measures, which are reasonably independent of education and intelligence. However, the two reasoning tests have been included in order to increase the accuracy of detection of dyslexia further, and reduce the incidence of false negatives and false positives. These also enable the administrator to obtain a rough estimate of the person's intellectual ability, which may be important when making decisions about further action after screening.

The tests in LADS Plus are adaptive; that is, the program varies the items given according to the performance of the individual taking the test. This means that the assessment is swift and efficient. Each of the five modules takes about five minutes, so the whole screening can usually be completed in about 20–25 minutes. Results can be viewed on screen or printed out immediately.

Administration of LADS Plus does not require professional training in education or psychology. The tests are self-administered and results very easy to interpret. The program assists interpretation by stating the probability that the person has dyslexia: 'high probability', 'moderate probability', 'borderline', and 'low probability'. However, because all the results of any LADS Plus screening are available to administrators they are not forced to accept the recommendations of the program; instead, they are free to use their own professional judgment when interpreting results and in making decisions about what to do next.