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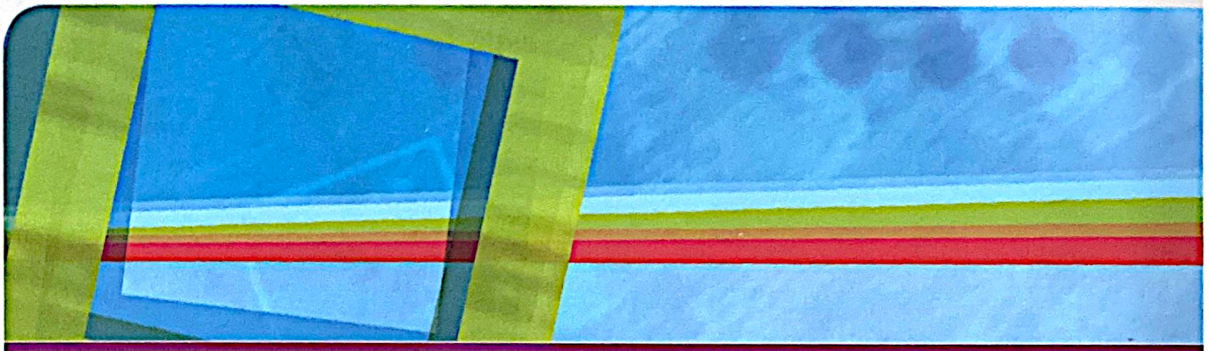

Critical Reasoning Test Battery

> User Manual

Access Ability

Critical Reasoning Test Battery

> User Manual

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Contents

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Foreword

User Manual

The purpose of this User Manual is to give a short introduction to the Critical Reasoning Test Battery (CRTB) and to provide the necessary instructions for the administration and scoring of the tests. A Technical Manual for the CRTB tests can be obtained by visiting the SHL Group Website at www.shl.com

Availability of the CRTB tests

The tests are available to people who are registered with SHL as qualified test users (i.e. those who hold an Occupational Testing qualification). SHL provides suitable courses in occupational testing following standards laid down by national and international psychological associations. In accordance with the recommendations of these associations for the use and supply of psychometric instruments, the test materials described by this User Manual are not available to the general public. Please contact SHL for details of test training and registration.

A note of caution

It is essential that test materials are kept securely under lock and key so that only qualified users have access to the question booklets, answer sheets and scoring keys. Test results need to be interpreted with professional care and treated with due regard to confidentiality.

Rationale and Development

The new CRTB tests measure verbal and numerical reasoning abilities. They are the latest versions of the CRTB test series designed for use in the selection, development or guidance of personnel at the supervisory and junior to middle level of management. The tests can be used for positions where higher-level reasoning skills are required, but where candidates are not necessarily of degree level. These tests are more efficient than the previous CRTB instruments, and as such they allow faster administration and scoring.

The diagrammatic test of critical reasoning (DC3.1) is also included in CRTB. This test remains unchanged from the previous version of the CRTB.

Rationale

Ability tests are one of the most powerful aids in assessing people at work and predicting their job success. The use of objective, standardised measures to assess job-relevant competencies is highly effective at ensuring the right people are in the right jobs in order to improve the efficiency and profitability of organisations.

This latest version of the CRTB series has been developed to provide two new types of test, with considerably shorter administration time in comparison to many existing ability tests. This innovation in ability test technology means that large numbers of candidates can be assessed quickly and efficiently, at various stages in the selection process. Furthermore, these tests can be combined more effectively with other assessments as might be used at an assessment or development centre.

The new version consists of two types of tests: Verbal Evaluation (VC1.3) and Interpreting Data (NC2.3), a numerical reasoning test. These two abilities have been repeatedly confirmed by job analysis and validation studies to be common requirements of a large variety of job roles. In particular, validity evidence shows that verbal and numerical tests are strongly predictive of analytical skills, as well as communication skills and strategic thinking. The new CRTB provides the capability to assess these abilities more efficiently than standard length ability tests without compromising the reliability or validity of the instruments.

These are provided with the existing diagrammatic series (DC3.1) test which assesses the ability to reason logically and flexibly when using sequences of diagrams or symbols. This test was originally designed as a 20-minute test to complement the new shorter times of the verbal and numerical tests.

Development

The new versions of verbal and numerical test in CRTB are based on items taken from an item bank that was developed as a result of an extensive information-gathering exercise. This was undertaken in order to collect sufficient data to produce Item Response Theory (IRT)[1] statistics relating to item difficulty and discrimination. In total, the responses of over 12,000 individuals were initially processed and analysed. By developing models for all of the selected items it was possible to model efficient and equivalent new CRTB test versions from this item bank.

[1] IRT allows item statistics to be produced that are test-independent and group-independent.

Using IRT statistics ensured the items maintained similar properties to previous versions of CRTB tests. Trials provided confirmation of the IRT statistics and test characteristics for the newly modelled tests.

Whilst the design of the new CRTB tests is similar to previous versions of CRTB, the format of the numerical test has been designed to facilitate the more efficient format of the test. The statistical tables in the numerical test have been positioned so that the questions appear on the same page as the corresponding data. This new format requires less time to locate the necessary information, and, therefore, results in a test that is less influenced by speed than other versions of the CRTB numerical tests.

Additionally, changes were also made to the use of calculators in answering the numerical items. As opposed to previous versions of CRTB, candidates are now allowed to use a calculator for the numerical test.

The CRTB tests have been designed for use with people ranging from those with the potential to gain good GCSEs up to those with A-levels or those working at an undergraduate level. The tests may be used separately or together depending on the competencies to be assessed.

The time limits and number of items in each test are given below:

Test	Number of items	Time limit
Verbal evaluation (VC1.3)	30	20 minutes
Interpreting data (NC2.3)	18	20 minutes
Diagrammatic series (DC3.1)	40	20 minutes

VC1.3

The verbal test is designed to measure a candidate's ability to understand written passages and to evaluate the logic of various kinds of argument. The test differs from many traditional types of verbal ability tests in that it seeks to measure the application of ability in a realistic context.

The test consists of eleven passages each of which is followed by either two or three statements relating to the content of the passage. The test also includes an example passage with three statements in order to help candidates to familiarise themselves with the test format. The task involves reading each passage and then evaluating whether each statement is true or false, or whether there is insufficient information in the passage to form a judgement. In deciding the answer, candidates must comprehend the passage as a whole, be able to identify the pertinent information, evaluate the relationship between the passage and the statement, recognise assumptions on which the statement is based and evaluate the logic of the statement in the context of the given passage.

The passages refer to different occupational areas and are based on the type of information encountered at the work levels for which the test is designed: supervisors, administrators or junior to middle managers.

NC2.3

The numerical test, 'Interpreting Data', is designed to measure a candidate's understanding of statistical tables and numerical data and the ability to make logical deductions from them. The test is intended to measure a candidate's ability to cope with figures and numerical procedures in a practical and realistic context.

The test consists of seven tables containing statistical information. The task in each question is to use the facts and figures presented to calculate and select the correct answer from five options. The items sample a number of areas of numerical ability and candidates not only have to make the appropriate calculations, but also have to evaluate the available information to assess whether or not there is enough data to answer the question. Reflective of contemporary working practices, candidates are allowed to use calculators in this test.

DC3.1

The Diagrammatic Series is a more abstract test that requires systematic but non-verbal reasoning. These items are designed to measure the ability to handle simultaneously one or more logical processes or symbolic sequences.

The test consists of items each of which contain five diagrams in a sequence, the candidate is required to select the next diagram in the series from five options. This ability is particularly relevant to the activities of system design and fault diagnosis.

Reliability and Validity

Reliability

When interpreting test scores, it is very important to know how consistent and therefore how accurate, the scores are. We need to be confident that a measure and an individual's score are consistent, dependable and stable.

To this end, the new CRTB tests have been subjected to a formal process of trialling and item analysis. Item analysis is a statistical procedure used to investigate the pattern of responses to each item in a test to ensure that all items have good psychometric properties and correlate sufficiently highly with all of the other items in the test.

The accuracy, and therefore the consistency of measurement, characteristic of a test is known as its reliability. This is normally expressed in terms of a correlation coefficient, called a reliability coefficient. There are a number of methods of estimating reliability, which are described in the Technical Manual.

Internal consistency reliability coefficients have been calculated for the new CRTB tests. The reliability coefficient obtained for the tests were 0.81 for the numerical interpreting data test and 0.75 for the verbal evaluation test. The reliabilities obtained for the new CRTB tests are comparable to previous though lengthier versions of CRTB. Data received on verbal evaluation VC1.1 shows a reliability coefficient of 0.74 and interpreting data NC2.1 obtained a reliability coefficient of 0.87. For further details regarding the reliability of the CRTB tests, and the process by which the reliability coefficients were estimated, please refer to the Technical Manual.

While VC1.3 and NC2.3 are considerably shorter than previous versions of the CRTB, it can be seen from the trial data that good levels of internal consistency have been achieved. This has been made possible by the careful selection of highly efficient combinations of items from a large bank of items with known item properties.

The DC3.1 test shows internal consistency reliability coefficients ranging from 0.75 to 0.87 in four samples drawn from school and occupational groups. Full details are contained in the Technical Manual.

Validity

The validity of a test refers to the evidence supporting its value in predicting the likely performance of an individual in a given role or job. There are a number of different forms of validity, which are described in the Technical Manual.

An analysis of recent validation studies using SHL's verbal and numerical CRTB 1 tests assessed the validity of the tests for the prediction of general job performance ratings and in the area of 'Analysing and Interpreting'. This is the competency domain with which the ability tests are expected to relate most strongly. The validity coefficients for the verbal test are estimated to be approximately 0.28 for overall job performance and 0.17 for 'Analysing and Interpreting'. The coefficients for the numerical test are estimated to be approximately 0.21 for overall job performance and 0.20 for 'Analysing and Interpreting'. Validity coefficients of such magnitude can be viewed as a significant

improvement over chance prediction. These coefficients reported tend to be underestimations as they are uncorrected for range restriction[2] or attenuation[3] due to unreliability of the criterion. As the new CRTB tests are designed and modelled to be parallel versions of the CRTB 1 tests, similar levels of validity are to be expected.

DC3.1 has also been found to correlate with job performance measures in the range 0.15 to 0.22.

Further details of the validation studies can be found in the Technical Manual.

[2] Correcting for restriction of range will increase the correlation obtained in proportion to the restriction in the variance of the group used.

[3] Attenuation refers to a reduction in apparent validity of a predictor due to unreliability in the criterion.

Equal Opportunities

Procedures for ensuring equal opportunities should be followed to make effective selection decisions. A full description of the issues relating to fair selection, along with specific guidelines for the appropriate use of tests, can be found in the Technical Manual. However, the attention of the test user is directed towards two areas of particular importance: adverse impact and group differences in performance.

Adverse impact

The interpretation of test scores, and the way in which they and the tests are used, is crucial to the avoidance of unlawful discrimination. Where a condition of a test has the effect of disproportionately excluding more people from one gender, religion or ethnic group, it is said to have adverse impact. In such a situation, the employer could be required to show that the condition or requirement is justifiable. If the test and the way it is used is justified (i.e., it measures a job relevant attribute as demonstrated by, say, a job analysis study), then its use would not contravene the law, despite the difference in rejection rates.

Further information about adverse impact can be found in the Technical Manual.

Group differences

Even with the correct use of an appropriate measure at the correct level of difficulty, there can be performance differences between groups, especially where there are differences in education and experience. Results of general research accumulated both in the UK and the US indicate that group differences exist between males and females and between different ethnic or racial groups.

The CRTB test trials identified no consistent, significant differences between males and females on the test scores for both the numerical and the verbal test.

White groups tended to score higher than ethnic minority groups on both the verbal and numerical tests. However, the differences in performance might be attributable to first language. It can be expected that the scores of non-native English speakers are lower than those of native speakers.

The Diagrammatic Series test does show a significant difference between males and females with males scoring on average about a third of a standard deviation higher than females. This test is also negatively correlated with age so that as age increases there is a moderate tendency for score to decrease.

In cases where score differences between groups have been found, it is essential to ensure that the test is measuring a relevant ability at an appropriate level. Unless a test is shown to be measuring an ability needed for proper performance in a job, use of the test is likely to cause adverse impact to the lower scoring group and this may constitute indirect discrimination.

Full results of the group difference analyses can be found in the Technical Manual.

Administration

Testing provides a fair and objective measure of an individual's ability in a relevant area. In order to compare performance between people, it is essential that instructions given to candidates are, as near as possible, exactly the same each time the test is administered.

Test administration cards

For ease of administration, full instructions are given on separate administration cards for each test. The instructions include everything that should be said and done throughout the testing session.

Introduction to the test session

It is important to provide an introduction to the test session, the content of which should reflect the nature of the group being tested and the reasons for testing. The administrator should explain why a test is being used (e.g. that the test provides an objective assessment of job relevant abilities), the role it plays in the overall selection procedure and what will happen to the results.

How much briefing should candidates be given?

Some candidates may be less familiar with tests, making it less easy for them to perform at their true level. Practice leaflets can be sent out in advance to all candidates, allowing them to become familiar with the test format. Candidates can also access practice verbal and numerical tests via SHL Direct, using the following web page: www.shldirect.com

How should the tests be administered?

The way a test is administered has been shown to significantly affect the results obtained and so the test user must always follow the instructions given. Particular care should be taken to establish rapport with those individuals who might lack confidence or who feel anxious about testing. Special attention should be paid to those whose first language is not English to ensure that they have understood properly what is required of them.

Good tests will always contain some example questions to familiarise candidates with the task before they start and it is important not to rush this part of the administration.

In order to give people sufficient attention, it is better to test in small groups. Testing in groups of ten or fewer will enable candidates to relax more and feel freer to ask questions.

Physical conditions and materials

The administration of the CRTB tests is the same as for other paper and pencil tests. A brief summary of the essential points referring to testing conditions and materials is given below.

- Appropriate physical conditions for testing should be ensured (i.e. a light and quiet room, comfortable and spacious seating and no interruptions)

- Adequate supervision according to the size of the group should be provided, i.e. two administrators for fifteen or more candidates and a maximum group size of forty candidates

- A stopwatch should be used with strict adherence to the time limits stated in the instructions

- Soft, thick pencils are required for completion of answer sheets, which is particularly important if they are to be machine scored. Supplies of pencils are available from SHL

- The use of a Test Log helps the administrator in the preparation and collation of test materials and also acts as a record of the testing session. Supplies of Test Logs are available from SHL

- Each candidate will require a test booklet and an answer sheet, as well as pencils and an eraser. Rough paper and a calculator are required for the numerical test

- The administrator will require copies of the test booklets, a set of answer sheets, a stopwatch and a second means of time-keeping such as a clock in the testing room (also useful for candidates), this User Manual, the administration instruction card and a Test Log

- Administrators should be familiar with the example questions and be prepared to help and guide candidates who are having difficulty with them

Scoring

The CRTB tests can be scored either by hand or machine.

Machine scoring

A NCS Opscan 4 optical mark reader can be used for the machine scoring of answer sheets on clients' premises. However, answer sheets can also be sent to SHL Bureau for machine scoring. Machine scoring gives more reliable results than hand scoring and considerably increases the speed at which tests can be marked. For further details on Bureau scoring services, please contact SHL at the following e-mail address: ukbureau@shlgroup.com

If answer sheets are to be machine scored then candidates must fill in the appropriate circles on side 'A' of the answer sheet underneath their name, the date etc.

Hand scoring

The multiple-choice format and specially designed answer sheets permit quick hand scoring using an acetate-scoring-key overlay. The following instructions should be adhered to when scoring answer sheets.

- Check for any obvious transcription errors on the answer sheet
- Check the answer sheets for any double responses. These should be clearly crossed through with a coloured felt-tip pen and counted as wrong
- Select the correct acetate key for the test. It is important to check that the name and version of the test on the answer key corresponds to the test being marked
- Carefully align the key over the answer sheet using the guidance marks provided
- Add up the number of questions answered correctly and record the raw score in the appropriate box (marked 'Rs') on the answer sheet
- Add up the number of incorrect and incomplete items and subtract this sum from the total number of items in the test. This figure should agree with the raw score recorded on the answer sheet
- Using the correct normative table (see Appendix 1), convert each raw score to a grade, a percentile, a T-score or a sten. These should be recorded in the appropriate box (marked 'Grade', '%ile', 'T-score' and 'Sten', respectively) on the answer sheet

Norming

Norm tables are provided for the new CRTB tests in Appendix 1. A number of different norm tables are available representing different industry sectors. A new feature of these CRTB tests is that a combined verbal and numerical norm is also available to assist test users who assess candidates using both tests.

For a detailed description of the different normative measures (percentiles, T-scores, sten scores and grades), please refer to the Technical Manual.

Step-by-step guide to using the norm tables

- Consider the make-up of the candidate group and the job or position in question. If possible, this should include the educational level and industry sector of the group
- Refer to the list of available norm groups opposite. This will allow you to decide which groups are likely to be most appropriate
- Select the most appropriate norm group. The more similar the norm group is to the actual applicant group, the better
- Having chosen the most appropriate norm group, turn to the appropriate table
- To convert a raw score to a standardised score, find the raw score in the body of the table and scan across to find the equivalent percentile score or grade on the left-hand side, or the equivalent T-score or sten score on the right-hand side of the table
- To find the raw score equivalent to a given T-score (e.g. to use as a cut-off), find the T-score required in the 'T-score' column. Scan across to find the appropriate raw score in the body of the table. If there is no raw score for the test in that T-score row then look down the column for the next row with a score
- To find the raw score equivalent to a given percentile (e.g. to use as a cut-off), find the percentile required in the '%ile' column. If you cannot find the exact percentile you require, choose the nearest available one. Then scan across to find the appropriate raw score in the body of the table. If there is no raw score for the test in that percentile row then look down the column for the next row with a score
- In addition, you will see that sten scores and grades are provided. Sten scores are located on the far right-hand side of the table. To look up the sten score, find the relevant raw score in the body of the table and scan across to the appropriate band representing each sten score. Grades are located on the far left-hand side of the table

The DC3.1 norms are drawn from the norm update completed in 2005 and contain a different but equivalent set of groups to those used for the VC1.3 and NC2.3. tests. A table is provided showing a mapping from the norm groups provided for the DC3.1 test onto those presented for the VC1.3 and NC2.3 tests.

A composite VC1.3 and NC2.3 norm table is also available to allow the production of a single standard score (grade, percentile, T-score or sten) for combined performance on the verbal and numerical tests. For instructions regarding this process, please refer to the final section of Appendix 1.

Appendix 1 - Normative Tables

Index to norm groups

CRTB Total general applicant groups (VC1.3 & NC2.3)

Group

The total general applicant group represents applicants applying for a variety of jobs within various sectors of industry and commerce. Industry-specific norms are available for the general applicant group, for the following industries: banking, hotel and leisure, manufacturing and engineering, petrochemicals and pharmaceuticals, professional services (e.g. accountants, consultants, solicitors, surveyors etc.), public services, retail and telecommunications.

Age

The total general applicant group represents applicants with an average age of 28.5, with the ages ranging between 17 and 61.

Gender

The total general applicant norm represents a group consisting of 60% male applicants and 40% female applicants for the numerical test and 67% male applicants and 33% female applicants for the verbal test.

Ethnic composition

The total general applicant group represents a group consisting of approximately 72.4% white European applicants.

Education

The total general applicant group represents a mixture of applicants holding no formal qualifications up to a degree. The majority reached GCSE, O-level or A-levels with 35% holding a degree.

The summary statistics for the general applicant groups relating to the specific industry sectors are detailed below.

Summary statistics for the banking general applicant group

	VC1.3	NC2.3
Mean	18.29	11.08
SD	4.40	4.01

Summary statistics for the hotel and leisure general applicant group

	VC1.3	NC2.3
Mean	17.33	9.07
SD	5.51	4.25

Summary statistics for the manufacturing and engineering general applicant group

	VC1.3	NC2.3
Mean	17.43	9.58
SD	4.58	3.92

Summary statistics for the petrochemicals and pharmaceuticals general applicant group

	VC1.3	NC2.3
Mean	17.56	8.88
SD	4.58	3.81

Summary statistics for the professional services general applicant group

	VC1.3	NC2.3
Mean	18.26	10.53
SD	4.52	3.93

Summary statistics for the public services general applicant group

	VC1.3	NC2.3
Mean	17.23	7.67
SD	4.85	3.80

Summary statistics for the retail general applicant group

	VC1.3	NC2.3
Mean	17.05	8.69
SD	4.89	4.19

Summary statistics for the telecommunications general applicant group

	VC1.3	NC2.3
Mean	16.08	8.33
SD	5.35	4.05

General applicant group - Banking

Grade	%ile	VC1.3	NC2.3	T-Score	Sten
A	99	30		75	10
	99	29		74	
	99			73	
	99	28		72	
	98			71	
	98	27		70	
	97			69	9
	96	26		68	
	96		18	67	
	95			66	
	93	25	17	65	
	92			64	8
B	90	24		63	
	88		16	62	
	86	23		61	
	84		15	60	
	82			59	7
	79	22		58	
	76		14	57	
	73	21		56	
C	69		13	55	6
	66	20		54	
	62			53	
	58	19	12	52	
	54			51	
	50		11	50	
	46	18		49	5
	42			48	
	38	17	10	47	
	34			46	
	31	16	9	45	
D	27			44	4
	24	15		43	
	21		8	42	
	18			41	
	16	14	7	40	
	14			39	3
	12	13		38	
E	10		6	37	
	8	12		36	
	7		5	35	
	5			34	2
	4	11		33	
	4		4	32	
	3	10		31	
	2		3	30	
	2	9		29	1
	1			28	
	1	8	2	27	
	1			26	
	1	0 – 7	0 – 1	25	

General applicant group – Hotel and leisure

Grade	%ile	VC1.3	NC2.3	T-Score	Sten
A	99			75	10
	99			74	
	99	30		73	
	99			72	
	98	29	18	71	
	98			70	
	97	28	17	69	9
	96	27		68	
	96			67	
	95	26	16	66	
	93			65	
	92	25	15	64	8
B	90			63	
	88	24	14	62	
	86			61	
	84	23		60	
	82		13	59	7
	79	22		58	
	76	21	12	57	
	73			56	
C	69	20	11	55	6
	66			54	
	62	19		53	
	58		10	52	
	54	18		51	
	50		9	50	5
	46	17		49	
	42	16		48	
	38		8	47	
	34	15		46	
	31		7	45	
D	27	14		44	4
	24		6	43	
	21	13		42	
	18			41	
	16	12	5	40	
	14	11		39	3
	12		4	38	
E	10	10		37	
	8		3	36	
	7	9		35	
	5			34	2
	4	8	2	33	
	4			32	
	3	7	1	31	
	2			30	
	2	6	0	29	1
	1	5		28	
	1			27	
	1	4		26	
	1	0 – 3		25	

General applicant group - Manufacturing and engineering

Grade	%ile	VC1.3	NC2.3	T-Score	Sten
A	99	29 – 30		75	10
	99			74	
	99	28		73	
	99		18	72	
	98	27		71	
	98			70	
	97	26	17	69	9
	96			68	
	96	25		67	
	95		16	66	
	93			65	
	92	24	15	64	8
B	90			63	
	88	23		62	
	86		14	61	
	84	22		60	
	82		13	59	7
	79	21		58	
	76			57	
	73	20	12	56	
C	69			55	6
	66		11	54	
	62	19		53	
	58			52	
	54	18	10	51	
	50			50	
	46	17	9	49	5
	42			48	
	38	16		47	
	34		8	46	
	31	15		45	
D	27			44	4
	24	14	7	43	
	21			42	
	18		6	41	
	16	13		40	
	14			39	3
	12	12	5	38	
E	10			37	
	8	11	4	36	
	7			35	
	5	10		34	2
	4		3	33	
	4	9		32	
	3		2	31	
	2			30	
	2	8		29	1
	1		1	28	
	1	7		27	
	1		0	26	
	1	0 – 6		25	

General applicant group - Petrochemicals and pharmaceuticals

Grade	%ile	VC1.3	NC2.3	T-Score	Sten
A	99	29 – 30		75	10
	99		18	74	
	99	28		73	
	99			72	
	98	27	17	71	
	98			70	
	97		16	69	9
	96	26		68	
	96			67	
	95	25	15	66	
	93			65	
	92	24		64	8
B	90		14	63	
	88	23		62	
	86		13	61	
	84	22		60	
	82			59	7
	79	21	12	58	
	76			57	
	73		11	56	
C	69	20		55	6
	66			54	
	62	19	10	53	
	58			52	
	54	18		51	
	50		9	50	
	46	17		49	5
	42		8	48	
	38	16		47	
	34			46	
	31		7	45	
D	27	15		44	4
	24			43	
	21	14	6	42	
	18			41	
	16	13	5	40	
	14			39	3
	12	12		38	
E	10		4	37	
	8	11		36	
	7		3	35	
	5			34	2
	4	10		33	
	4		2	32	
	3	9		31	
	2			30	
	2	8	1	29	1
	1			28	
	1	7	0	27	
	1			26	
	1	0 – 6		25	

General applicant group - Professional services

Grade	%ile	VC1.3	NC2.3	T-Score	Sten
A	99	30		75	10
	99	29		74	
	99			73	
	99	28		72	
	98			71	
	98			70	
	97	27	18	69	9
	96			68	
	96	26		67	
	95		17	66	
	93	25		65	
	92		16	64	8
B	90	24		63	
	88			62	
	86		15	61	
	84	23		60	
	82		14	59	7
	79	22		58	
	76			57	
	73	21	13	56	
C	69			55	6
	66	20	12	54	
	62			53	
	58	19		52	
	54		11	51	
	50			50	
	46	18	10	49	5
	42			48	
	38	17		47	
	34		9	46	
	31	16		45	
D	27		8	44	4
	24	15		43	
	21			42	
	18	14	7	41	
	16			40	
	14			39	3
	12	13	6	38	
E	10			37	
	8	12	5	36	
	7			35	
	5	11		34	2
	4		4	33	
	4	10		32	
	3		3	31	
	2			30	
	2	9		29	1
	1		2	28	
	1	8		27	
	1		1	26	
	1	0 – 7	0	25	

General applicant group - Public services

Grade	%ile	VC1.3	NC2.3	T-Score	Sten
A	99	30	17 – 18	75	10
	99	29		74	
	99			73	
	99	28	16	72	
	98			71	
	98	27		70	
	97		15	69	9
	96	26		68	
	96		14	67	
	95	25		66	
	93			65	
	92	24	13	64	8
B	90			63	
	88	23		62	
	86		12	61	
	84	22		60	
	82		11	59	7
	79	21		58	
	76			57	
	73	20	10	56	
C	69			55	6
	66	19	9	54	
	62			53	
	58	18		52	
	54		8	51	
	50	17		50	
	46			49	5
	42		7	48	
	38	16		47	
	34		6	46	
	31	15		45	
D	27			44	4
	24	14	5	43	
	21			42	
	18	13		41	
	16		4	40	
	14	12		39	3
	12		3	38	
E	10	11		37	
	8			36	
	7	10	2	35	
	5			34	2
	4	9		33	
	4		1	32	
	3	8		31	
	2		0	30	
	2	7		29	1
	1			28	
	1	6		27	
	1			26	
	1	0 – 5		25	

General applicant group - Retail

Grade	%ile	VC1.3	NC2.3	T-Score	Sten
A	99	30		75	10
	99	29		74	
	99			73	
	99	28	18	72	
	98			71	
	98	27	17	70	
	97			69	9
	96	26		68	
	96		16	67	
	95	25		66	
	93		15	65	
	92	24		64	8
B	90		14	63	
	88	23		62	
	86			61	
	84	22	13	60	
	82			59	7
	79	21	12	58	
	76			57	
	73	20	11	56	
C	69			55	6
	66	19		54	
	62		10	53	
	58	18		52	
	54		9	51	
	50	17		50	5
	46			49	
	42	16	8	48	
	38			47	
	34	15	7	46	
	31			45	
D	27	14	6	44	4
	24			43	
	21	13		42	
	18		5	41	
	16	12		40	
	14		4	39	3
	12	11		38	
E	10			37	
	8	10	3	36	
	7			35	
	5	9	2	34	2
	4			33	
	4	8	1	32	
	3			31	
	2			30	
	2	7	0	29	1
	1			28	
	1	6		27	
	1			26	
	1	0 – 5		25	

General applicant group - Telecommunications

Grade	%ile	VC1.3	NC2.3	T-Score	Sten
A	99	30		75	10
	99	29	18	74	
	99			73	
	99	28		72	
	98		17	71	
	98	27		70	
	97	26	16	69	9
	96			68	
	96	25		67	
	95		15	66	
	93	24		65	
	92		14	64	8
B	90	23		63	
	88		13	62	
	86	22		61	
	84			60	
	82	21	12	59	7
	79			58	
	76	20	11	57	
	73			56	
C	69	19		55	6
	66	18	10	54	
	62			53	
	58	17	9	52	
	54			51	
	50	16		50	
	46		8	49	5
	42	15		48	
	38		7	47	
	34	14		46	
	31			45	
D	27	13	6	44	4
	24			43	
	21	12	5	42	
	18			41	
	16	11		40	
	14	10	4	39	3
	12			38	
E	10	9	3	37	
	8			36	
	7	8		35	
	5		2	34	2
	4	7		33	
	4		1	32	
	3	6		31	
	2			30	
	2	5	0	29	1
	1			28	
	1	4		27	
	1	3		26	
	1	0 – 2		25	

Composite VC1.3 and NC2.3 norm table

The Composite VC1.3 and NC2.3 norm table can be used to produce a single standard score (a grade, a percentile, a T-score or a sten) for the overall performance of a candidate on both the verbal and numerical tests. The composite score gives an equal weighting to the two tests.

In order to generate a composite score, follow the steps outlined below:

- Use the appropriate norm table to determine T-scores for the separate VC1.3 and NC2.3 scores for each candidate
- Ensure that the same norm group is used for both the numerical and the verbal tests
- Now sum these two T-score values to provide a total score
- Using this total score, refer to the Composite VC1.3 and NC2.3 norm table, on the following page, to convert this value to a single T-score, percentile, sten or grade, as required

An example to illustrate these steps is described below:

Suppose that a candidate applying for a position in the retail sector obtained a raw score of 12 on NC2.3 and a raw score of 19 on VC1.3. Using the General Applicant Group - Retail table, these raw scores equate to a T-score of 58 on the numerical test and a T-score of 54 on the verbal test.

Summing these two T-score values gives a total score of 112. Using the Composite VC1.3 and NC2.3 norm table this value can then be converted into standard scores, giving a T-score of 57, a percentile of 76, a sten of 7 or a Grade B. These composite standard scores can then be used to compare the overall performance of this candidate on the VC1.3 and NC2.3 tests with other candidates.

Composite Verbal and Numerical general applicant group

Grade	%ile	Combined T-scores	T-Score	Sten
A	99	143 – 150	75	10
	99	142	74	
	99	140 – 141	73	
	99	138 – 139	72	
	98	136 – 137	71	
	98	135	70	
	97	133 – 134	69	9
	96	131 – 132	68	
	96	129 – 130	67	
	95	128	66	
	93	126 – 127	65	
	92	124 – 125	64	8
B	90	122 – 123	63	
	88	121	62	
	86	119 – 120	61	
	84	117 – 118	60	
	82	115 – 116	59	7
	79	114	58	
	76	112 – 113	57	
	73	110 – 111	56	
C	69	108 – 109	55	6
	66	107	54	
	62	105 – 106	53	
	58	103 – 104	52	
	54	101 – 102	51	
	50	100	50	
	46	98 – 99	49	5
	42	96 – 97	48	
	38	94 – 95	47	
	34	93	46	
	31	91 – 92	45	
D	27	89 – 90	44	4
	24	87 – 88	43	
	21	86	42	
	18	84 – 85	41	
	16	82 – 83	40	
	14	80 – 81	39	3
	12	79	38	
E	10	77 – 78	37	
	8	75 – 76	36	
	7	73 – 74	35	
	5	72	34	2
	4	70 – 71	33	
	4	68 – 69	32	
	3	66 – 67	31	
	2	65	30	
	2	63 – 64	29	1
	1	61 – 62	28	
	1	59 – 60	27	
	1	58	26	
	1	50 – 57	25	

Diagrammatic Series groups (DC3.1)

Total composite group

The total composite group represents 1,065 applicants and incumbents in a variety of jobs within various sectors of industry and commerce. These are drawn from a wider group with the following characteristics. Work experience varied from 0 to 31 years (average 3 years). Testing was performed between 1994 and 2004.

Age

Ages ranged from 15 to 58 years with an average age of 33 years.

Gender

Approximately 59% were male and 41% were female.

Ethnic composition

Based on the information available 70% described themselves as White, 7% as Black, 5% as Indian and the remainder (18%) were from other ethnic groups.

Education

This varied from GCSE up to post-graduate level. 32% had A levels, 27% had degrees and 25% had GCSE-level qualifications.

Summary statistics for the total composite group

	DC3.1
Mean	21.88
SD	7.06

Total composite group

Grade	%ile	DC3.1	T-Score	Sten
A	99	40	75	10
	99	39	74	
	99	38	73	
	99		72	
	98	37	71	
	98	36	70	
	97	35	69	9
	96		68	
	96	34	67	
	95	33	66	
	93		65	
	92	32	64	
B	90	31	63	8
	88	30	62	
	86		61	
	84	29	60	
	82	28	59	7
	79		58	
	76	27	57	
	73	26	56	
C	69		55	6
	66	25	54	
	62	24	53	
	58	23	52	
	54		51	
	50	22	50	
	46	21	49	5
	42		48	
	38	20	47	
	34	19	46	
	31	18	45	
D	27		44	4
	24	17	43	
	21	16	42	
	18		41	
	16	15	40	
	14	14	39	3
	12		38	
E	10	13	37	
	8	12	36	
	7	11	35	
	5		34	2
	4	10	33	
	4	9	32	
	3		31	
	2	8	30	
	2	7	29	1
	1	6	28	
	1		27	
	1	5	26	
	1	0 – 4	25	

Composite non-management group
The composite non-management group is drawn from 886 employees in non-management jobs in a range of organisations. Average work experience was two years. Testing was performed between 1997 and 2004.

Age
Ages ranged from 15 to 58 years with an average age of 26 years.

Gender
Approximately 58% were male and 42% were female.

Ethnic composition
Based on the information available 78% described themselves as White, 7% as Afro-Caribbean and 11% as Indian.

Education
33% had A levels, 25% had degrees and 24% had GCSE-level qualifications.

Summary statistics for the composite non-management group

	DC3.1
Mean	21.42
SD	7.17

Composite non-management group

Grade	%ile	DC3.1	T-Score	Sten
A	99	39 – 40	75	10
	99		74	
	99	38	73	
	99	37	72	
	98		71	
	98	36	70	
	97	35	69	9
	96	34	68	
	96		67	
	95	33	66	
	93	32	65	
	92		64	8
B	90	31	63	
	88	30	62	
	86	29	61	
	84		60	
	82	28	59	7
	79	27	58	
	76		57	
	73	26	56	
C	69	25	55	6
	66	24	54	
	62		53	
	58	23	52	
	54	22	51	
	50		50	
	46	21	49	5
	42	20	48	
	38	19	47	
	34		46	
	31	18	45	
D	27	17	44	4
	24		43	
	21	16	42	
	18	15	41	
	16	14	40	
	14		39	3
	12	13	38	
E	10	12	37	
	8		36	
	7	11	35	
	5	10	34	2
	4	9	33	
	4		32	
	3	8	31	
	2	7	30	
	2		29	1
	1	6	28	
	1	5	27	
	1	4	26	
	1	0 – 3	25	

Graduate group
The graduate group represents 179 graduate applicants to a National Health Service Management Training Scheme. Testing was performed between 1997 and 2004.

Age
Ages ranged from 21 to 50 years with an average age of 27 years.

Gender
Approximately 40% were male and 60% were female.

Ethnic composition
96% described themselves as White and 2% as Indian and the remainder were from other ethnic groups.

Education
All applicants were educated at least to degree level.

Summary statistics for the graduate group

	DC3.1
Mean	24.16
SD	6.04

Graduate group

Grade	%ile	DC3.1	T-Score	Sten
A	99	39 – 40	75	10
	99		74	
	99	38	73	
	99		72	
	98	37	71	
	98	36	70	
	97		69	9
	96	35	68	
	96		67	
	95	34	66	
	93	33	65	
	92		64	8
B	90	32	63	
	88		62	
	86	31	61	
	84	30	60	
	82		59	7
	79	29	58	
	76		57	
	73	28	56	
C	69	27	55	6
	66		54	
	62	26	53	
	58		52	
	54	25	51	
	50	24	50	
	46		49	5
	42	23	48	
	38		47	
	34	22	46	
	31	21	45	
D	27		44	4
	24	20	43	
	21		42	
	18	19	41	
	16	18	40	
	14		39	3
	12	17	38	
E	10		37	
	8	16	36	
	7	15	35	
	5		34	2
	4	14	33	
	4	13	32	
	3		31	
	2	12	30	
	2		29	1
	1	11	28	
	1	10	27	
	1		26	
	1	0 – 9	25	

DC3.1 Norm groups combined with VC1.3 & NC2.3 groups

When selecting a DC3.1 Norm table, please consider the type of candidates or incumbents in your sample as follows:

- For a mixture of candidates - total composite group
- For mainly non-managers - composite non-management group
- For mainly graduates - graduate group

In general it is best to select the total composite group when using an industry specific norm group for VC1.3 and NC2.3 in combination with a DC3.1 norm group. However, if the candidates being assessed are very clearly drawn from one of the other two groups provided, then they can be selected from that particular group.