

REVELIAN

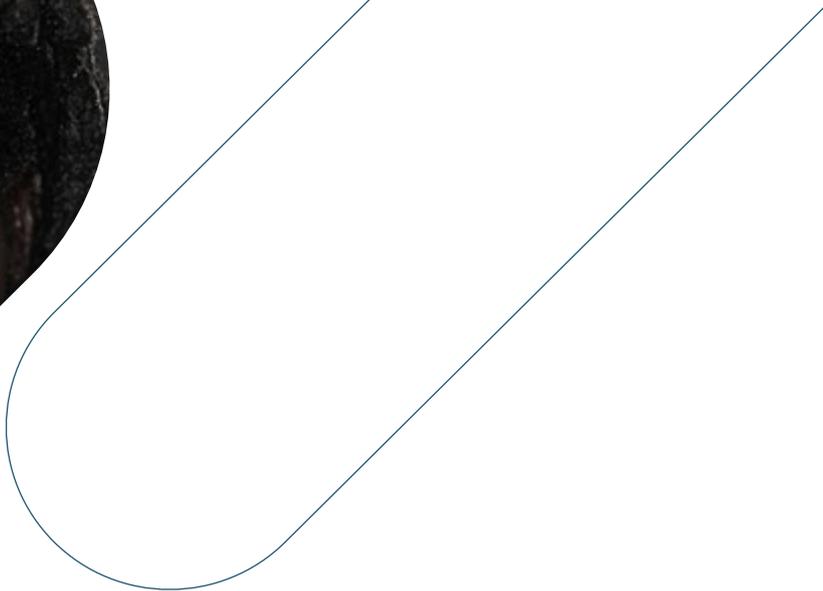
A Criteria Company

Talent Insight Revealed

ASSESSMENT INFORMATION BRIEF

Numerical Reasoning Test





ASSESSMENT INFORMATION BRIEF

NUMERICAL REASONING

Predict the capacity to effectively solve numerical problems

Numerical reasoning has strong links to job performance in a variety of roles requiring the ability to work with numbers.

Numerical reasoning is especially important in jobs that require people to process large amounts of data, such as complex technical jobs and managerial roles. Numerical reasoning becomes more important as a predictor of job performance as the complexity of the job increases. However, even if you don't need an employee who can find the value of X in an algebraic equation, this test can help you differentiate your candidates in a valuable way.

The Revelian Numerical Reasoning Test is an excellent predictor of job performance for a wide variety of positions. A person who achieves a high score in this assessment is more likely to:

- quickly grasp numerical concepts
- effectively solve problems using numerical information
- make sound, logical decisions involving numbers.



MEASURE

The ability to understand numerical relationships and to reason using numbers



PREDICT

Numerical aspects of job performance



TIME

12 minutes, timed



QUESTIONS

25 questions

WHAT IS NUMERICAL REASONING?

Numerical reasoning refers to the ability to understand numerical relationships and concepts and to reason using numbers. Numerical reasoning has strong links to job performance in a variety of roles requiring the ability to work with numbers. The Numerical Reasoning Test consists of 25 questions, each of which requires the candidate to process numerical information in order to answer the question correct. The candidate is scored based on the number of questions they have answered correctly.

WHY MEASURE NUMERICAL REASONING WHEN SELECTING STAFF?

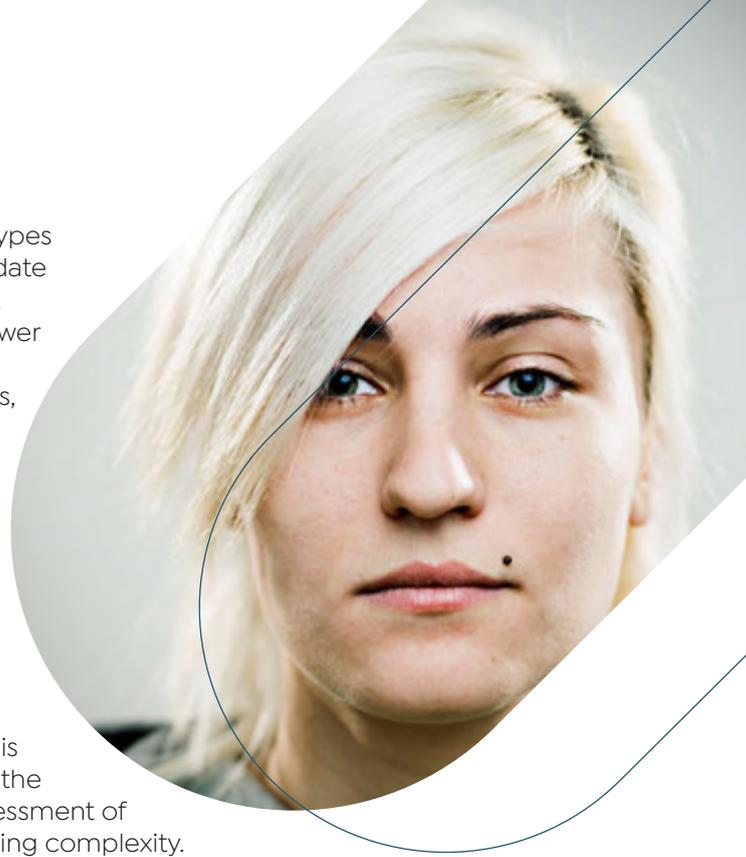
People who score well on numerical reasoning tests are more likely to quickly grasp numerical concepts, effectively problem solve using numerical information, and make sound, logical decisions involving numbers. As a result, people with high levels of numerical reasoning ability are more likely to perform well in roles requiring the ability to work with numbers.

Numerical reasoning becomes more important as a predictor of job performance as the complexity of the job increases. As such, numerical reasoning is especially important in jobs that require people to process large amounts of data, such as complex technical jobs and managerial roles.

EXAMPLE QUESTION

The Numerical Reasoning Test includes several different types of numerical questions. Each question requires the candidate to acquire information in numerical form, and then retain, organise, and manipulate that information in order to answer the question correctly. By examining the performance of the candidate across a number of different question types, an estimate of the candidates overall level of numerical reasoning ability can be obtained. An example question is shown below.

The example question shown here is relatively easy – most individuals get this question correct. In the actual assessment, the questions become more difficult as the candidate moves through the test. Questions in the assessment range in difficulty from those that a large majority of candidates answer correctly, to questions that only a small proportion of candidates answer correctly. This broad range of questions and question types means that the Numerical Reasoning Test provides a comprehensive assessment of numerical reasoning ability applicable across roles of varying complexity.



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NUMERICAL REASONING

Replace the question mark with the missing number?

22	24	?	28	30	32
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6 OF 25

SUBMIT

NORMATIVE GROUPS

When a candidate completes the Numerical Reasoning Test, their score is calculated by totaling the number of correct answers they achieved out of a possible 25. This score is actually meaningless until you contrast it with scores achieved previously by specific groups of people. The group that you contrast the score against is vitally important for the interpretation you make. In other words, the more relevant the comparison group to the position, the greater confidence you can place in the interpretation of the score achieved by the candidate.

Revelian has three types of comparison groups that may be used when interpreting candidate scores on the Numerical Reasoning Test (up to three of these can be displayed in the candidate's report at any one time). The types of comparison groups available for selection is dependent on the assessment language that has been selected for the position and is briefly outlined below:

General Population – Comprised of a large group of individuals from a wide range of industries and job types.

Industry Group – Industry comparisons provides additional information that aids in determining whether a candidate has the ability that is consistent in peers who are operating within a similar industry.

Management Level – Managerial level comparisons provides additional information that aids in determining whether a candidate has the ability that is consistent in peers operating at a similar level.

Company Specific Benchmark – provides a benchmark of the existing level of ability of current employees at the organisation. Please contact Revelian if you would like further information about creating an organisational specific benchmark.

The table below lists the currently available comparison groups for Numerical Reasoning Test:

	AUSTRALIAN ENGLISH	AMERICAN ENGLISH
General Population	✓	✓
INDUSTRY GROUP		
Accounting & Finance	✓	
MANAGEMENT LEVEL		
Graduates	✓	
BENCHMARK		
Company Benchmark	✓ (
	(Available upon request)	

Note: Additional normative comparison groups beyond the General Population group are available to enterprise clients only.

EXAMPLE ROLES IN INDUSTRY LEVEL NORMATIVE GROUPS FOR THE NUMERICAL REASONING TEST

Revelian is constantly working towards the development of new management level benchmarks. The table below provides an example of what is classified as a typical role within the graduate management level comparison group.

INDUSTRY GROUP	EXAMPLE ROLES
Accounting & Finance	Accountant, Accounts Payable/Receivable, Book Keeper, Credit Officer, Financial Controller.

EXAMPLE ROLES IN MANAGEMENT LEVEL NORMATIVE GROUPS FOR THE NUMERICAL REASONING TEST

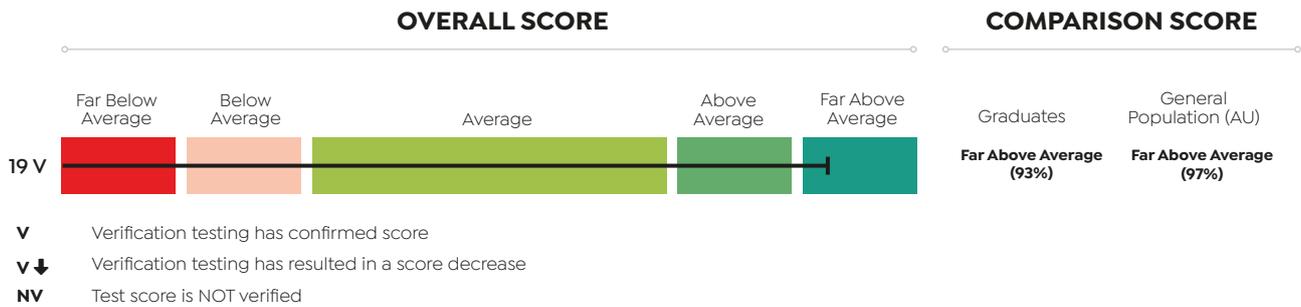
Revelian is constantly working towards the development of new management level benchmarks. The table below provides an example of what is classified as a typical role within the graduate management level comparison group.

MANAGEMENT LEVEL	EXAMPLE ROLES
Graduates	Graduate positions

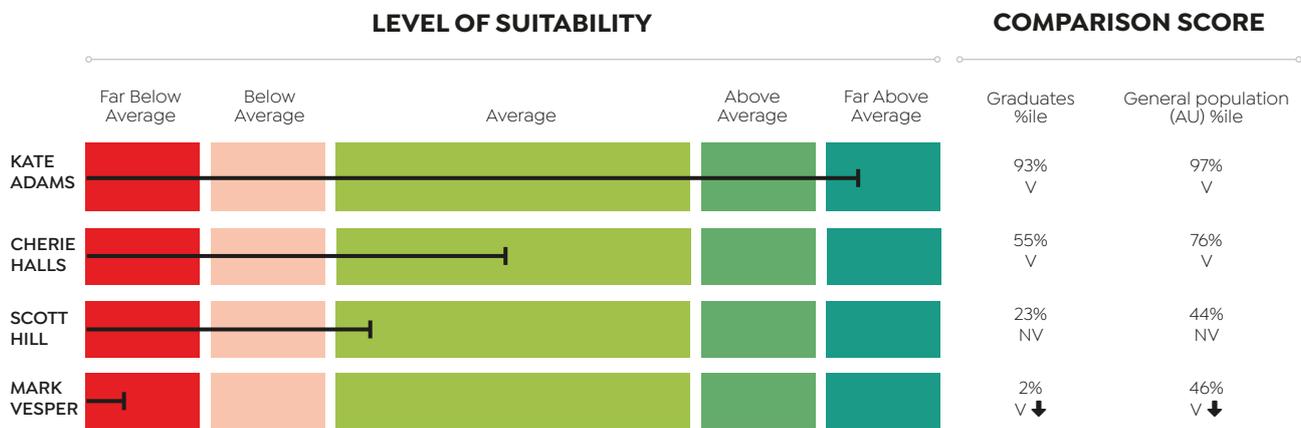


REPORTING RESULTS

Once a candidate has completed the assessment, they are assigned a percentage score which indicates the proportion of the comparison group(s) that they exceeded. In the example below, the candidate answered 19 questions correctly, and this score has been compared against two comparison groups. The score exceeded 93% of people in an industry benchmark of Graduates; and 97% of people in the General Population group of Australians.



When multiple candidates for the one position complete the Numerical Reasoning Test, then the results of those candidates are compared against one another in a position report, which ranks the candidates in terms of their performance on the assessment. An example of this type of reporting is shown below.



ONLINE SECURITY

Like all Revelian assessments, the Numerical Reasoning Test can be completed remotely over the internet under unsupervised conditions. This provides a high level of flexibility and convenience for the candidate. When testing is conducted under unsupervised conditions, however, it is possible that the candidate may have had assistance in completing the assessment, and it is essential to protect the security of the assessments. Revelian adopts the following best practice strategies to ensure on-line security, and reduce the likelihood of cheating.

MOTIVATING CANDIDATES TO COMPLETE HONESTLY

All candidates are informed that if they progress in the recruitment process, they will be tested again with different questions to confirm their results. This ensures that candidates are motivated to complete the assessments honestly and accurately. Prior to completing the Revelian assessments, all candidates are required to electronically endorse a short statement, indicating that they:

- Will not receive help from others when answering assessment questions; and
- Will be honest, accurate and perform at the best of their ability.

UNIQUE ASSESSMENT FORM FOR EVERY CANDIDATE

Candidates who sit the assessment will randomly receive a unique set of questions, different to those streamed to other candidates. This is achieved through Revelian's application of Linear-on-the-Fly (LOFT) item streaming for the Numerical Reasoning Test. Furthermore, answer options in each test are randomly scrambled. Both these features ensure that no two candidates will receive the same test, thus greatly reducing the possibility that candidates will collaborate when completing assessments.

SECURE ASSESSMENT DELIVERY

Our online testing engine is delivered using secure web technology, which allows us to ensure that assessment security and integrity is maintained, and that assessment time is tracked accurately.

DETAILED ASSESSMENT SESSION LOGGING

From the moment the candidate logs on to the Revelian website, to the moment they finish their assessments, Revelian creates detailed test logs of the candidates testing session, including time spent answering questions, and internet connectivity. Should the candidate indicate that their internet connection dropped out, or that they were disturbed while completing the assessment, then assessment logs can be consulted to verify the candidate's claims.

CANDIDATES CAN ONLY COMPLETE THE ASSESSMENT ONCE WITHIN A 12 MONTH PERIOD

Candidates can get better at specific assessments through practice. In order to ensure that all candidates can be compared against one another fairly, Revelian restricts candidates to one assessment within a 12 month period. To facilitate this, we gather identification details from candidates at a number of stages of the application and assessment process, so that new candidates can be compared against candidates in our database. If a candidate has been tested within the previous 12 months, then they are not able to sit the assessment again. Rather, they are provided with the opportunity to "release" their previous results to the new employer. This strategy eliminates candidate practice effects, resulting in fairer and more accurate assessment scores.

VERIFICATION TESTING

Revelian provides a free verification service, whereby individuals who have been tested remotely on the Revelian Numerical Reasoning Test can be re-tested on a parallel form of the test with different questions under supervised conditions. Revelian's systems automatically compare the results from the initial unsupervised assessment to the verification assessment. If the candidate does not verify their initial score then their results are updated to reflect the results from the second verification assessment and the client is informed.

VALIDATION AND PSYCHOMETRIC SUMMARY

THEORETICAL BACKGROUND

Specific aptitude theory proposes that specific abilities, such as numerical reasoning, are important in employee selection as performance in different jobs requires different specialist abilities. Therefore the prediction of job performance is said to be enhanced by focusing on the specific aptitude (or aptitudes) required for each unique role¹. For example, the use of numerical reasoning tests would be suitable for roles requiring the ability to use and work with numbers.

The premise of specific aptitudes dates back to the early 1900's when cognitive abilities were first suggested to exist within a hierarchy, with general cognitive ability at the broadest level, followed by general aptitudes (e.g. numerical reasoning), then narrower subcomponents referred to as specific aptitudes (e.g. spelling and arithmetic) at the third level². Since then, a considerable amount of research has explored the relationship between both general cognitive ability and specific aptitudes and their relationship with training outcomes and job performance.

Research has demonstrated numerical reasoning to be an excellent predictor of job performance and training success. For example, a large review of 56 scientific papers identified numerical reasoning as an excellent predictor of future job performance and training success³. This finding has also been demonstrated in various other studies across a number of different occupations. As such, numerical reasoning can be considered a valid and reliable measure to predict future job performance and training success.

DEVELOPMENT AND VALIDATION OF THE REVELIAN NUMERICAL REASONING TEST

1 Mount, M., Oh, I., & Burns, M. (2008). Incremental validity of perceptual speed and accuracy over general mental ability. *Personnel Psychology* (61), pp. 113-139.

2 Brown, K., Le, H., & Schmidt, F. (2006). Specific aptitude theory revisited: Is there incremental validity for training performance? *International Journal of Selection and Assessment* (14), pp., 87-100.

3 Bertua, C., Anderson, N., & Salgado, F. J. (2005) The predictive validity of cognitive ability tests: A UK me-



The Numerical Reasoning Test was developed in a number of stages. These were:

Question Development: Initially a large number of numerical reasoning questions were developed of varying item difficulty and item type. Including items of varying difficulty would allow candidates with diverse levels of numerical reasoning ability to be adequately assessed. Including items of varying type would ensure that content remained novel and adequately covered the construct of interest. Questions were evaluated, and modified where necessary, through a process of expert review which considered various aspects of item development including item clarity and cultural bias. This review first occurred with items in written form and then again once items were developed in a computerised format.

Question Testing: Question testing was undertaken in two stages. For initial testing purposes, items were grouped into blocks and streamed to candidates as part of a recruitment process following their completion of a general measure of cognitive ability. Responses to these test items were not scored nor considered as part of this recruitment process. After a sufficient sample of participants had responded to an item block (n=200) this data was collated and analysed to assess the adequacy of each new item. Item analysis, including both classical and item response theory techniques, determined which items were retained, modified or removed at this stage of development.

Retained items were then used to form parallel forms of a general cognitive ability, an assessment used for recruitment across a diverse range of positions and industries. Large datasets were then captured (in some cases in excess of 30,000 data points) to further calibrate the characteristics of each item. Principal component analysis and scale reliabilities were then used to demonstrate the adequacy of an assessment consisting of these numerical reasoning items only.

Assessment Validation: Those items retained through both phases of question testing were then used to form a bank of numerical reasoning items. Using Linear-on-the-Fly (LOFT) item streaming methodology, random forms of the Numerical Reasoning Test were then streamed and validated using two pilot populations. Under LOFT items are streamed randomly to candidates, ensuring that each candidate is administered a unique form of the assessment. Both item type and difficulty is controlled, allowing for fair and equitable comparisons between candidate scores. Both pilot populations had been sourced from pools of candidates who had previously completed Revelian assessments. The first pilot involved participants completing a randomly streamed form of the Numerical Reasoning Test to validate its initial calibration, i.e. time-limit, number of items. Participants (n=79) were of diverse ethnic backgrounds, age and gender who had applied for positions across various industries and management levels. Results demonstrated support for the initial calibration of the Numerical Reasoning Test with a normal score distribution, adequate internal consistency and no floor or ceiling effects.

The second pilot involved participants completing a randomly streamed form of the Numerical Reasoning Test as well as another measure of numerical reasoning, i.e. the numerical reasoning component of the Pearson Differential Aptitude Test (DAT). Participants (n=87) were equally counterbalanced, with one half of the sample completing the Numerical Reasoning Test followed by the DAT and the other half completing the DAT followed by the Numerical Reasoning Test. Correlational analysis demonstrated strong construct validity for the Numerical Reasoning Test in relation to the Pearson DAT.

Data from both pilot studies contributed to initial normative comparison groups as well as estimates of internal consistency and standard error of measurement, both of which were used in determining verified score ranges for the assessment.

ta-analysis. *Journal of Occupational and Organizational Psychology* (78), pp. 387-409.

PSYCHOMETRIC SUMMARY

The statistical results of the development and validation process are summarised below, and provide confidence that the Numerical Reasoning Test represents a reliable and valid measure of numerical reasoning ability. The Numerical Reasoning Test has:

- Strong face and content validity. The various numerical item types used in the Numerical Reasoning Test, e.g. sequence, matrix, arithmetic, reasoning, demonstrate clear relevance to as well as comprehensive coverage of the construct of interest.
- An internal consistency of 0.86. This indicates that the questions within the Numerical Reasoning Test form a coherent group that reliably assess numerical reasoning ability.
- A correlation with the Pearson DAT of 0.65 ($p < .001$). The DAT is a well-established and empirically supported assessment of numerical reasoning ability. This correlation indicates that the Numerical Reasoning Test is validly assessing the construct of numerical reasoning ability.
- Equivalence in item form difficulty. Due to the random nature of LOFT item streaming, overall level of item difficulty may differ slightly between candidates. By controlling item difficulty and content, it was shown that no meaningful difference in candidate scores can be attributed to random item streaming.
- A sufficiently large item bank. The number of unique forms of the Numerical Reasoning Test ensures that no two candidates will be streamed the exact same assessment, thus contributing to its ongoing validity and security.



FAST, RELIABLE AND TRUSTWORTHY HR DATA

Our assessments give you access to the insights you need to make informed decisions about your people and organisational culture.

CONSTRUCT	REVELIAN ASSESSMENTS	WHAT IS MEASURED	WORKPLACE OUTCOMES
Aptitude, cognitive ability	<ul style="list-style-type: none"> • Cognify • Cognitive Ability Test (RCAT) • Separate ability tests 	<ul style="list-style-type: none"> • General cognitive and problem-solving ability 	<ul style="list-style-type: none"> • Better job performance • Reduced turnover (involuntary) • Improved training outcomes • Increased productivity
Behaviour and personality	<ul style="list-style-type: none"> • Behavioural Profile (RBP) • 16 Personality Factors* 	<ul style="list-style-type: none"> • Style and behaviour at work 	<ul style="list-style-type: none"> • Team understanding • Team effectiveness • Reduced turnover (voluntary) • Improved communication and teamwork
Emotional intelligence	<ul style="list-style-type: none"> • Emotify • Emotional Intelligence Test (MSCEIT) 	<ul style="list-style-type: none"> • Identifying, understanding and using emotions at work 	<ul style="list-style-type: none"> • Improved leadership performance and customer satisfaction • Improved communication and teamwork
Work-related values	<ul style="list-style-type: none"> • Values Inventory (RVI) 	<ul style="list-style-type: none"> • Organisation and cultural fit 	<ul style="list-style-type: none"> • Improved organisational commitment, engagement and tenure • Reduced turnover (voluntary)
Preferences	<ul style="list-style-type: none"> • Work Preferences Profile (RWPP) 	<ul style="list-style-type: none"> • Person-job fit 	<ul style="list-style-type: none"> • Reduced turnover (voluntary) • Increased job satisfaction and engagement
Safety behaviour	<ul style="list-style-type: none"> • Work Safety Assessment (RWSA) 	<ul style="list-style-type: none"> • Safety attitudes and behaviours 	<ul style="list-style-type: none"> • Improved safety motivation and participation • Reduced LTIs, MTIs and work cover claims
Integrity and reliability	<ul style="list-style-type: none"> • Work Reliability Scale (RWRS) 	<ul style="list-style-type: none"> • Attitudes to counterproductive behaviours 	<ul style="list-style-type: none"> • Reduced incidence of behaviours such as fraud, theft, dishonesty, shrinkage, absenteeism
Skills Tests**	<ul style="list-style-type: none"> • Basic Skills Test • Computer Literacy & Internet Knowledge • Microsoft Excel • Microsoft Word • Microsoft PowerPoint • Typing Test • Ten Key Test 	<ul style="list-style-type: none"> • Skills and abilities 	<ul style="list-style-type: none"> • Reduced training requirements • Increased productivity

*The 16 Personality Factors assessment is only available in Australia and New Zealand

**Available in 2021

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Discover what lies
below the surface.

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