

## FACTOR B: REASONING & PROBLEM-SOLVING ABILITY

FACTOR B IS DETERMINED BY THE RESPONSES TO THE 15 REASONING PROBLEMS AT THE END OF THE 16PF. THE PROBLEMS CONSIST OF SIMPLE BASIC MATH, PATTERNS AND ANALOGY QUESTIONS. THEY MEASURE A PERSON'S ABILITY TO SOLVE PROBLEMS USING 3 TYPES OF REASONING: VERBAL, NUMERICAL AND LOGICAL

The role of problem solving, critical thinking skills and intelligence in successful job performance varies a great deal with the cognitive demands of the job. In many jobs, personal stability and responsibility will be vastly more important. In other jobs, a minimal level of intellectual ability will be required for acceptable performance. However, the more significant the role, the greater the intellectual demands for the job. Because of these dynamics, it becomes more important for the employer to examine an applicant's intelligence and critical thinking skills beyond their level of education.

Scores on Factor B have shown significant correlations with performance in work settings.

- Scores of 7.0 or greater indicate a higher level of reasoning and problem- solving
- Scores of 5.0 and 6.0 suggest an ability to function adequately
- Scores of 4.0 or less should raise question as to whether the person has enough reasoning skills for jobs requiring a higher degree of problem-solving, especially in more senior level positions

### High Scorers

Individuals with a high score on Factor B are generally seen as bright, quick learners who also tend to be more adept at abstract thinking and problem solving. A high score (7 or above) suggests a person who is capable of conceptualizing and solving more complex issues. It has a high correlation to IQ, or a person's natural intelligence described as perceptual reasoning.

It also has a high correlation to good grades in school and higher levels of education. Scores of 10 are no longer achievable since the assessment has updated norms. A score of 9 is the highest score possible when all 15 problems are answered correctly.

## **Moderate Scorers**

Moderate scores (5-6) suggest a modest degree of reasoning and problem-solving, and these individuals are likely to be comfortable with the majority of problem-solving issues they may face. In some cases they may need more time to adapt or learn new concepts.

## **Low Scorers**

Lower scores on Factor B (1-4) suggest an individual who may have difficulty in reasoning or solving more complex items they may come across. Low scores raise concerns that the individual may have difficulty performing jobs of a more complex nature. These individuals tend to be more hands-on in their learning style and often may need more time to reflect. They are more effective in situations in which they have background and experience to fall back on, or when performing jobs that are repetitive in nature. They may experience difficulty when faced with new things that are presented about which they have no experience to draw from. The task or role of the job would need to be simpler by nature with consistent activities that can be remembered as a result of the continuous repetition of the task.

When scores are unexpectedly low on Factor B (especially 1-3), given the person's educational level or other achievements, further investigation is warranted before a hiring decision is made. Because of this, when scores on Factor B are both low and consistent with the individual's past accomplishments, then a positive hiring decision should be made only upon consideration of the importance of the required cognitive functioning for that particular position. There is significant relevance to a low score because you can statistically guess and still obtain a score of 3.

## **Areas of Potential Concern**

There are 15 Areas of Potential Concern identified on the 16PF. These are areas of behavior that can impact a person's functioning and performance. A low score on Factor B is considered one of the 15 areas of potential concern and is the only one related to problem-solving; the other 14 are behavior-based. In general, two areas of potential concern may signal a higher need for caution when considering hiring someone. When one such area is Factor B, it suggests that the person may lack the cognitive strengths to compensate for the other area. If there are 2 or more areas where Factor B is one of the two, it is highly recommended to evaluate the challenges these scores are revealing.

## Educational Background

When evaluating low scores it is essential to check for depth of educational background. If scores are low, explore levels of education, grades, GPA, favorite subjects in school, type and depth of education (i.e., community college vs. ivy league school or Associate's Degree vs. MBA).

If there is only a high school diploma or if a GED is their highest level of learning, low scores may be concerning in higher-level roles where more analytical thinking is required. Differences between community colleges and more prestigious universities may be a telling factor as well. People with higher level education, especially those with an MBA, should be evaluated carefully when low scores are present.

## Case Studies

In one particular study evaluating high-potential leaders in a Fortune 100 bottling company, there were a group of 80 high-potential managers. The mean score on Factor B for the group was 7. That correlated positively to their IQ scores (perceptual reasoning). The mean score was 110 for the people in the study versus a mean score of 100 for the general population. IQ will be discussed later in the article.

Another study was conducted of shop floor supervisors in a manufacturing facility across two manufacturing plants. Those supervisors who were rated low on their ability to solve problems on the shop floor averaged 3.3 on Factor B. Those supervisors who were rated higher on their ability to solve problems on the shop floor averaged 5.9 on Factor B.

In another study for sales personnel in a company that sells software solutions, the mean score for low performers on Factor B was 5.8, while the mean score for average and above average performers was 6.9 and 6.8 respectively.

On an individual level, a Plant Manager of a manufacturing facility scored a 4 on Factor B and had his GED. He had left school for family reasons and because he was bored with school as well. He later returned to obtain his GED. He could tear down and rebuild any piece of equipment and re-program any of the machines on the floor. Upon further testing it was revealed he possessed an IQ of 127 which is in the superior range of perceptual reasoning. While these situations are rare, in our case studies they do exist, which supports the need for various kinds of intelligence tests. On occasion there are those rare exceptions where low scores on Factor B are not indicative of a person's IQ.

## Additional Considerations

A low Factor B score does not always represent low reasoning ability, but could exist for a variety of reasons:

1. Low reading ability
2. Limited formal education
3. Confusion, stress, fatigue, or distractibility
4. Lack of motivation or even cooperation
5. Impatience
6. Feeling of the assessment process being “beneath” the individual
7. English not being the first language

To determine the true meaning of a low score on Factor B, it is advantageous to conduct further testing to determine a person’s true level of cognitive ability. This is because the 15 problems that make up the score on Factor B are written at a 5th grade reading level and are normed for ages 16 and above.

Another reason low scores should raise concerns is because this section is untimed and a person has the ability to work through the problems without time constraints. Low scores are of special consideration because if an individual cannot get through the most basic reasoning and problem-solving questions that are written at a 5th grade reading level, how will they manage more complex situations? In more senior roles, where skills such as the ability to commit thought to paper, write reports, articulate at higher levels or be more strategic in thinking, higher scorers are certainly more desirable.

There are many kinds of intelligence and not all of them are highly correlated with each other. Musical ability and mechanical aptitude are obvious ones. Even among cognitive tasks, Factor B is probably not that highly correlated with perceptual reasoning (IQ) as in architecture, computation, processing speed, or self-awareness.

People may be more challenged regarding their problem-solving ability when they are exhausted, defeated, worried, stressed, heavily medicated or more importantly, “under the influence.” People who have been in the work force for a long time without an emphasis on continuing education and knowledge may have lower scores as well.

## Questions to Ask

To assess the significance of the B score in an employment setting and to understand whether or not the individual has the ability to perform the role intellectually, there are questions that can be asked to determine when a low score may become problematic:

- What is the depth of your formal education?
- Tell me about your education and your experiences in school.
- What were your best subjects and where did you excel? How well did you do on your SAT's?
- What kind of activities were you involved with?
- Did learning things come easy for you?
- What have you done regarding continuing education? (i.e. seminars, courses)
- Describe your reading habits. (Books, articles: global factors, general business function, industry).
- What are a couple of the best and worst decisions you have made in the past year?
- What are a couple of the most difficult or challenging decisions you have made recently?
- Please describe your decision-making approach when you are faced with difficult situations.
- In comparison with others at about your level in the organization, are you decisive and quick, but sometimes too quick, or are you more thorough, but sometimes too slow?
- Are you intuitive or do you go purely with the facts?
- Do you like to involve many or few people in decisions? How do you determine what and who will be included?
- Are you more comfortable dealing with concrete, tangible, short-term or more abstract, conceptual long-term issues? Please explain.
- How creative are you? What are the best examples of your creativity in processes, systems, methods, products, structure, services and sales?
- Do you consider yourself a better visionary or better implementer? Why?
- Tell about a time when you got frustrated with a customer or someone at work because it took them a long time to understand a point you were making.
- Tell about a time when you lost or almost lost a sale because you weren't able to explain the product's advantages or how it worked.

## **Additional Assessments to Evaluate Critical Thinking Skills**

In some roles the ability to learn more advanced skills can be impacted because a person may not possess the ability to obtain higher level learning due to their level of learning ability. Caution should be used when interpreting the 15-item Factor B scale where low scores exist but high scores need to be considered as well to determine a person's true level of ability.

Just because a person does score higher on Factor B does not automatically assure higher level learning ability. The 15 problems that make up this scale are a short measure of reasoning ability and may not provide a deep enough look into the reasoning and problem-solving abilities of the individual. Because of the level of sophistication that may be required in some roles, in addition to using information derived from scores on Factor B a person receives, we recommend additional testing of an individual's cognitive abilities. There are several, highly valid assessments available for use in these instances. While there are many to choose from, these are the 3 additional tests The Executive Group has chosen to support this dimension.

The Thurstone Test of Mental Alertness is a test of general mental ability. It measures reading and comprehension and the person's rate of speed of processing. It also evaluates the capacity to adjust to new situations, think flexibly, understand complex or subtle relationships, and acquire new knowledge & skills and apply them to problem solving. There are 126 alternating questions of verbal and numerical nature that get progressively more difficult. There is a correlation to a person's SAT scores. The individual has 20 minutes to take the test. Low scores do not necessarily predict low reading and comprehension ability; it just may be that the individual is slow and deliberate and strives for accuracy. However, the scores are not calculated to reflect this.

The Watson Glaser evaluates 5 important abilities involved in critical thinking. It evaluates an individual's inductive and deductive reasoning in five areas; inference, recognition of assumptions, deduction, interpretation, and evaluation of arguments. The Watson Glaser contains 40 problems and is untimed. It measures how a person applies logic to the problems they approach. Raw scores of less than 25 out of a possible 40 should raise caution when low scores on Factor B are present.

Further evaluation can be made using the Culture Fair. The assessment is designed and written to be "culturally fair." It does not discriminate between male or female, education or ethnic background. It is a true IQ test that measures perceptual reasoning and consists of 4 separate, timed tests which are spatial relationship in nature. The Culture Fair measures non-verbal intelligence, not educational (verbal and numerical) intelligence. Educational intelligence is referred to as crystalized intelligence.

The Culture Fair score is charted on a "bell curve." The mean score for general population is 100 with scores between 90 and 110 representing average range. When scores on the Culture Fair are below 100, the same concerns apply to the references regarding Factor B when it is low as well.

**Scores of 70–90:      Slow learners**  
**Scores of 90–110:    Average intelligence**  
**Scores of 110–140:  Higher problem solving ability**  
**Scores or 140+ :     Gifted**

When low scores on Factor B coincide with low scores on these 3 additional assessments, extreme caution must be exercised, especially for higher level positions. These additional assessments will further explore and support Factor B (Verbal Facility) referred to in the findings of the report and assess the depth of an applicants' cognitive ability.

It is not uncommon for someone to score high on verbal and numerical intelligence and low on their IQ test which measures their perceptual reasoning. By the same standards, it is not uncommon for someone to score low on their IQ (perceptual reasoning) and high on their verbal and numerical intelligence.

**For more information, please contact The Executive Group**

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