Chapter 2

Can we Measure Intelligence?

I think that this is the most extraordinary collection of talent, of human knowledge, that has ever been gathered together at the White House, with the possible exception of when Thomas Jefferson dined alone.

–John F. Kennedy, 35th President of the United States
(delivered at a dinner honoring American Nobel Prize winners, 1962)

One of the many hotly-debated topics that surfaces on the internet from time to time is the question, "Who was the most intelligent of the 46 U.S. Presidents from George Washington to Joe Biden?" Was it Thomas Jefferson, as suggested by John F. Kennedy? Or was it John Quincy Adams, or Kennedy, himself? Maybe it was one of the lesser known presidents like James Garfield who discovered a proof of the Pythagorean Theorem. In chapter 1, we observed that we cannot compare the intelligence of Albert Einstein and Thomas Edison without specifying the domain in which their performance is to be measured. A popular quote attributed to Einstein asserts, "Everybody is a genius. But if you judge a fish by its ability to climb a tree it will live its whole life believing that it is stupid." However, it would seem that comparing the intelligence of the US presidents, might be a more reasonable task, because it involves comparing men in the same role. In attempting to create a metric for this comparison, it would be necessary to identify the behaviors through which intelligence is manifest, such as creativity, inventiveness, a capacity for deep abstraction, or a soundness of judgment. Not only would it be difficult to assess each of these components, but once assessed, each component would have to be weighted and combined with the other components to yield a single number. Since weighting these factors is highly subjective, the ranking of the presidents by intelligence would vary, depending on the perception of the person or committee creating the metric. Furthermore the assessment of each component of intelligence would have to be inferred from the perceived impact of the individual's judgment, leadership skills, and decisions. At this point, we merely acknowledge that creating a metric for intelligence is a daunting task, and must begin with a reasonably clear idea of what is meant by "intelligence" in the human species. We will return to ranking the intelligence of the US presidents later in this chapter.

A Definition of Intelligence

Since the beginning of recorded history, people have recognized that individuals differ in their ability to solve problems, deal with abstractions, and learn new ideas. We call this many-faceted ability *intelligence*. However, when it comes to defining this enigmatic trait, we face the famous Jainist conundrum in which three blind men grasp the tusk, trunk, and tail of an elephant and attempt to reconcile their different perceptions of this unfamiliar pachyderm.[1]

We all have an intuitive perception of what we mean by "intelligence." Those who see further than the rest of humanity–formulating complex theories, inventing new technologies, and making successful decisions–are seen to be highly intelligent. Those who have no interest in learning or find learning very difficult and whose lives are encumbered with a litany of self-defeating decisions, are usually perceived as unintelligent.

During more than a century of debate and discussion, cognitive psychologists have proposed a variety of definitions of intelligence and there remains a diversity of opinion. However, psychologist Linda Gottfredson advanced, in 1997, a definition that has achieved some consensus among members of the American Psychological Association (APA):[2]

> *Intelligence is a very general mental capability that, among other things, involves the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly, and learn from experience. It is not merely book-learning, a narrow academic skill, or test-taking smarts. Rather, it reflects a broader and deeper capability for comprehending our surroundings, "catching on," "making sense" of things, or "figuring out" what to do.*

Early Attempts to Measure Intelligence

The first foray into establishing a metric for intelligence began in the early 1820's, when Samuel George Morton, an American natural scientist and physician began collecting human skulls and measuring their dimensions–a "science" known as *craniometry*. His investigation was based on the dual assumptions that larger skulls house larger brains and that larger brains are more intelligent than smaller brains. By 1851, Morton's collection exceeded one thousand trophies, including a large number from various indigenous tribes in the Americas. Assuming that cognitive ability is proportional to cranial volume, Morton filled each of the skulls with lead buckshot and measured its volume. Using this data, he concluded that whites are, on average, the most intelligent race, aboriginals in America came second, and blacks came last. However, faulty sampling procedures were later shown to invalidate his findings.[3] Morton's flawed conclusions were either a careless error in statistical inference or an early example of statistical skulduggery.

Morton's assumption that cranial volume is indicative of brain size was challenged in 1994 by a study asserting:[4]

> *The correlation between external cranial size (head circumference) and brain volume is only about 0.288.* [i.e., a weak relationship]

> **Note:** The correlation between two variables is a measure of the extent to which their values vary in relation to each other. For example, there is a strong correlation between height and weight because *on average* taller people are heavier. This correlation underpins the *body mass index* (BMI). By comparing a person's weight with the average for people of their height, we can determine whether an individual might be regarded as obese or anorexic. For a precise definition of correlation and its meaning, see Appendix A, p. 315.

Recent studies have shown that Neanderthals not only had a cranial volume of 1600 cm^3, larger than that of modern humans at 1250–1400 cm^3, and may also have been as intelligent as we.[5, 6]

Is Brain Size a Measure of Intelligence?

Autopsies on prominent humans enabled the investigation of intelligence relative to brain size, rather than cranial volume. Though some highly intelligent people were found to have possessed significantly larger than average brains, there were many who did not. Gauss, regarded by historians of mathematics as one of the three greatest mathematicians of all time, weighed in at what has been called an "embarrassing" 1492 grams–slightly greater than an average-sized brain.[7] Einstein's brain, part of which resides at McMaster

University in Hamilton, Ontario, tipped the scales at 1230 g, which is below average.[8] However, subsequent studies have revealed that the brains of both Gauss and Einstein are much more convoluted in structure than average. Einstein's brain was found to have a higher density of neurons than normal. Some cognitive scientists suggest that high cognitive ability may be associated with a density of connections rather than total brain mass.

With the development of brain scan technology, it became possible to measure actual brain size in humans *in vivo*, i.e., before shrinkage through age or disease. Studies involving the MRI (Magnetic Resonance Imaging) techniques indicate that there is only a moderate correlation between brain size and intelligence (as measured by IQ tests). The 2003 publication *The Scientific Study of General Intelligence* asserts:[9]

> *The large number of MR [magnetic resonance] studies replicated multiple times by independent groups has unequivocally confirmed a relationship between brain volume and higher IQ scores for normal men and women. The value of this correlation hovers near r = 0.35.*

This suggests that other factors such as, neuron density or convolution, must account for *most* of the difference in intelligence among humans.

The Creation of IQ–a Performance-Based Metric for Intelligence

Alfred Binet 1857– 1911

In 1904, Alfred Binet was the director of the psychology laboratory at the Sorbonne in Paris. The Minister of Public Education commissioned Binet to develop tests to identify less capable students who should be provided with some form of special education. To this purpose, Binet set out to develop a series of tests connected to everyday types of cognitive processes such as counting coins, ordering numbers, comprehending readings, and identifying patterns. His intent was to construct tests that measure innate intelligence and are relatively knowledge free. Between 1904 and his death in 1911, Binet designed a sequence of tests that he normed, based on average performances of students of each age up to 16 years. He wrote:[10]

> *It is a specially interesting feature of these tests that they permit us, when necessary, to free a beautiful native intelligence from the trammels of the school.*

Each student worked through the battery of tests until reaching the first test at which he was unsuccessful. Binet called the age assigned to this test his *mental age*. By subtracting the student's mental age from his chronological age, Binet obtained a single number that became his measure of the student's intelligence. In 1912, German psychologist William Stern modified Binet's measure by dividing the mental age by the chronological age and multiplying by 100 to obtain a whole number. With this, the concept of IQ (Intelligence Quotient) as a measure of intelligence was born.

IQ = Mental age ÷ Chronological age × 100 (for ages ≤ 16 years)

Dividing by the chronological age created a metric that enabled the comparison of IQs between children of different ages. Hence, a 12-year-old with a measured IQ of 115, whose mental age increases the following year should also register an IQ of approximately 115 the following year.

The General Factor of Cognitive Ability

In 1904, English psychologist Charles Spearman tested 23 boys in a preparatory school near Oxford on each of: classics, French, English, mathematics, discrimination of pitch, and music. Constructing a table of 23 rows and 6 columns, he entered in each row the scores that a particular boy earned on each of the 6 tests. By calculating the correlations between the data in each pair of columns, he obtained table 2-1 showing the correlations between the scores obtained by all 23 students across each pair of tests.

Correlations between tests **Table 2–1**

	Classics	French	English	Math	Pitch Dis	Music
Classics	–	0.83	0.78	0.70	0.66	0.63
French	0.83	–	0.67	0.67	0.65	0.57
English	0.78	0.67	–	0.64	0.54	0.51
Math	0.70	0.67	0.64	–	0.45	0.51
Pitch Dis	0.66	0.65	0.54	0.45	–	0.40
Music	0.63	0.57	0.51	0.51	0.40	–

For example, the correlation coefficient in the 3rd row and 4th column of table 2-1 is 0.64, indicating a strong correlation between the students' performance on the English test (3rd row) and the math test (4th column).

On analyzing these correlations, he asked, "What pervasive cognitive faculty accounts for the fact that a student who does well on any of these tests, usually, *but not always,* does well on the others?" Spearman hypothesized that the cognitive abilities brought to bear in each test consist of a general ability, common to all the tests, along with a specific ability unique to that test. He called this general factor of cognitive ability the *g factor* which he computed from the table of correlations, using a mathematical technique known as *factor analysis.* (See Appendix B, pp. 316–317, for the mathematical details.)

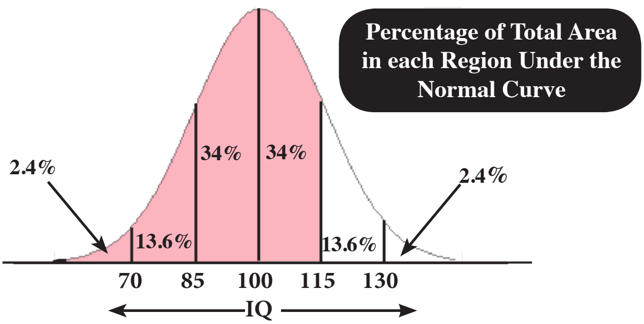
Spearman's *g* Expanded the Scope of IQ

From the data in table 2-1, we see that the test scores in the classics have the highest correlations with those of the other tests, suggesting that facility in learning the classics is closely correlated to the general intelligence factor, *g*. In modern psychometric parlance we say, "Performance in the classics draws (loads) heavily on *g*." However, pitch discrimination is not highly correlated to the other tests, suggesting that it draws (loads) less on *g* and draws more heavily on a unique factor (special aptitude).

However, some psychologists charged that *g* is a mathematical fiction and has no real existence, while others celebrated *g* as a long sought-after metric for comparing humans by intelligence. As the justification of the general factor *g* was sought in mathematical models, the concept of IQ was migrating across the Atlantic to America where it would take on a new life.

Gradually, IQ became widely accepted as a proxy for intelligence. In 1955, American psychologist David Wechsler published a new intelligence test for adults that became known as the Wechsler **Adult** Intelligence Scale (WAIS). Defining intelligence as "the global capacity of a person to act purposefully, to think rationally, and to deal effectively with his environment," he created two sub-tests–one measuring "verbal intelligence" and the other, "non-verbal (performance) intelligence".[11] Wechsler made the assumption that intelligence is normally distributed, i.e., has a bell-curve distribution throughout the population, and mapped his test scale onto a normal distribution with mean 100 and standard deviation 15. By standardizing his tests in this way, he linked his scale directly to percentiles, allowing for immediate comparisons to average intelligence. A person with an IQ of 100 would be in the 50th percentile, meaning that she scored higher than 50% of adults who took the test. This definition of IQ was age independent since all adults were believed to have reached full brain development. The correspondence between IQ and percentile ranking is displayed below in figure 2.1.

The Percentiles Corresponding to IQ **Fig. 2.1**



For example, the area of the shaded region left of IQ 115 is 84% (i.e., 50% + 34%) of the total area under the curve. So, someone with an IQ of 115 scored higher than 84% of the population and ranks in the 84th percentile. This is called the *percentile ranking*. Table 2–2 gives the percentiles that match familiar IQs.

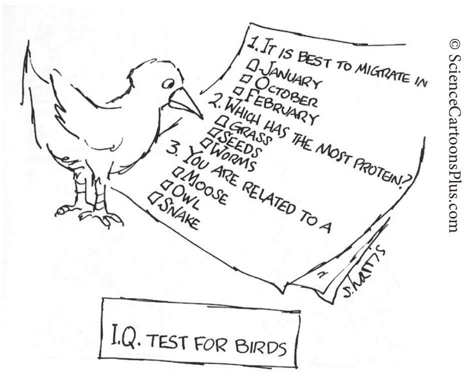
Table 2–2

Percentiles corresponding to Some IQs		
IQ	**Percentile Ranking**	**Meaning of this Percentile**
100	50th percentile	50% of people score below 100.
115	84th percentile	84% of people score below 115.
130	97.6th percentile	97.6% of people score below 130.

Wechsler's recognition that intelligence may have more than one dimension had prompted him to depart from a single measure of intelligence offered by the original Binet tests and the Stanford-Binet test. Subsequent revisions of the Wechsler tests included measures of verbal comprehension, perceptional reasoning, working memory, and processing speed. WAIS-IV now has 10 subtests and 5 supplemental tests that summarize intelligence with two measures–a final IQ score and a General Ability Index. The following is an example of a question or item designed to test verbal comprehension.

Which of these five words is not similar in meaning to the others?
A. relinquish **B.** abandon **C.** enrol **D.** forsake **E.** quit

The multiple-choice format was used in these tests to simplify as well as standardize the scoring, by removing human judgment of answers as a variable. Despite this, however, such items as the one above have been criticized as culturally dependent, because people from educationally deprived environments may not have been exposed to an expansive vocabulary. To address this criticism, psychologists developed multiple choice tests known as the *Raven's Progressive Matrices*. Despite naysayer claims that IQ tests are "for the birds," these tests have become the gold standard of culture-free tests of cognitive ability.



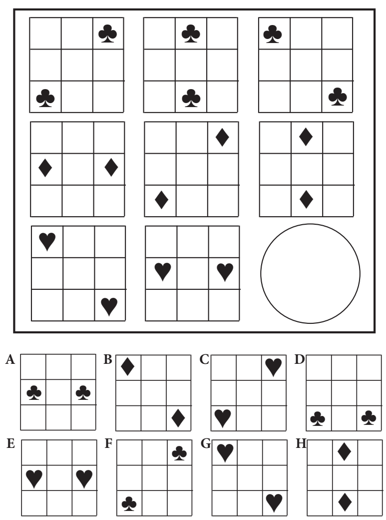
What does a Raven's Progressive Matrices IQ Test Look Like?

While there are many different IQ tests, the Raven's Progressive Matrices have the most widespread usage because they are not "culture-loaded." That is, they are purely visual, language-independent, and free of knowledge favoring a particular culture. Each test consists of either 48 or 60 items, presented in order of increasing difficulty and is time-limited to about 40 minutes. Samples of the kinds of items that appear on these tests are given in the next few pages. Typically, an item consists of an array of 3 × 3 grids, called *matrices*, arranged in 3 rows and 3 columns. As you scan the 3 matrices from left to right in a particular row, you are expected to determine how each matrix is derived from the one on its left. Sometimes, there will also be a relationship among matrices in the same column, in which case you must ascertain how each matrix is derived from the one above it. Answering an item correctly involves choosing the matrix or matrices that complete the pattern or patterns evident within the progression from left to right and/or top to bottom. Tests containing items with this structure are called *Raven's Progressive Matrices*, after their creator John C. Raven.[12]

In the following sample items, examine how the matrices change as you scan from left to right along the top row of the display. Then look for a pattern in how the matrices change in the middle row. Did the matrices in both rows change the same way?

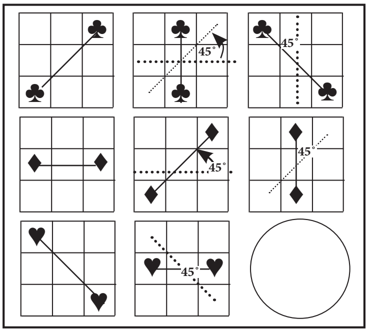
Now, do the same for the matrices in each of columns 1 and 2 as you move from top to bottom. Did the matrices in both the rows and columns change the same way? If so, apply the same change to the second matrix in the bottom row and the second matrix in the third column to obtain the correct grid from the offerings "A" to "H" that belongs in the circle.

Sample Item 1: Select the option, A through H, that belongs in the circle below to complete the pattern. (Try this before reading ahead.)



Answer to Sample Item 1

As we move from left to right along the top row of 3 × 3 matrices, the line joining the ♣ symbols rotates by 45˚ counterclockwise.



Similarly, as we move from left to right along the middle row of 3 × 3 matrices, the line joining the ♦ symbols rotates by 45˚ counterclockwise.

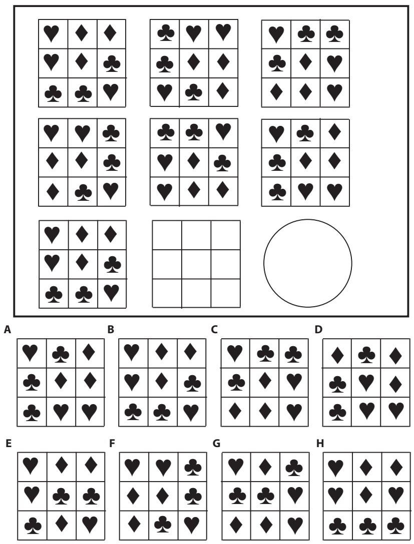
Also, as we move from left to right along the bottom row of 3 × 3 matrices, the line joining the ♥ symbols rotates by 45˚ counterclockwise.

Moving from top to bottom in each column of matrices, we observe that the line joining the icons rotates by 45˚ clockwise and the symbols change from ♣ to ♦ to ♥. Taking into account both the angular and symbol changes, answer C is the only matrix that continues the patterns from left to right and top to bottom in the array of 3 × 3 matrices.

Sample Item 2 (A More Difficult Test Item)

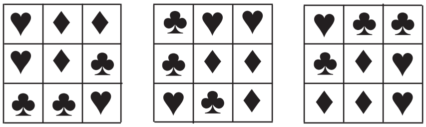
Complete the empty matrix in the middle of the bottom row. Then select the matrix, A through H that belongs in the circle below to complete the pattern. (Try this before reading ahead.)

Reminder: Examine how the 3 × 3 matrices change as you move from left to right along each row of the array. Then look for patterns in the changes as you move from top to bottom in each column.

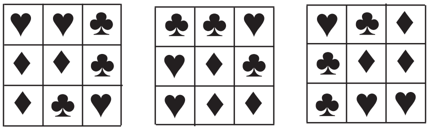


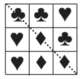
Answer to Sample Item 2

Moving from left to right along the top row of the 3 × 3 matrices, we see that the second and third matrices are obtained by rotating the matrix on its left by 90˚ clockwise about the center.

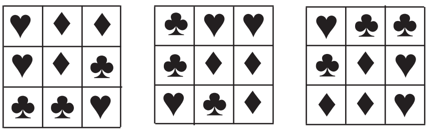


In the middle row, the matrices are rotated by 90˚ *counterclockwise*, as we proceed from left to right.



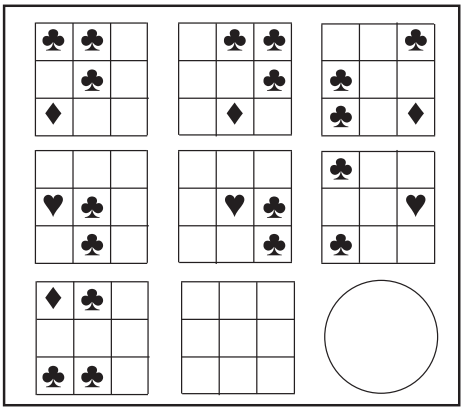


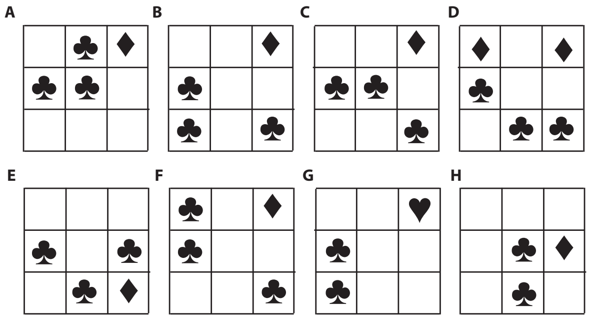
As we move from top to bottom in a column of the array, each matrix is reflected in its main diagonal (dotted line) to yield the matrix below it. Reflecting the middle matrix of the second row in its main diagonal yields the middle matrix in the third row shown below. This matrix is also obtained from the matrix on its left by a 90˚ clockwise rotation. Similarly, reflecting the third (right-most) matrix in its main diagonal yields the final matrix, shown here, which, again, is also obtained from the matrix on its left (the middle matrix below) by a 90˚ clockwise rotation, so answer C is correct.



Sample Item 3:

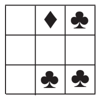
By moving from left to right in each of the first two rows of the array shown here, determine a pattern. Complete the empty matrix in the bottom row. Then select the matrix, A through H, below that belongs in the circle to complete the pattern. (Try this before reading the answer.)



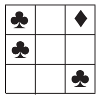


Answer to Sample Item 3

We see that as we move from left to right along a row of 3 × 3 matrices the icons move one column to the right. Therefore, as we move from the first matrix in the bottom row to the second matrix in the bottom row, we move the icons in column 1 into column 2 to obtain this matrix in the middle of the bottom row.



We observe also, that when column 3 moves to the right, it becomes column 1 and its icons drop down one row, yielding the final matrix shown on the right. That is, the correct response is F.



Why IQ Matters

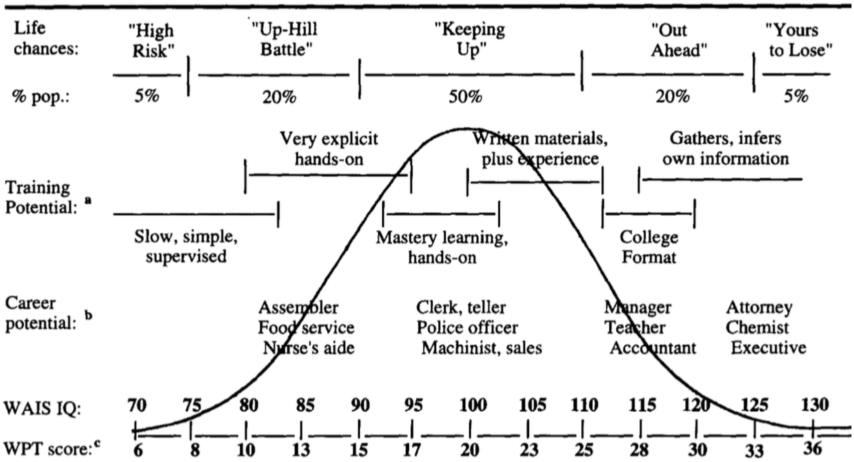
The IQ of a person who takes the Raven's Progressive Matrices test is calculated from the number of items answered correctly. However, to many people, items such as those shown above seem rather academic and unrelated to tasks in real-life contexts. Consequently, many regard IQ as a measure of book-learning skills–skills perceived to be irrelevant in the everyday world of work. Yet, such tests are used extensively for the selection of job applicants in business and industry, and for recruitment in the military. Why?

In her article *Why g Matters*, psychologist Linda Gottfredson observes:[13]

> *Research in job analysis and personnel selection refutes the claim that g* [measured as IQ] *is useful only in academic pursuits. Intelligence turns out to be more important in predicting job performance than even personnel psychologists thought just two decades ago…The key observation here is that personnel psychologists no longer dispute the conclusion that g* [i.e., IQ] *helps to predict performance in most if not all jobs.*

In supporting her assertion of a close connection between IQ and job performance, Gottfredson compiled information from the Wonderlic Personnel Test and Scholastic Level Exam to create the display in figure 2.2.

Link Between IQ and Career Potential **Fig. 2.2**



Sources: a. Training Potential: *Wonderlic Personnel Test and Scholastic Level Exam: User's manual.* 1992. Libertyville, IL. p. 26.
b. ibid. p. 20. c. ibid. p. 34.

In the figure, the row labeled *training potential* reveals that those of IQ below 80 usually need constant supervision and should be assigned cognitively simple tasks. Those of higher IQ, but less than 105, can typically learn more complex tasks, but the training methods should involve *mastery learning*, i.e., frequent practice and reinforcement until the job is performed routinely. Those of IQ higher than 110 can be expected to learn independently from books and manuals and do not usually need much formal instruction.

The row labeled *career potential* shows the spectrum of employment ranging from routine, relatively unskilled occupations at the low IQ levels to the occupations demanding complex cognitive skills at the high IQ levels. As we move from left to right along this employment spectrum, we see that the level of job complexity increases in parallel with the corresponding IQ scores. It is not surprising that the increasing levels of complexity in the jobs match the increasing levels of complexity in the items on the IQ tests.

Of course, the scale in the figure represents average IQs in various occupations that have exceptions at the individual level. That is, there are those individuals of average or lower IQ who find employment in teaching, law, and medicine, just as there are individuals of high IQ who languish in unskilled occupations. However, the measure of IQ is an excellent predictor of career *potential*, albeit a less accurate predictor of career *attainment*. And again, since these data represent averages, a low IQ should not be interpreted as a barrier to achievement. When we observe superachievers in life, we find that non-cognitive attributes, such as tenacity and passion, are often major factors contributing to their success. As Gottfredson observes:[14]

> *The causal impact of g does not mean, of course, that it is the only cause of differences in job performance. Other personal and environmental attributes clearly matter. However, the evidence is overwhelming that differences in intelligence are a major source of enduring, consequential differences in job performance.*

How Do the Hi-Q People Choose a Profession?

Some of the so-called Hi-Q people (previously known as "high IQ people) choose a profession early in life. "Dad is a lawyer, so I want to study law," or "I want to become an executive in mom's corporation." Sometimes, a nurturing instinct moves a person into teaching, nursing, or social work. A love of literature or history, or a passion for philosophy, might move someone into the humanities where they become engaged in research in a particular field of interest. Alternatively, a fascination with plants or animals might lead someone into a career in biology. However, most of the Hi-Q people remain undecided among several potential options until their natural proclivities begin to emerge. At the end of secondary school, students in the US take the SATs (acronym for Student Achievement Tests) and apply for admission to various universities. Their SAT scores, known to correlate strongly with IQ, are a significant determinant of the universities and the programs of study into which they will be accepted. Figure 2.3, using data from the College Board, shows the average SAT scores of students in each of the programs of study across the American university system as of 2014.[15]

Average SAT Math & Verbal Score for Students entering each College Major Fig. 2.3

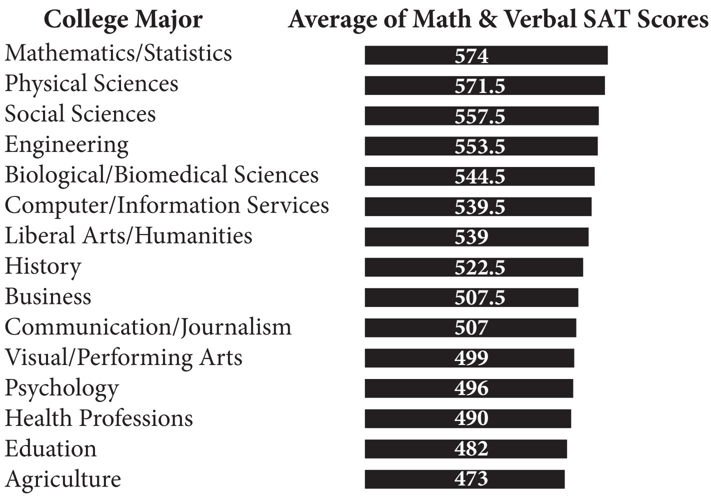


Figure 2.3 reveals that the highest average SAT scores are earned by those in the STEM (acronym for Science, Technology, Engineering, and Mathematics) subjects, while the lowest are in agriculture and education. In *The Bell Curve*, Herrnstein and Murray identify those in the "high-IQ professions" (listed in alphabetic order) as accountants, architects, chemists, college teachers, dentists, engineers, lawyers, and physicians. They state:[16]

> *The mean IQ of people entering those fields* [STEM subjects] *is about 120, give or take a few points. The state of knowledge is not perfect, and the sorting process is not precise. Different studies find slightly different means for these occupations, with some suggesting that physicians have a mean closer to 125, for example. Theoretical physicists probably average higher than natural scientists in general.*

Comparing average IQs across college majors can be misleading because the variation in IQs within a major is much greater than the variation across majors. That is, there is a very wide difference in the IQs of students in any particular major, so the person with the highest IQ in a field such as education may have an IQ greater than the IQs of many of the students in theoretical physics. However, there are general trends that are worth exploring. For example, only those with an IQ high enough to score well on the SATs will be able to gain admission to theoretical physics or mathematics, while people who score lower on the SATs will be able to qualify for entry only into programs listed near the bottom of figure 2.3. Indeed, both SAT scores and IQ are significant determinants of available career choices. However, once a person has embarked upon a particular career, their level of performance may depend significantly on cognitive skills, such as leadership and openness to others, that complement their IQ. This is particularly true in administrative jobs where performance is contingent on motivating others to the achievement of a shared goal. And nowhere else is this talent more apparent than in the role of President of the United States.

Revisiting the IQs of the Most Intelligent US Presidents

In 2006, psychologist Dean Keith Simonton conducted what is called a *historiometric* study of the 42 US presidents from George Washington to George W. Bush in an attempt to estimate their IQs. Entering data from biographies detailing their educational backgrounds, personality descriptions, intellectual achievements, and accomplishments into a sophisticated software program designed to estimate IQs from such profiles, he ranked them by IQ.

Since many arbitrary judgments are involved in quantifying cognitive characteristics, the specific IQ for any particular president should be taken as a very rough estimate at best. Changing input data by even a small amount would change significantly the estimated IQ. However, the value in this study resides in its comparison of the potential for achievement (IQ) with *actual* achievement. Table 2–3 lists, in descending order, the 10 presidents with the highest estimated IQ. Many presidents, like Washington at 20th (est. IQ 132.5) and Lincoln at 12th (est. IQ 140) who are *not* on this list, achieved significantly more than several who made the top ten, suggesting that performance in a role is not dependent on IQ alone. Simonton states, "Intellect is not, by any means, the only predictor of presidential leadership. Many other variables are involved as well, including both personality traits and situational factors."[17]

Table 2-3

The Ten Most Intelligent US Presidents	
John Quincy Adams	175.0
Thomas Jefferson	160.0
John F. Kennedy	159.8
Bill Clinton	159.0
Jimmy Carter	156.8
Woodrow Wilson	155.2
John Adams	155.0
Theodore Roosevelt	153.0
James Garfield	152.3
Chester A. Arthur	152.3

Epilog

IQ is not a complete measure of intelligence, because it has dimensions, such as judgment, that we have not yet learned how to identify or measure. However, a significant advantage of IQ as a measure of general intelligence *g*, is its objectivity. If we were to ask 100 people to compare the intelligence of various US Presidents, we would obtain a variety of widely disparate answers based on perception, and possibly political orientation. However, if we were able to administer IQ tests to those Presidents, we would have some real surprises in discovering significant differences in their capacities for abstraction and problem solving.

When we observe those who are articulate, we tend to judge them as highly intelligent, while those who lack verbal fluidity are perceived as intellectually limited. Of course, eloquence often derives from high intelligence but it's not always the case. In high profile roles, like the US presidency, there is a premium on communication skills in creating an impression of intellectual power, while qualities like instinct and strategic decision-making are less observable and may escape inclusion in our personal assessment. Therefore, we must move to certainty very slowly in our estimates of someone's IQ.

The difficulty in estimating the IQs of the US Presidents was evident in Simonton's study. Every US President had an estimated IQ of 130 or greater, placing them all in the top 3% of the general population in intelligence. For example, the estimate for the IQ of George W. Bush was 138.5, placing him in the top 0.9% of the population, but lower than most US Presidents.[18] However, Simonton acknowledged the fragility of such estimates:[19]

> *George W. Bush may be much smarter than [our estimate] implies. The counterargument must aim at the score he received on Openness, a score that provided the only information for the imputation of his IQ and Intellectual Brilliance estimates.*

In the photo below, Jimmy Carter, Bill Clinton, Barack Obama, and George W. Bush share a moment of levity as they wait backstage before the dedication of the George W. Bush Presidential Library in April 2013.[20] It's not clear what everyone is laughing about, but close examination suggests the object of their humor.

Official White House photo by Pete Souza / Public domain

Rising above the ridicule of his fellow members of the presidents' club, good-natured George opened with self-deprecating humor, "There was a time in my life when I wasn't likely to be found at a library, much less found one."[21] Though not known for his "school smarts," George's acquired skills in leadership and human relationships, brought him an approval rating greater than 85% following the September 11 attacks–the greatest approval rating of any US President before or since.

Myths: • IQ is irrelevant. A metric such as IQ is a measure of "school smarts" and has little to do with a person's suitability for a particular career or future job performance.

• IQ is a complete measure of your intelligence.

Truth: Your IQ is a measure of a significant portion of your intelligence, including your ability to learn, problem solve, and draw inferences. However, cognitive abilities, such as leadership, judgment, and interpersonal skills must be acquired through the application of your IQ to your experiences.