

# **Intelligence**

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INTELLIGENCE



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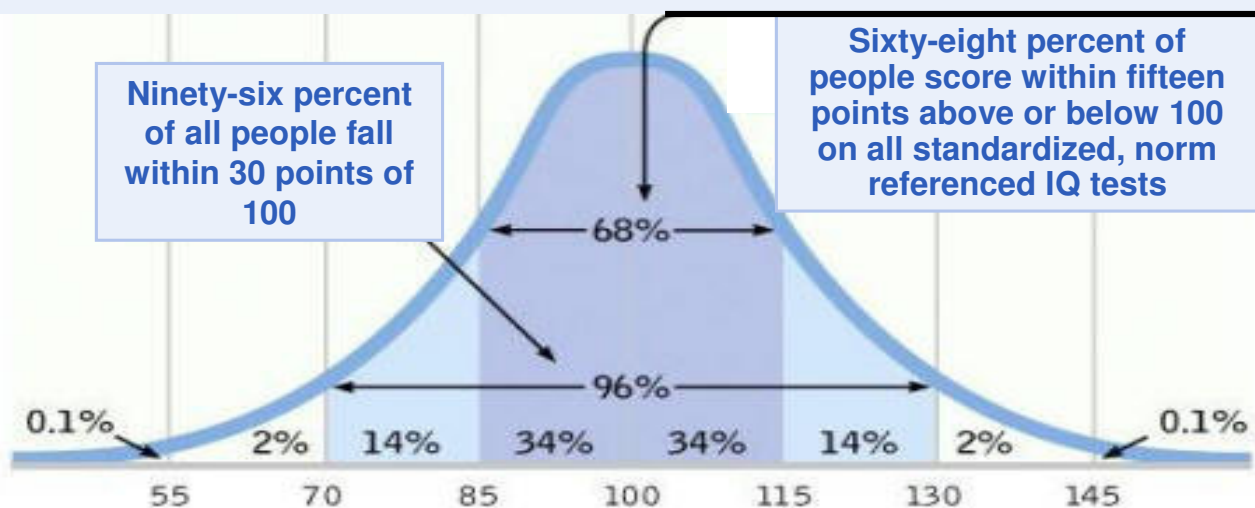


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# PSYCHOLOGY 100

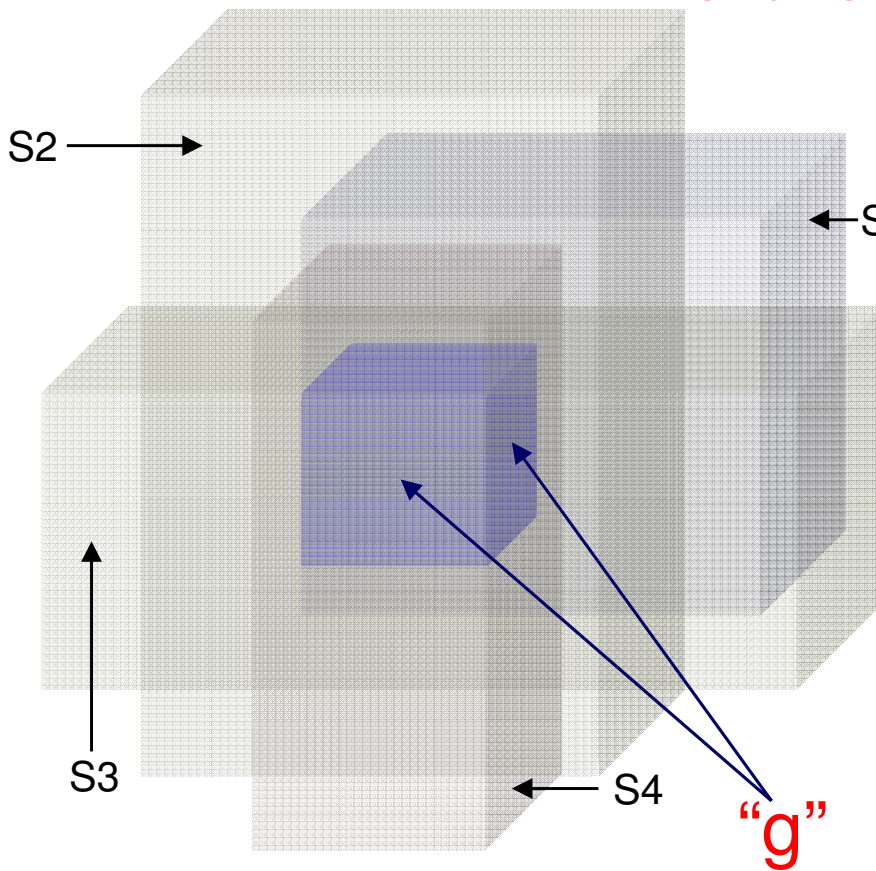
DR. JESSI SMITH

Intelligence can be defined as a combination of mental competencies and potentialities that includes the ability to (a) learn from experience and to (b) apply this knowledge, (c) formulate new understandings, and (d) construct solutions to novel problems encountered in new and challenging situations (Vessels, 2004).



## Charles Spearman's "g"

In his analysis of the structure of intellect, Charles Spearman found that *specific* mental talents (S1, S2, S3, etc.) were highly Inter-correlated. He concluded that all cognitive abilities share a common "core," which he labeled "g" for general mental ability.



## Spearman and The $g$ Factor

- **Spearman proposed that intelligence consisted of two kinds of factors: a single general factor  $g$  and numerous specific factors  $s1$ ,  $s2$ ,  $s3$ , and so on.**

# Spearman and The $g$ Factor

- An examinee's performance on any homogenous test or subtest of intellectual ability was determined mainly by two influence:  $g$ , the pervasive general factor, and  $s$ , a factor specific to that test or subtest. (An error factor  $e$  could also sway scores, but Spearman sought to minimize this influence by using highly reliable instruments.)

## Spearman and The $g$ Factor

- **For example, several tests might share a common unitary memorization factor that was halfway between the  $g$  factor and the various  $s$  factors unique to each test.**

## **Thurstone and the primary mental ability**

- **Thurstone concluded that several broad group factors—and not a single general factor—could best explain empirical results. There are seven group factors frequently corroborated, which have been designated primary mental abilities (PMAs).**



# Thurstone's Theory of Intelligence (1938)

- Proposed that intelligence is based on seven primary mental abilities
  1. verbal comprehension
  2. numeric ability
  3. spatial relations
  4. perceptual speed
  5. word fluency
  6. associative memory
  7. inductive reasoning
- A major critic of Spearman's theory
- Concluded there was no evidence of Spearman's idea of general intelligence (*g*)
- Believed that intelligence needed to be measured on all seven mental abilities rather than just one factor (like Spearman's *g* factor)

# Thurstone and the primary mental ability

- Verbal comprehension
- Word fluency
- Number
- Space
- Associative memory
- Perceptual speed
- Inductive reasoning

## Thurstone and the primary mental ability

- However, Thurstone acknowledged that his primary mental abilities correlated moderately with each other, proving the existence of one or more second-order factors.
- Vernon (1950) provided a rapprochement between these two viewpoints (Spearman vs. Thurstone) by proposing a hierarchical group factor theory.

## **Thurstone and the primary mental ability**

- In his view, g was the single factor at the top of a hierarchy that included two major factors labeled verbal-educational (V:ed) and practical-mechanical-spatial-physical (k:m). Underneath these two major group factors were several minor group factors resembling the PMAs of Thurstone; specific factors occupied the bottom of the hierarchy.

## Guilford and the Structure-Of-Intellect (SOI) Model

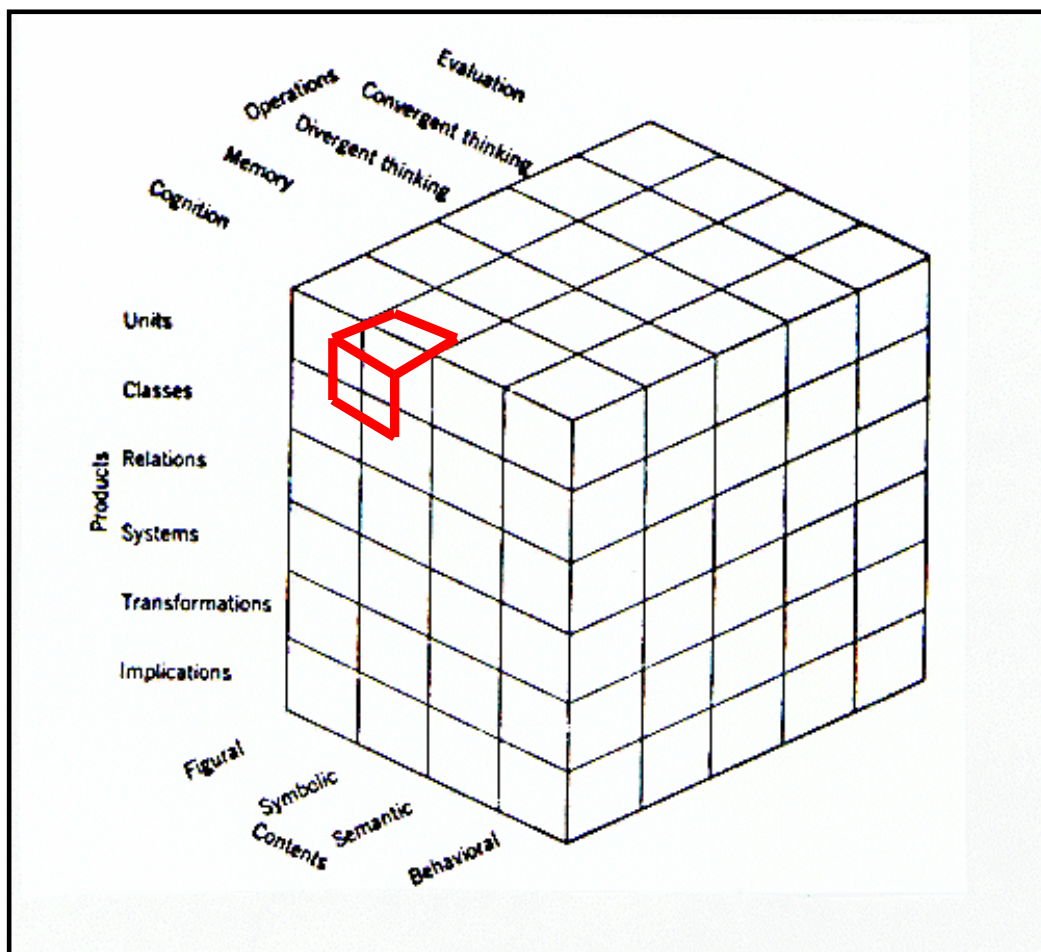
- Each combination of an operation (e.g., memory), a content (e.g., symbolic), and a product (e.g., units) represents a different factor of intellect.
- Prior to Guilford's contributions, most tests of intelligence required mainly convergent production. Guilford raised the intriguing possibility that divergent production.

# Divergent Thinking

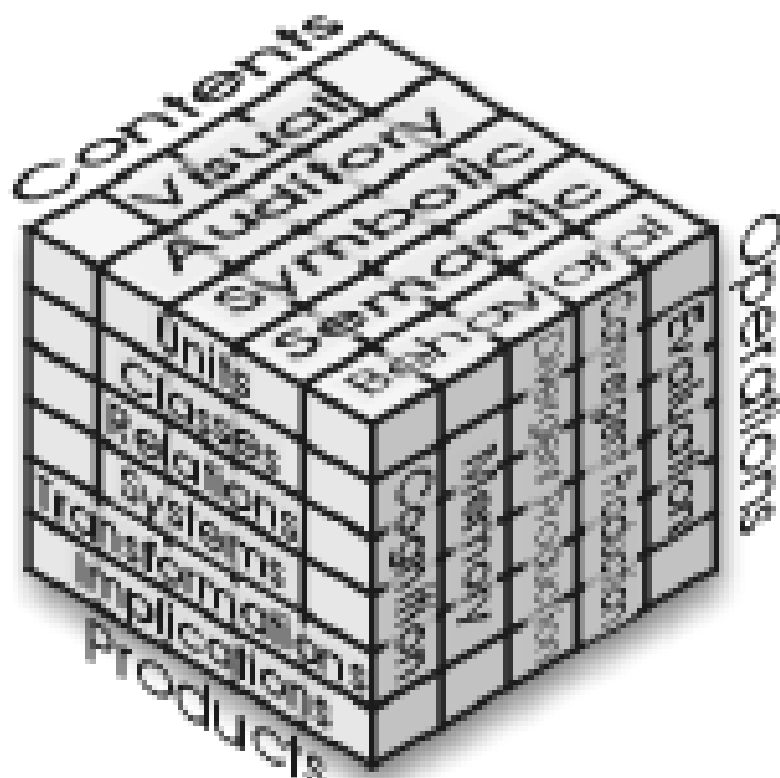
- How many different ways can you group a deck of cards?
- How many different words begin with L and end with N?

L\_\_\_\_\_N

## Guilford's 'Structure of Intellect'



# Guilford's Model of Intelligence: Structure of Intellect Theory

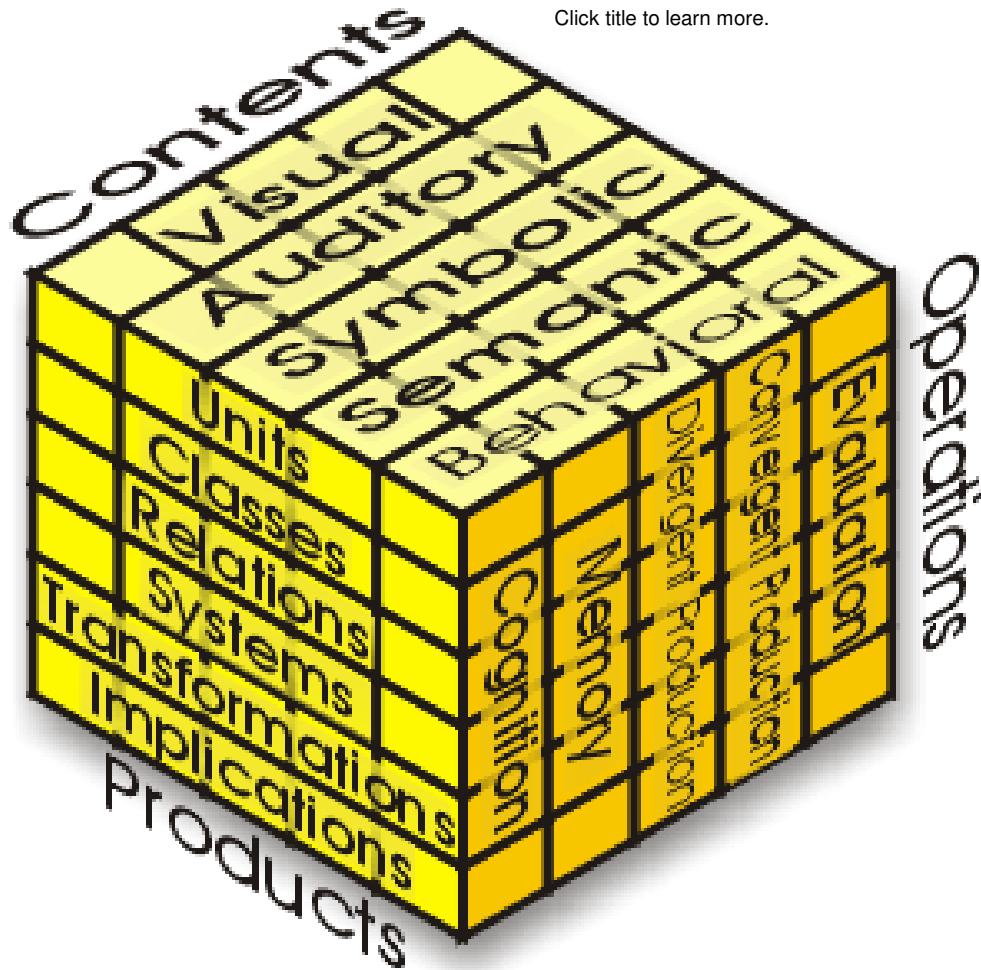


- This model proposes that intelligence consists of 150 independent abilities that result from the interaction of :
  - five types of contents,
  - five types of operations,
  - and six types of products (after Guilford, 1982).



# Guilford's Structure of Intellect

[Click title to learn more.](#)



## **Gardner and the theory of multiple intelligences**

- Howard Gardner (1983, 1993) has proposed a theory of multiple intelligences based loosely on the study of brain-behavior relationships.
- Gardner's seven intelligences included linguistic, logical-mathematical, spatial, musical, bodily-kinesthetic, interpersonal, and intrapersonal.

## Howard Gardner's Eight Intelligences

Type of Intelligence	Description
Linguistic intelligence	"word smart"
Logical-mathematical intelligence	"number/reasoning smart"
Spatial intelligence	"picture smart"
Bodily-Kinesthetic intelligence	"body smart"
Musical intelligence	"music smart"
Interpersonal intelligence	"people smart"
Intrapersonal intelligence	"self smart"
Naturalist intelligence	"nature smart"

# Sternberg and the triarchic theory of intelligence

- His theory emphasizes what he calls successful intelligence or “the ability to adapt to, shape, and select environments to accomplish one’s goals and those of one’s society and culture.”
- Sternberg’s theory is called triarchic (ruled by three) because it deals with three aspects of intelligence: componential intelligence, experiential intelligence, and contextual intelligence.

## Theories of Multiple Intelligence: Sternberg's Triarchic Model

- Sternberg proposes that intelligence is comprised of three fundamental aspects:
  - Factors related to the “internal world” of the individual (e.g. executive processes, performance components as in sensory functioning, and problem solving or knowledge acquisition components);
  - Factors relating to the “external world” (e.g. how we adapt to the external world, how we shape our environment to suit our needs, how we select new environments);
  - Factors related to “experience” (e.g. difficult tasks may become easy with practice, so experience shapes intellectual functioning)

Primary source for this slide: Sternberg, R.J. (1988). *The triarchic mind: A new theory of human intelligence*. New York: Viking.

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# Sternberg and the triarchic theory of intelligence

- Experiential (Creative) Intelligence:
  - Ability to deal with novelty
  - Ability to automatize information processing
- Contextual (Practical) Intelligence:
  - Adaptation to real-world environment
  - Selection of a suitable environment
  - Shaping of the environment

# Robert Sternberg's Triarchic Theory of Intelligence

## ANALYTIC

Characteristic of people who have high IQs on traditional tests; includes the capacity to acquire and apply knowledge.

## CREATIVE

Shown by people who think divergently and flexibly and can consider a wide range of original solutions to problems.

## PRACTICAL

Displayed by people who can "size up" a real-world situation and then adapt effectively to demands and circumstances.

Sources: Sternberg, Robert (1985). *Beyond IQ, A triarchic theory of human intelligence*. New York: Viking; Sternberg, R. J. (1997). The triarchic theory of intelligence. In Dawn P. Flanagan, Judy, L. Genshaft, & Patti L. Harrison (Eds.). *Contemporary Intellectual Assessment: Theories, tests, and issues* (pp. 92-104) New York: Guilford Press.)

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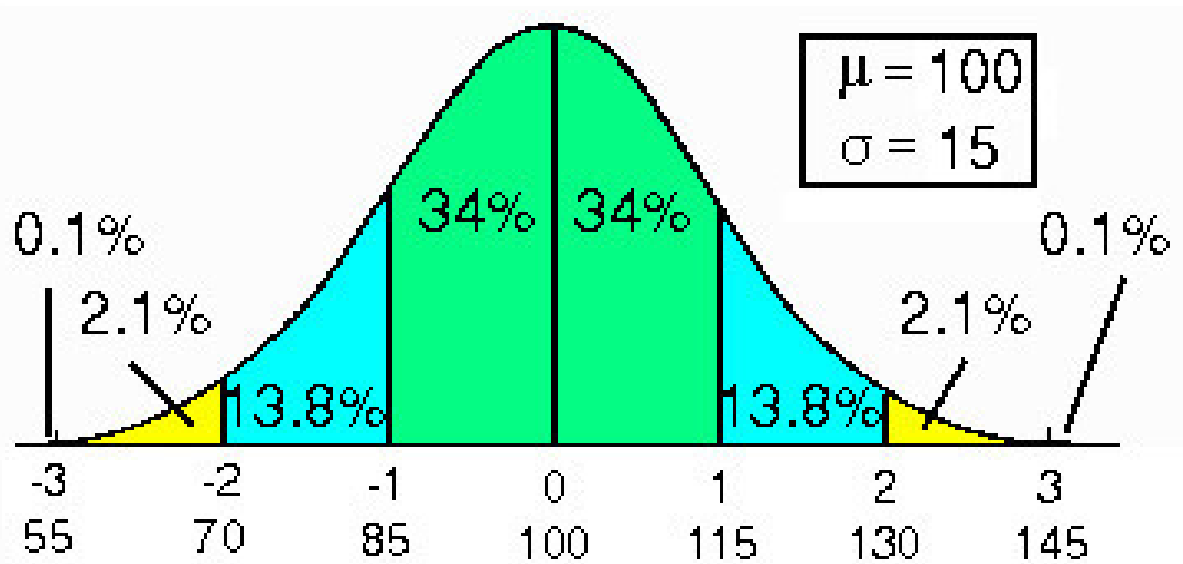
## The history of IQ testing

- calculated as
- $$IQ = \frac{\text{Mental Age}}{\text{Chronological age}} \times 100$$

Nowadays NORM referenced.. that is the average performance of a group is calculated, then individual comparison



## Z-scores and IQ Scores and Percentages under the Normal Curve



# Historical Perspective

$$\text{IQ} = \frac{\text{Mental Age}}{\text{Chronological Age}}$$

A 4 year old who can answer questions that a typical 6 year old could answer would have an IQ of 150

Distinguishing Ignorance from Stupidity?

# Historical Perspective

Mean = 100 Standard Deviation = 15

130+ = Gifted

145+ = Genius

70- = Moron

55- = Imbecile

25- = Idiot