Frank and Ernest

MENSA MEETING
Admission $10
IQ must be 150

BUY TICKETS HERE

INSTEAD OF USING THIS THIRTY PERCENT-OFF COUPON FOR ADMISSION, CAN I PUT IT TOWARD MY IQ?

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Genius, Creativity, and Talent

Definitions and Manifestations
What is genius?

- **High-IQ Definition:**
  - “A person who has an exceptionally high intelligence quotient, typically above 140.”

- **High-Achievement Definition:**
  - “an exceptional natural capacity of intellect, especially as shown in creative and original work in science, art, music, etc. ... a person having such capacity.”
High-IQ Definition

- Origins of the IQ Test
  - Galton’s anthropometric measures
  - Binet-Simon’s intelligence scale
3 years
Show eyes, nose, mouth
Name objects in a picture
Repeat 2 figures
Repeat a sentence of 6 syllables
Give last name

6 years
Repeat a sentence of 16 syllables
Compare two figures from an aesthetic point of view
Define by use only, some simple objects
Execute 3 simultaneous commissions
Give one’s age
Distinguish morning and evening
High-IQ Definition

- Origins of the IQ Test
  - Galton’s anthropometric measures
  - Binet-Simon’s intelligence scale
  - Stern’s IQ = 100*MA/CA
  - Terman’s Stanford-Binet
  - Wechsler Adult Intelligence Scale, etc.
- Definition in terms of the normal curve
High-IQ Definition

- 110 = top 1/3\textsuperscript{rd} of population; about average for HS grads, but only 50-50 chance of college graduation
- 115 = superior IQ (top 1/6\textsuperscript{th}); approximate average for individuals in professional occupations
- 120 = potentially gifted (top 10%); average for college graduates
- 130 = borderline genius; eligibility for Mensa (top 2%); average IQ of most PhD recipients
High-IQ Definition

- 140 = genius level IQ (top 1%); about average for PhD’s in physics or who graduate Phi Beta Kappa
- 150 = Fewer than 1 in 10,000 this high
- 160 = eligibility for Four Sigma Society; 1 out of 30,000 score this high
- 165 = 1 in a million; eligibility for Mega Society
- 228 = Record IQ claimed by columnist Marilyn Jarvik (née Vos Savant)
High-IQ Definition

Applications of the IQ Test

- Terman’s *Genetic Studies of Genius*
  - The IQ = 140 threshold: $M = 151$
  - The aftermath

- Roe’s 64 eminent scientists
  - Verbal IQs 163 (121-177)
  - Spatial IQs 140 (123-164)
  - Math IQs 160 (128-194)
  - [N.B.: Physicists excluded from last]
High-IQ Definition

- Criticisms of the IQ Test
  - Narrowly defined intelligence assessment
    - e.g., Raven’s Progressive Matrices
Which answer fits in the missing space to complete the pattern?

1.  
2.  
3.  
4.  
5.  
6.  

?  

Options:

- [ ] 1
- [ ] 2
- [ ] 3
- [ ] 4
- [ ] 5
- [ ] 6
High-IQ Definition

- Criticisms of the IQ Test
  - Narrowly defined intelligence assessment
  - Intelligence actually multiple dimensional rather than a single dimension
    - e.g., ...
GARDNER’S 7 INTELLIGENCES

- Linguistic
- Logical-mathematical
- Spatial
- Bodily-kinesthetic
- Musical
- Intrapersonal
- Interpersonal

- T. S. Eliot
- Einstein
- Picasso
- Martha Graham
- Stravinsky
- Freud
- Gandhi
High-IQ Definition

- Criticisms of the IQ Test
  - Narrowly defined intelligence assessment
  - Intelligence actually multiple dimensioned rather than a single dimension
  - Although positively associated with occupational attainment, not strongly correlated with the magnitude of within-occupation achievement
  - High IQ can even be largely useless!
How To Think Like A Genius With Marilyn vos Savant

Why do objects of the same temperature feel cooler or warmer than one another? For example, standing with one foot on a bathroom rug and one foot on a tile floor, the rug feels warm and the tile floor feels cold, even though both are in the same 70° room.

—Anonymous

Heat flows naturally in the direction of decreasing temperature, and some objects conduct it better than others. Because the tile is a more efficient conductor, it will transfer heat away from the foot on the tile faster, making that foot feel cooler than the one on the rug.
High-IQ Definition

- One reason for the poor predictive validity at the upper end of the adult intelligence scale:
- The only items that discriminate at the upper end of the distribution represent specialized analytical test-taking ability rather than knowledge and skills having general intellectual utility: e.g. ...
A man plays the game of Russian roulette in the following way. He puts two bullets in a six-chamber cylinder and pulls the trigger twice. The cylinder is spun before the first shot, but it may or may not be spun after putting in the first bullet and after taking the first shot. Which of the following situations produces the lowest probability of survival?

A. Spinning the cylinder after loading the first bullet, and spinning again after the first shot.
B. Spinning the cylinder after loading the first bullet only.
C. Spinning the cylinder after firing the first shot only.
D. Not spinning the cylinder either after loading the first bullet or after the first shot or after the first shot.
E. The probability is the same for all cases.
High-Achievement Definition

- Exceptional creativity
- Outstanding leadership
- Prodigious performance
High-Achievement Definition

- Exceptional creativity
  - Big-C versus little-c creativity
  - Quantitative rather than qualitative difference both within and between these categories
  - e.g., ...
<table>
<thead>
<tr>
<th></th>
<th>Composer</th>
<th>Score</th>
<th>Composer</th>
<th>Score</th>
<th>Composer</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>J. S. Bach</td>
<td>26.</td>
<td>Machaut</td>
<td>50.5</td>
<td>Fauré</td>
<td>77.</td>
</tr>
<tr>
<td>2</td>
<td>Beethoven</td>
<td>27.</td>
<td>Schütz</td>
<td>52.</td>
<td>Dowland</td>
<td>77.</td>
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<tr>
<td>5</td>
<td>Brahms</td>
<td>30.</td>
<td>Corelli</td>
<td>55.</td>
<td>Perotinus</td>
<td>79.</td>
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<tr>
<td>7</td>
<td>Debussy</td>
<td>32.</td>
<td>Gabrielli</td>
<td>57.</td>
<td>Bartók</td>
<td>77.</td>
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<tr>
<td>8</td>
<td>Schubert</td>
<td>33.</td>
<td>Couperin</td>
<td>58.</td>
<td>Grieg</td>
<td>80.5</td>
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<tr>
<td>9</td>
<td>Wagner</td>
<td>34.</td>
<td>Gluck</td>
<td>59.</td>
<td>Weber</td>
<td>80.5</td>
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<tr>
<td>10</td>
<td>Chopin</td>
<td>35.</td>
<td>Puccini</td>
<td>60.</td>
<td>Gibbons</td>
<td>85.</td>
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<tr>
<td>14</td>
<td>Schumann</td>
<td>39.</td>
<td>Bruckner</td>
<td>64.</td>
<td>Saint-Saëns</td>
<td>88.5</td>
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<tr>
<td>15</td>
<td>des Prez</td>
<td>40.</td>
<td>Sibelius</td>
<td>65.5</td>
<td>Telemann</td>
<td>91.</td>
</tr>
<tr>
<td>16</td>
<td>de Lassus</td>
<td>41.</td>
<td>Rameau</td>
<td>65.5</td>
<td>Lulli</td>
<td>91.</td>
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<tr>
<td>17</td>
<td>Purcell</td>
<td>42.</td>
<td>Frescobaldi</td>
<td>67.</td>
<td>Landino</td>
<td>91.</td>
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<tr>
<td>18</td>
<td>Berlioz</td>
<td>43.</td>
<td>Okeghem</td>
<td>68.</td>
<td>MacDowell</td>
<td>91.</td>
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<tr>
<td>20</td>
<td>Mendelssohn</td>
<td>45.</td>
<td>A. Scarlatti</td>
<td>70.</td>
<td>Leoninus</td>
<td>91.</td>
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<tr>
<td>21</td>
<td>Tchaikovsky</td>
<td>46.</td>
<td>Dunstable</td>
<td>71.</td>
<td>A. Gabrieli</td>
<td>91.</td>
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<tr>
<td>22</td>
<td>Vivaldi</td>
<td>47.</td>
<td>Bizet</td>
<td>72.5</td>
<td>Carissimi</td>
<td>91.</td>
</tr>
<tr>
<td>23</td>
<td>Mahler</td>
<td>48.</td>
<td>Gesualdo</td>
<td>72.5</td>
<td>Pergolesi</td>
<td>91.</td>
</tr>
<tr>
<td>25</td>
<td>Dufay</td>
<td>50.5</td>
<td>de Victoria</td>
<td>75.</td>
<td>Smetana</td>
<td>91.</td>
</tr>
</tbody>
</table>

(The next 4 are tied)

*Note.* Adapted from Farnsworth (1969, 228). Copyright 1966 by Music Educators National Conference. Adapted by permission.
High-Achievement Definition

- Exceptional creativity
- Outstanding leadership
  - Exceptional personal influence
  - Big-C creativity as outstanding leadership
High-Achievement Definition

- Exceptional creativity
- Outstanding leadership
- Prodigious performance
  - Sports
  - Chess
  - Music
  - IQ?
What is creativity?

- Three-criterion definition
  - Novelty/Originality
  - Usefulness/Adaptiveness
  - Nonobviousness/Surprise

- Three p's of creativity
  - Process: e.g., logic versus intuition
  - Product: e.g., scientific versus artistic
  - Person: e.g., ability versus personality
What is talent?

- Thesis: Nature
- Antithesis: Nurture
- Synthesis: Nature-Nurture Integrated
- Complications
What is talent?

- Thesis: Nature
  - Galton (1869): *Hereditary Genius*
  - de Candolle (1873): *Histoire des sciences et des savants depuis deux siècles*
  - Galton (1874): *English Men of Science: Their Nature and Nurture*
What is talent?

- Antithesis: Nurture
  - Watsonian/Skinnerian Behaviorism
- Cognitive Psychology:
  - Domain-specific expertise (knowledge/skills)
  - Deliberate practice
  - The 10-year rule
- Empirical problems
  - Individual differences in 10-year rule
  - Performance predictors with substantial heritabilities
What is talent?

- Synthesis: Nature-Nurture Integrated
  - Talent is defined as any set of two or more individual-variables that
    - feature substantial heritability coefficients, and
    - either accelerate expertise acquisition or
    - enhance performance given a particular level of expertise acquisition
  - Given this definition, variance attributed to talent can be estimated using published validity and heritability coefficients
<table>
<thead>
<tr>
<th>Criterion (c)</th>
<th>$r_{cM}$</th>
<th>$r_{cM}^2$</th>
<th>$h_{cL}^2$</th>
<th>$h_{cU}^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>First-year graduate grade point average</td>
<td>.41$^a$</td>
<td>.168</td>
<td>.118</td>
<td>.134</td>
</tr>
<tr>
<td>Graduate grade point average</td>
<td>.39$^a$</td>
<td>.152</td>
<td>.106</td>
<td>.122</td>
</tr>
<tr>
<td>Faculty ratings</td>
<td>.37$^a$</td>
<td>.137</td>
<td>.096</td>
<td>.110</td>
</tr>
<tr>
<td>Comprehensive examination scores</td>
<td>.58</td>
<td>.336</td>
<td>.235</td>
<td>.269</td>
</tr>
<tr>
<td>Degree attainment</td>
<td>.21$^b$</td>
<td>.044</td>
<td>.031</td>
<td>.035</td>
</tr>
<tr>
<td>Time to finish degree</td>
<td>.35$^b$</td>
<td>.123</td>
<td>.086</td>
<td>.098</td>
</tr>
<tr>
<td>Research productivity</td>
<td>.19$^b$</td>
<td>.036</td>
<td>.025</td>
<td>.029</td>
</tr>
</tbody>
</table>

The lower-bound estimate assumes that $h_{L}^2 = .70$ and the upper-bound estimate that $h_{U}^2 = .80$
Table 2
California Psychological Inventory Criterion
Heritability Estimation for Two Criteria

<table>
<thead>
<tr>
<th>Estimator</th>
<th>SvNS</th>
<th>CvLCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equation 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$k$</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Sum ($\sum r_{cj}^2 h_j^2$) = $h_{c1}^2$</td>
<td>.1233</td>
<td>.2955</td>
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<tr>
<td>Equation 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$k$</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Sum ($\sum \beta_{cj} \hat{h}<em>j^2$) = $h</em>{c2}^2$</td>
<td>.0260</td>
<td>.0454</td>
</tr>
<tr>
<td>Equation 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$k$</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Sum ($\sum r_{cj} \hat{\beta}_{cj} \hat{h}<em>j^2$) = $h</em>{c3}^2$</td>
<td>.0467</td>
<td>.0915</td>
</tr>
<tr>
<td>$h_{c3}^2/R_c^2$</td>
<td>.3659</td>
<td>.4770</td>
</tr>
</tbody>
</table>
What is talent?

- Complications
  - Simple or Complex?
    - Latter multidimensional
  - Additive or Multiplicative?
    - Latter emergenic
  - Static or Developmental?
    - Latter epigenetic
If $k$ is small, then talent is *simple*; if $k$ is large, then it is *complex.*

Assuming that $k > 1$, then two additional possibilities:

If $\Sigma$ is the operator, then talent is *additive*; if $\Pi$, then it is *multiplicative.*
If developmental trajectories are epigenetic rather than static:
Former additive epigenesis;
Latter multiplicative (emergenic) epigenesis

\[ P_i(t) = \sum_{j=1}^{k} C_{ij}(t)^{w_j}, \]

\[ P_i(t) = \prod_{j=1}^{k} C_{ij}(t)^{w_j}, \]
## Fourfold Typology Based on the Two Dimensions of Simple Versus Complex and Additive Versus Multiplicative Giftedness

<table>
<thead>
<tr>
<th></th>
<th>Additive</th>
<th></th>
<th>Multiplicative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Repercussions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trait profiles</td>
<td>uniform</td>
<td>diverse</td>
<td>uniform</td>
</tr>
<tr>
<td>Cross-sectional distribution</td>
<td>normal</td>
<td>normal</td>
<td>skewed</td>
</tr>
<tr>
<td>Proportion ungifted</td>
<td>small</td>
<td>extremely small</td>
<td>large</td>
</tr>
<tr>
<td>Familial inheritance</td>
<td>highest</td>
<td>high</td>
<td>low</td>
</tr>
<tr>
<td>Developmental trajectories</td>
<td>few</td>
<td>numerous</td>
<td>few</td>
</tr>
<tr>
<td>Developmental onset</td>
<td>early</td>
<td>earliest</td>
<td>later</td>
</tr>
<tr>
<td>Identifiability</td>
<td>highest</td>
<td>high</td>
<td>low</td>
</tr>
<tr>
<td>Instruction/training strategies</td>
<td>few</td>
<td>numerous</td>
<td>few</td>
</tr>
</tbody>
</table>