

Northern Michigan for Talented Youth



Using the tools

Support materials & presentation available at 4ty.org



Northern Michigan for Talented Youth

Needs

- Free
- Quick, no hassle
- Robust, reliable
 - face & construct validity
- Easy to administer
- Cheat-proof/resistant
- Flexible
 - no internet connection
 - ideally no equipment
- HAT
 - Humanized Adaptive Testing
 - Human-Adaptable Tests
 - scored on the spot
- Fun

Fulfillment

- OTCI - Open Test of Context Independence
- OQRT - Open Quick Reasoning Test
- OVRT - Open Vocabulary Reasoning Test
- ITY - Intelligence Test for Youth
- ORT-3 - Open Rotation Test - 3 dimensions
- ORT-4 - Open Rotation Test - 4 dimensions

(Assemble Objects - Princeton Review)



OTCI - Open Test of Context Independence

- Sue Cummings, U Chicago
- USAF or U.S. Army Air Force
- A screening tool, focus/perform despite distractions

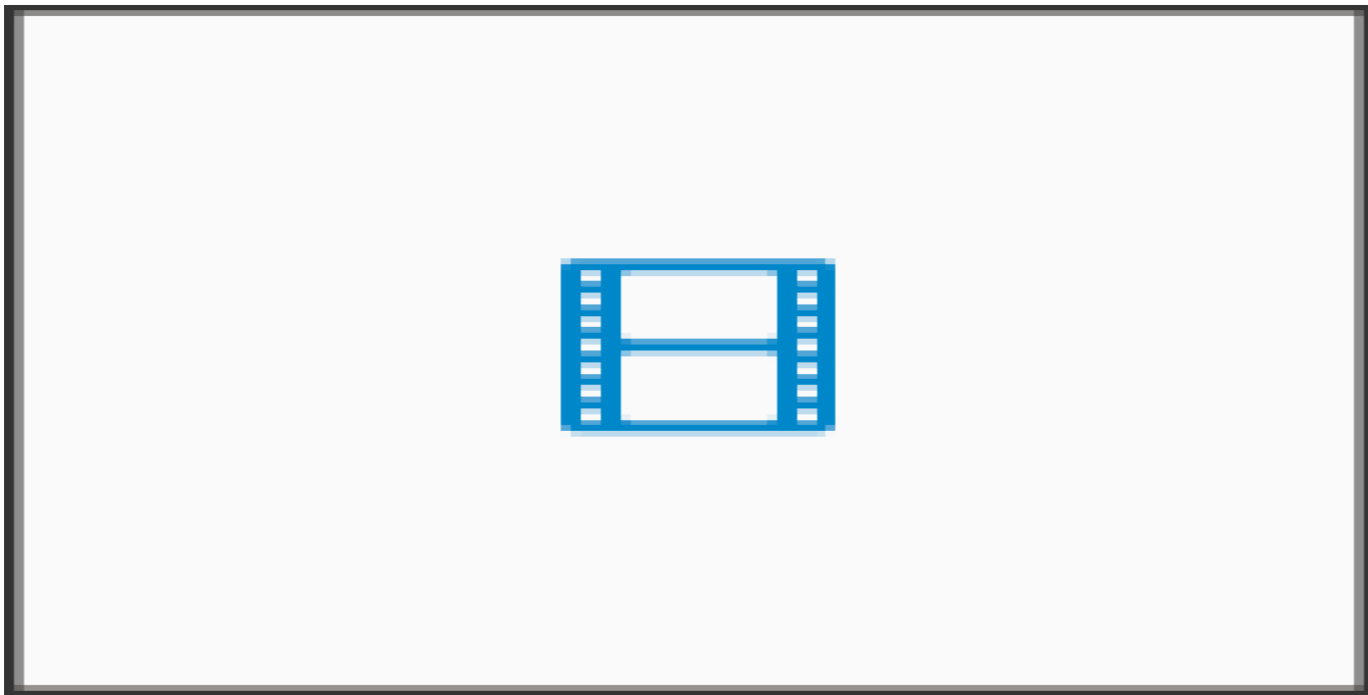
"Well, I never! There's no getting round it, you can work when you're a mind to, Tom."
And then she diluted the compliment by adding, "But it's powerful seldom you're a mind to, I'm bound to say. Well, go 'long and play; but mind you get back some time in a week, or I'll tan you."

She w asso o verco mebythesp le ndorof hisac hie vemen tthatshe tookhimin totheclosetandselec te dac hoiceapp lean ddeliv er editto him, alo ngw ithanimp rov in glecture uponthea ddedv al ueandfla voratrea too k toitselfw henitca m ewitho utsinthrough virtuouse ffort.And whi leshecl oseedw i thaha ppyScrip tu ralflouri sh,he"hooke d"adoughn ut.

OTCI - Open Test of Context Independence



OTCI - Open Test of Context Independence



OQRT - Open Quick Reasoning Test

3 existing: Baddeley, Persian, Baudson & Preckel mini-q
1 new: digits

A 3 min reasoning test based on grammatical transformation

A. D. BADDELEY¹

MEDICAL RESEARCH COUNCIL, APPLIED PSYCHOLOGY RESEARCH UNIT, CAMBRIDGE, ENGLAND

A simple reasoning test involving the understanding of sentences of various levels of syntactic complexity is described. It is short, easily administered, and reliable. Performance correlates with intelligence (+.59) and has proved to be sensitive to a number of stresses.

In investigating the effects on human performance of environmental stresses or drugs, it is often desirable to sample a wide range of tasks in a very limited amount of time. There is therefore need for a battery of performance tests which are short and easy to administer, and which at the same time are valid, reliable, and sensitive. While short tests of motor skill (Legge, Steinberg, & Summerfield, 1957) and simple addition (Baddeley & Flemming, 1967) are already available, there does not appear to be a suitable test involving "higher mental processes." The present report describes an attempt to fill this gap.

Recent studies in psycholinguistics have shown that the time taken to understand a sentence is closely dependent on its syntactic structure, with positive statements being understood more quickly than negatives, active statements more rapidly than passives, and true statements faster than false (Wason, 1961;

"This is illustrated in examples 1 and 2 below. When you have read 1 and 2, try examples 3, 4, 5, and 6.

Examples

True

False

1. A follows B—BA ✓
2. B precedes A—AB ✓
3. A is followed by B—AB
4. B is not followed by A—BA
5. B is preceded by A—BA
6. A does not precede B—BA

"When you start the main test, work as quickly as you can without making mistakes. Start with sentence 1 and work systematically through the test leaving no blank spaces."

The test comprised all 64 possible combinations of the following six binary conditions: (1) Positive or Negative, (2) Active or Passive, (3) True or False, (4) Precedes or Follows, (5) A or B mentioned first, (6) Letter pair AB or BA. Five different test forms were produced with the 63 items occurring in a different random order on each. The Ss were allowed 3 min to complete as many items as possible.

Results

Total items correct has generally proved the most

The square surrounds the circle

The circle does not surround the square

The circle is inside the square

The square is inside the circle

The square does not surround the circle

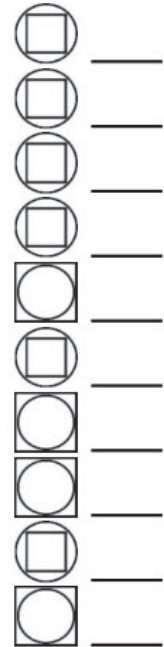
The circle does not surround the square

The square does not surround the circle

The circle surrounds the square

The square is surrounded by the circle

The circle is not inside the square



HAT

Humanized Adaptive Testing
Human-Adaptable Tests

- Versus Computerized Adaptive Testing
- ▶ • Fast scoring, on the spot
- Skip not just items/questions but whole tests, sections
 - e.g. shorten a 3-minute test to 1 minute,
 - "I can tell, well enough - on to the next" (or not)
- Eventual quality of measurement comes from:
 - redundancy,
 - treating the tests as screening tools,
 - eventually administering gold-standard tests

Read 'em at a glance

Sum is not even
At least one is not even
At least one is not odd
Sum is not odd
Both are odd
Difference is odd
Both are even
Difference is not even
Difference is not even
Neither is odd
Neither is even
Both are even
Neither is even
Both are odd
Difference is odd
Difference is not odd
Both are even
Difference is even
At least one is even
Sum is even
At least one is not even
Neither is even
At least one is not odd
Difference is not even
Sum is even
Sum is not odd
Sum is odd
Difference is not even
Difference is odd
Sum is odd
At least one is odd
Both are odd

6 2 F
6 2 F
5 1 F
5 1 T
6 2 F
6 2 F
4 5 F
6 2 F
4 5 T
5 1 F
6 2 F
2 3 F
4 5 F
2 3 F
2 3 T
6 2 T
6 2 T
6 2 T
6 2 T
6 2 T
5 1 T
2 3 T
5 1 T
2 3 T
5 1 F
4 5 F
6 2 T
4 5 T
2 3 T
4 5 T
4 5 T
4 5 T
2 3 T
4 5 T
2 3 T
4 5 T
2 3 T
4 5 T
4 5 F
6 2 T
4 5 T
2 3 T
4 5 T
2 3 T
4 5 T
4 5 T
2 3 T
4 5 T
4 5 F

Neither is odd
Sum is even
Neither is even
At least one is odd
Both are odd
At least one is odd
Difference is even
Sum is not odd
Sum is odd
Both are even
Difference is even
Sum is not even
At least one is not odd
Sum is even
Difference is not odd
At least one is not odd
At least one is not even
Sum is not even
At least one is even
Sum is not even
Difference is not odd
Difference is odd
Difference is not odd
Sum is odd
Sum is not odd
At least one is even
Difference is even
Neither is odd
Neither is odd
At least one is odd
At least one is even
At least one is not even

4 5 F
2 3 F
2 3 F
6 2 F
5 1 T
5 1 T
5 1 T
4 5 F
6 2 F
5 1 F
4 5 F
5 1 F
4 5 T
6 2 T
5 1 T
6 2 T
4 5 T
4 5 T
2 3 T
2 3 T
4 5 F
5 1 F
2 3 F
5 1 F
2 3 F
2 3 F
2 3 F
6 2 T
2 3 T
4 5 T
5 1 T

... and so on

Northern Michigan for Talented Youth

But...

What about clever people?

(A question for the audience)

Who wants to talk about cheating?

(Yes/No - a digression into the real world, and Metis)



In the field

Metis - an
introduction
and digression



In the field

aah!

Got it!



Μῆτις - Mêtis - Mètis

Negative Connotations

guile
deviousness
ability to spot and exploit weaknesses
user
exploiter
scrounger
person who takes advantage
wheedler
conniver, connivance
manipulator
subterfuge
trickery
machination
deception
schemer, scheme
dodger, as in Artful Dodger
plotter
stratagem
racket
sharp
cunning
shrewd

Positive Connotations

clever, cleverness
street smart, street smarts
real-world practical
worldly
can't pull a fast one on 'em, can't fool 'em,
can't pull the wool over their eyes
ability to spot and exploit opportunities
macher
interpersonal jiu-jitsu
scrounger
person who creates opportunities
on the ball
would make a good cop
not a victim, not a sucker
subtle
trickster (e.g. native myths, like coyote)
tactical thinker, tactician, master tactician
strategic thinker, strategist
sharp
sly
cunning
shrewd

Μῆτις - Mêtis - Mètis

Negative Connotations

sly
treacherous
wily
unscrupulous
conspiring
crooked
intriguing, intriguer
Machiavellian
scheming
deceitful
tricky
sneaky, sneakiness
devious
shyster
carnie

Positive Connotations

adroit
canny
dextrous
slick
witty
quick-witted, quick on the trigger, quick
nobody's fool
keen
foxy
cagey
astute
nimble
savvy
deft, agile
handy
one step ahead of the game
master of the game
good to have on your side

Metis in the vernacular

In popular
culture and
common use

Agnes was beautiful... She was radiant. She was funny. She was both smart and clever, which were never quite the same thing, and she was enormously talented.

Agnes complimented Paul on handling this with typical cleverness. Paul was proud to be clever in her eyes. Between them, they'd spent a lot of time in the company of geniuses over the past year. Clever would do just fine.

I've come across your type before. (...) Your kind mistakes cleverness for wisdom. Your kind mistakes high-class trappings for genuine class. You take such pride in being so very smart, and do you know what the saddest part is? You're actually not stupid, Mr. Cravath. You're just not nearly as smart as you think you are. Good luck. You'll need it.

- Graham Moore, The Last Days Of Night

Further reading - Detienne, Luttwak

Cunning Intelligence in Greek Culture and Society

MARCEL DETIENNE

Ecole des Hautes Etudes, Paris

AND

JEAN-PIERRE VERNANT

College de France, Paris

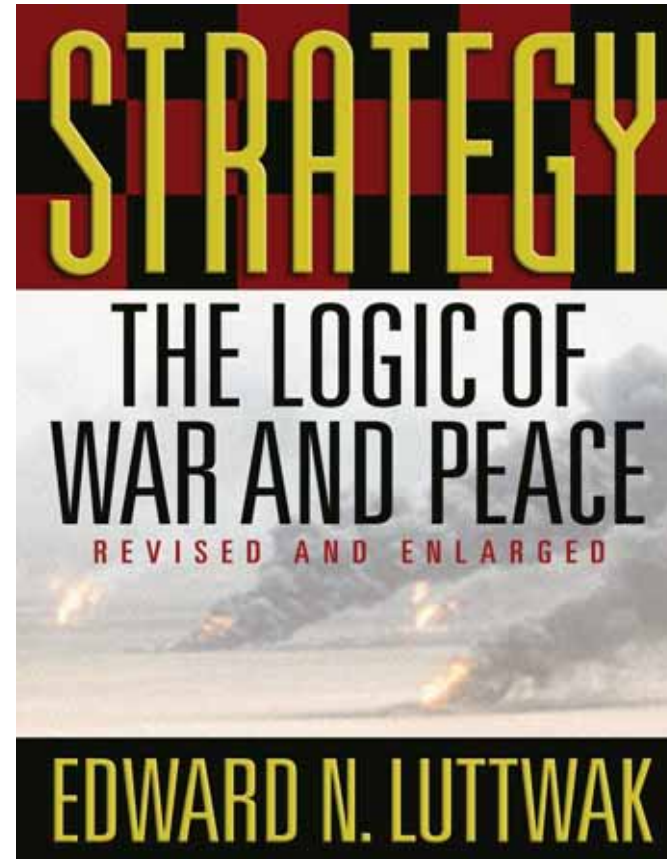
TRANSLATED FROM THE FRENCH BY

JANET LLOYD



THE UNIVERSITY OF CHICAGO PRESS

Chicago and London



Check 'em at a glance

Sum is not even	6	2	F	Neither is odd	4	5	F
At least one is not even	6	2	F	Sum is even	2	3	F
At least one is not odd	5	1	F	Neither is even	2	3	F
Sum is not odd	5	1	T	At least one is odd	6	2	F
Both are odd	6	2	F	Both are odd	5	1	T
Difference is odd	6	2	F	At least one is odd	5	1	T
Both are even	4	5	F	Difference is even	5	1	T
Difference is not even	6	2	F	Sum is not odd	4	5	F
Difference is not even	4	5	T	Sum is odd	6	2	F
Neither is odd	5	1	F	Both are even	5	1	F
Neither is even	6	2	F	Difference is even	4	5	F
Both are even	2	3	F	Sum is not even	5	1	F
Neither is even	4	5	F	At least one is not odd	4	5	T
Both are odd	2	3	F	Sum is even	6	2	T
Difference is odd	2	3	T	Difference is not odd	5	1	T
Difference is not odd	6	2	T	At least one is not odd	6	2	T
Both are even	6	2	T	At least one is not even	4	5	T
Difference is even	6	2	T	Sum is not even	4	5	T
At least one is even	6	2	T	At least one is even	2	3	T
Sum is even	5	1	T	Sum is not even	2	3	T
At least one is not even	2	3	T	Difference is not odd	4	5	F
Neither is even	5	1	T	Difference is odd	5	1	F
At least one is not odd	2	3	T	Difference is not odd	2	3	F
Difference is not even	5	1	F	Sum is odd	5	1	F
Sum is even	4	5	F	Sum is not odd	2	3	F
Sum is not odd	6	2	T	At least one is even	5	1	F
Sum is odd	4	5	T	Difference is even	2	3	F
Difference is not even	2	3	T	Neither is odd	2	3	F
Difference is odd	4	5	T	Neither is odd	6	2	T
Sum is odd	2	3	T	At least one is odd	2	3	T
At least one is odd	4	5	T	At least one is even	4	5	T
Both are odd	4	5	F	At least one is not even	5	1	T

Metis - In the field

Be aware of it;
prepare to
detect and
respond



OVRT - Open Vocabulary Reasoning Test

- Not a verbal reasoning test
- Got the idea from Emil* & co.
- Open-source, free, offers a word bank
 - 2 of 5, 3 of 5
 - measures understanding
 - distinguishes deep ("networked") vs surface knowledge
 - not amenable to memorization
 - (or more simply) memorization isn't enough

*A New, Open Source English Vocabulary Test
Emil O. W. Kirkegaard, Meng Hu and Jurij Fedorov
10.46469/mq.2024.65.2.7
<https://mankindquarterly.org/archive/issue/65-2/7>

1.- Classic match-finding

Which word is the best match?

OVRT

Match	1	2	3	4	5	Answer
Corpulent	bodily	military	fat	tolerant	dead	
Cognizant	aware	partial	complete	authorized	in progress	
Commiserate	incomplete	following	relative	sympathize	ordinary	

2.- Pick 2 of 5

Two of the words in each row match in some way. Which two?

1	2	3	4	5	Answer 1	Answer 2
parameter	plaudit	factor	similarity	creation		
allowed	speculative	begotten	authorized	reliant		
atomize	glamorize	pulverize	sympathize	empathize		

3.- Pick 3 of 5

Three of the words in each row match in some way. Which two do not?

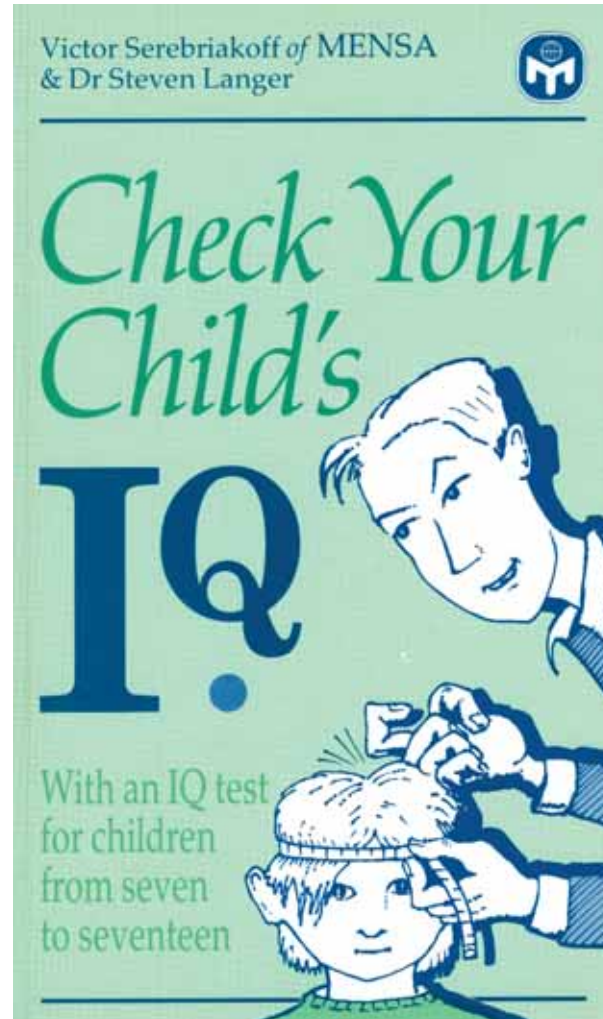
1	2	3	4	5	Answer 1	Answer 2
plaudit	shame	exemplar	guilt	anxiety		
reliant	heroic	brave	brassy	valiant		
aspiration	ambition	ideal	great	awesome		

OVRT - Open Vocabulary Reasoning Test

Question type or structure	Actual question	Word Choices
Direct conceptual relation, synonym, noun and noun, no negation	Saw is to knife as hammer is to	nail, workbench, mallet, handle, punish
Distant conceptual relation, synonym, noun and noun, no negation	Knife is to apportion as pencil is to	enlighten, paper, eraser, erudition, graffiti
Direct conceptual relation, noun and adjective "alike", no negation	Match is to fiery as extinguisher is to	happy, safety, precarious, depressed, sensible
Indirect conceptual relation, noun and adverb "alike", no negation	Spatula is to tastily as shoe is to	swiftly, boot, boxed, sock, happily
Indirect conceptual relation, noun and adverb "alike", negation	Pillow is to groggily as table is not to	chair, food, full, covered, hungrily
Distant conceptual relation, antonym, noun and adjective, negation	Vase is to sprinkler as motley is not to	plain, excellent, previous, variegated, diminished
No conceptual relation, synonym, adverb and adjective "alike", no negation	Swimmingly is to elevated as proudly is to	humbly, seeming, self-satisfied, tentative, humorous
Direct conceptual relation, antonym, noun and noun, no negation	A woman needs a man like a fish needs a	bicycle, aquarium, wormy, hungrily, feeding



ITY - Intelligence Test for Youth



ITY - Intelligence Test for Youth

Test created by Steven Langer, copyright 1977

- Redrawn, reprinted, Creative Commons copyrighted w/permission of his estate
- Thank you!

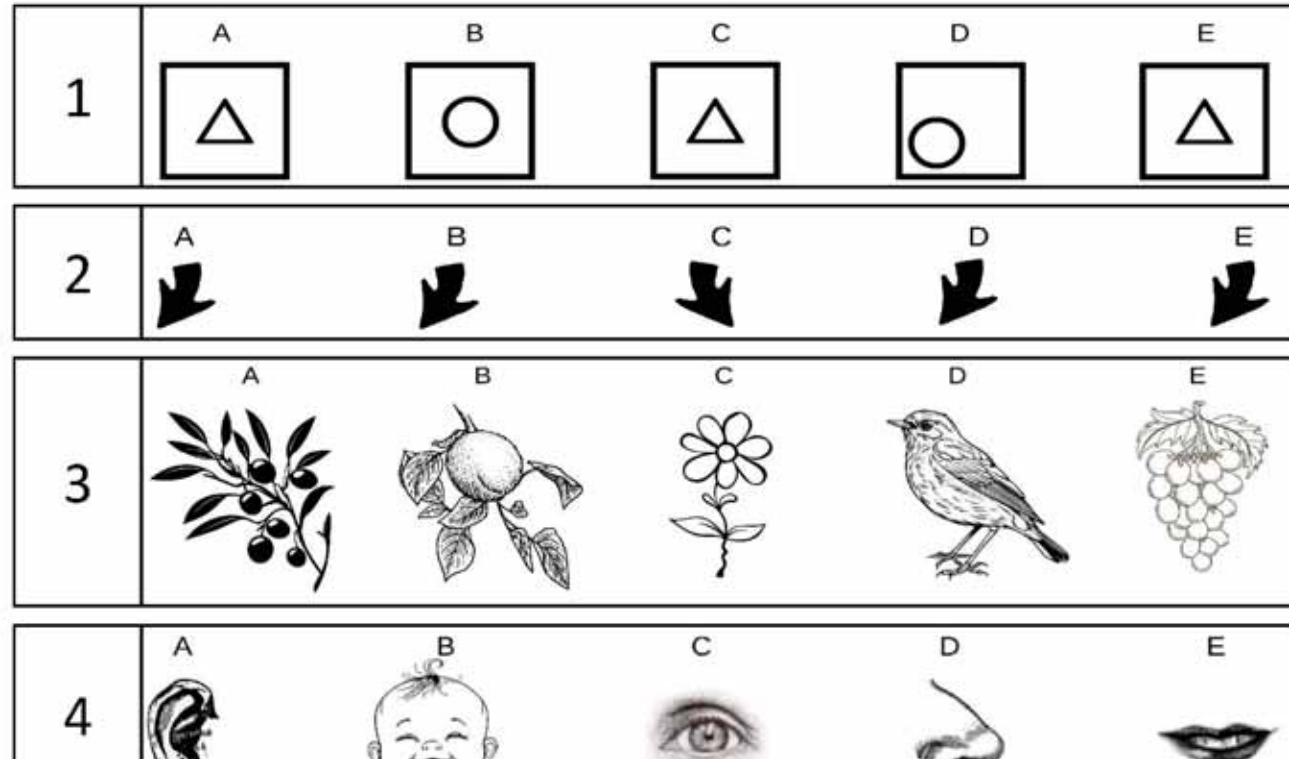
Normed in suburban Cook County, Illinois in 1970s

- Thornton Township High School District No. 205
- Elmwood Park Community Unit School District No. 401
- Elm School
- Elmwood School
- Elmwood Park High School
- John Mills School
- Thornridge High School
- Thornwood High School
- Thornton High School





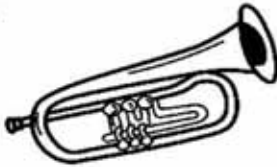










ITY - Intelligence Test for Youth

ITY
















ITY - Intelligence Test for Youth



ITY - Intelligence Test for Youth

5	A 	B 	C 	D 	E 
6	A 	B 	C 	D 	E 
7	A 	B 	C 	D 	E 

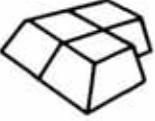
ITY - Intelligence Test for Youth


8	A 	B 	C 	D 	E 
9	A 	B 	C 	D 	E 
10	A 	B 	C 	D 	E 

ITY - Intelligence Test for Youth

How many blocks?

Remember, each block in a higher row has to be held up by a block under it.

16		A	B	C	D	E
		1	2	3	4	5

17		A	B	C	D	E
		6	8	9	10	11

ITY - Intelligence Test for Youth

	A	B	C	D	E
44)	3	5	7	11	21
45)	29	22	18	15	8
46)	3	6	10	15	19
47)	4.6	6.9	9.2	18.4	36.8
48)	8.6	9.9	10.1	11.2	12.5
49)	2	4	8	12	48
50)	6,561	3,321	81	9	3

ITY - Intelligence Test for Youth

	A	B	C	D	E
51)	3	6	8	13	18
52)	$2\frac{3}{4}$	$1\frac{3}{4}$	$1\frac{1}{2}$	1	$\frac{1}{2}$
53)	$\frac{1}{2}$	$3\frac{1}{2}$	4	$7\frac{1}{2}$	11
Younger than 14 years 6 months may stop here.					
54)	3	2.54	1.73	1.32	1.15
55)	$\frac{35}{36}$	$\frac{17}{18}$	$\frac{33}{36}$	$\frac{31}{36}$	$\frac{13}{18}$

ITY - Intelligence Test for Youth

12 years 9 months-13 years	14	15	18	19	21	22	23	25	27	28	30	31	34
13 years-13 years 3 months	14	16	18	20	21	22	24	25	27	28	30	31	34
13 years 3 months-13 years 6 months	15	16	19	20	22	23	24	26	27	28	30	31	34
13 years 6 months-13 years 9 months	15	17	19	21	22	23	24	26	27	28	30	32	35
13 years 9 months-14 years	16	18	20	21	22	24	25	26	27	29	31	32	35
14 years-14 years 3 months	17	19	20	21	23	24	25	26	27	29	32	33	35
14 years 3 months-14 years 6 months	18	19	20	22	23	24	26	27	28	29	32	34	36
Percentile	2	5	10	20	30	40	50	60	70	80	90	95	98
Approximate I.Q. equivalent	65	73	79	86	91	96	100	104	109	114	121	127	133

Table 3: I.Q.s of Children Aged 14 Years 6 Months to 16 Years or Older

Child's Age	Questions 16-55 - Raw Score												
14 years 6 months-15 years	11	12	13	14	17	19	20	21	23	24	26	27	29
15 years-15 years 6 months	12	13	14	15	18	20	21	21	24	25	27	28	29
15 years 6 months-16 years	12	13	14	16	19	20	22	22	25	26	28	28	29
16 years or older	13	14	14	17	19	21	22	23	25	26	28	29	30
Percentile	2	5	10	20	30	40	50	60	70	80	90	95	98
Approximate I.Q. equivalent	65	73	79	86	91	96	100	104	109	114	121	127	133

I.Q.s based on 1970s suburban Cook County, Illinois students. Results of current I.Q. tests may differ.

ITY - Intelligence Test for Youth

Support materials

Instructions for Group Administration,
Instructions for Individual Administration

- 3 age bands - roughly child, tween, teen

Scoring instructions

- Explanation and advice, test was normed 50 years ago

Score sheets

Practice test

ITY - Intelligence Test for Youth

Intelligence Test for Youth

(Children, Tweens, and Teens)

Instructions for Group Administration

Ages: at least 6 years 6 months, younger than 10 years 6 months.

Sample test

The sample questions and answer sheets are provided for use with children who are young and/or unfamiliar with testing. Going through the samples does require about 5 minutes, but can increase the number of test items such students complete, as they get used to the process before taking the actual test. Children already used to testing and marking answer sheets may not need the sample test.

You may allow &/or provide a simple 4-function (non-programmable) calculator.

Do not allow watches, clocks, phones, tablets, laptops, computers, or other electronic devices.

Set or pass out:

- sample test questions
- sample answer sheets
- pencils.

Keep for yourself one copy of the sample test questions and sample answer sheet.

Say:

"On the answer sheet, write your name, your date of birth, and whether you are a boy or a girl."

Explain, check, demonstrate. In case of objection you may state that they don't have to fill in anything their parents don't want them to.

Now say:

"Now look at the sample test. It is like the real test, but shorter. You *read questions* and *mark the answer sheet*. The first three questions are picture puzzles. Each puzzle shows *five* pictures or drawings. *Four* of them *go together in some way* or *are the same in some way*. One is *different*

ITY - Intelligence Test for Youth

Excerpt - from the scoring instructions:

After you have circled all the questions the child answered correctly, go back and *count the number of questions you have circled as having been answered correctly in the group of questions designated as the questions to be answered for your child's age level.* The total you get is your child's raw score.

Now, using the Raw Score to I.Q. Charts:

1. Pick out the correct table for your child's age.
2. In that table, find the row that indicates your child's age.
3. In that row, read across columns until you find the column with your child's raw score.
4. Read down to find the two numbers at the bottom. These show your child's percentile and approximate I.Q.

These tables were developed - or, technically, this test was "normed" - in the 1970s by giving it to public school students in suburban Cook County, Illinois. I.Q. tests work by comparing your child's raw score to the scores of other children, so in a sense, by using these charts, you are comparing your child to children who lived, thought, and learned 50 years ago. I.Q. tests do age and need to be "re-normed"; until this is done, please note that the I.Q. you just found may not be perfectly accurate.

ORT-3 - Open Rotation Test - 3 Dimensions

Bodner and Guay, 1997, freely offering their 20-item ROT test for general use:

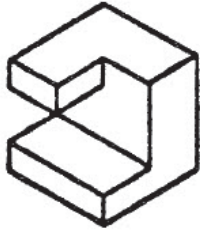
"Copies of the 20-item Purdue Visualization of Rotations test and a scoring key can be obtained from the first author. They can also be downloaded from this journal's abstract page for this article. Permission to use this test is freely granted. Reasons to use this test are many and varied. It can be used to diagnose ... It can be used as a research instrument ... It can be used to probe changes in gender effects on spatial ability. It can be used as the basis for evaluating courses ... It can be used to probe students' perception ..." [et cetera]

It's a nice, generous offer - anticipates Creative Commons

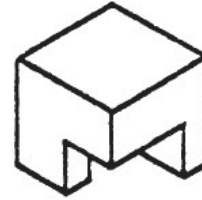
Unfortunately many of the materials say "Copyright Purdue Research Foundation"

There's another BIG problem: Isometric Ambiguity

6



IS ROTATED TO

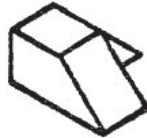


AS



IS ROTATED TO

A



B



C



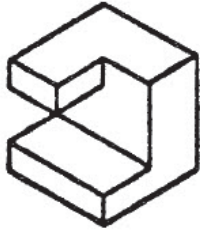
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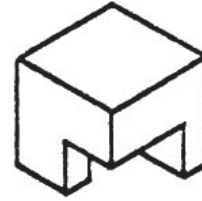
E



6



IS ROTATED TO

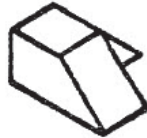


AS



IS ROTATED TO

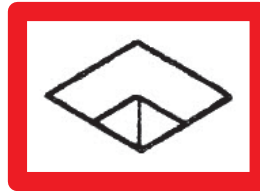
A



B



C



D



E



ORT-3 - Open Rotation Test - 3 Dimensions

What is spatial intelligence?

Newcombe & Shipley - *Thinking About Spatial Thinking: New Typology, New Assessments*

- intrinsic to objects (their shapes and part-based representations)
 - parts
 - orientation
 - bending
 - rotation
 - scaling
 - extension
 - 2D - to - 3D
 - cross-sectioning 3D object into 2D slices
 - reconstructing 3D object from 2D slices
- extrinsic to objects, environmental (relations among objects and between objects and frames of reference)
 - situation, location
 - reference frame
 - objective, allocentric
 - body-relative, egocentric

... and by the way ...

"there are literally hundreds of spatial tests"

- sigh -

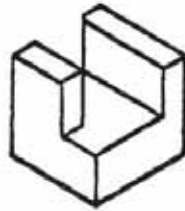
ORT-3 - Open Rotation Test - 3 Dimensions

What is spatial intelligence?

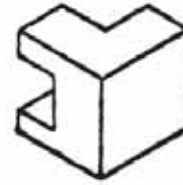
Thurstone's three spatial factors:

- S1: The ability to recognize the identity of an object when it is seen from different angles
- S2: The ability to imagine the movement or internal displacement among the parts of a configuration
- S3: The ability to think about those spatial relations in which the body orientation of the observer is an essential part of the problem"

22



IS ROTATED TO

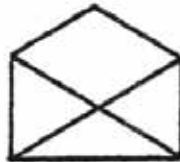


AS



IS ROTATED TO

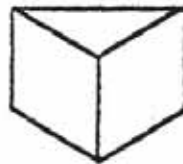
A



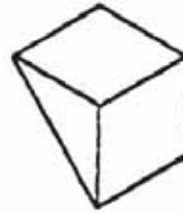
B



C



D



E



Confound it!

Confounded:

1) Invisible &/or not-thought-of variable influences both independent and dependent variables

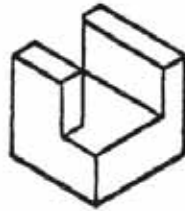
- statystycznie mylone
- verwirrt

2) Darned, dratted

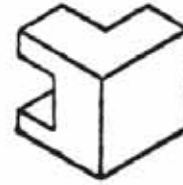
- cholerny
- verdammt, verflixt, verflucht



22



IS ROTATED TO

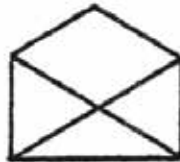


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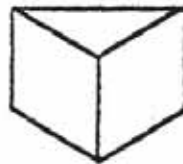
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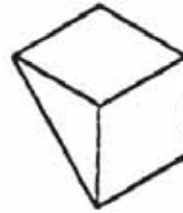
B



C



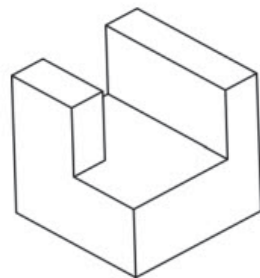
D



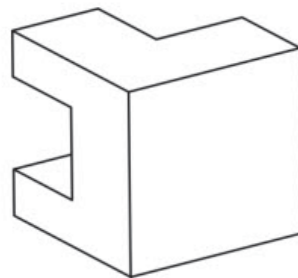
E



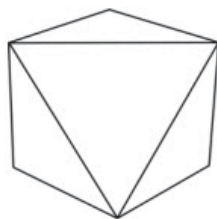
29



is rotated to

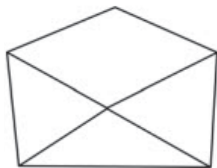


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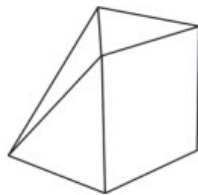


is rotated to

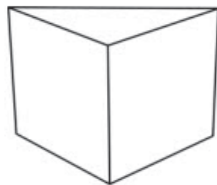
A



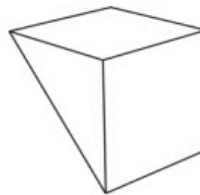
B



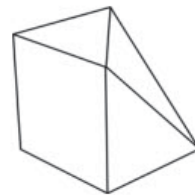
C



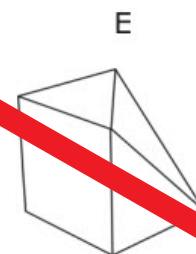
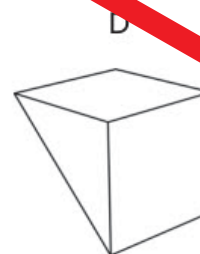
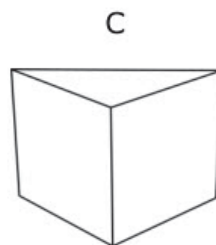
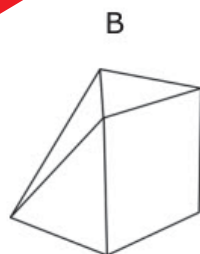
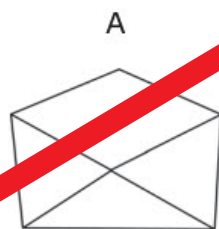
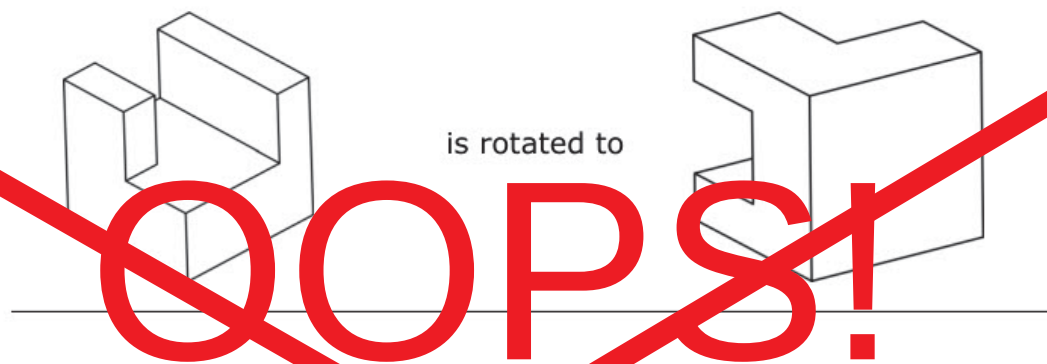
D



E



29



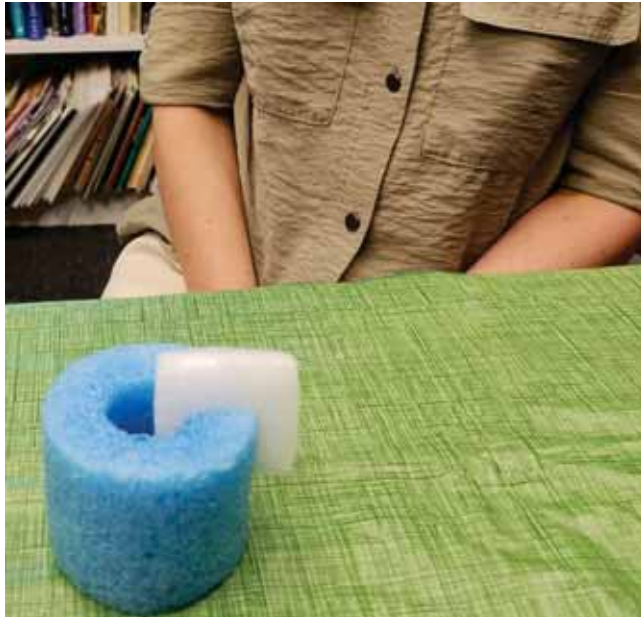
ORT-3 - Open Rotation Test - 3 Dimensions

Clean-Room Development

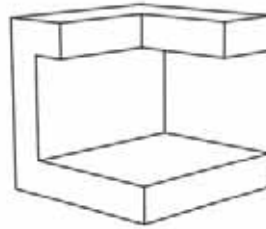
- Process used in software industry
- Duplicate function without ever seeing original
- https://en.wikipedia.org/wiki/Clean-room_design



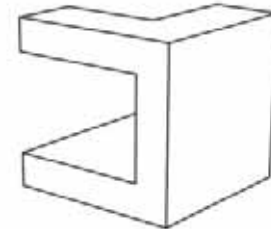
ORT-3 - Open Rotation Test - 3 Dimensions



6



is rotated to



as

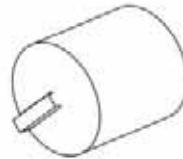


is rotated to

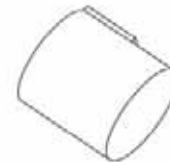
A



B



C



D



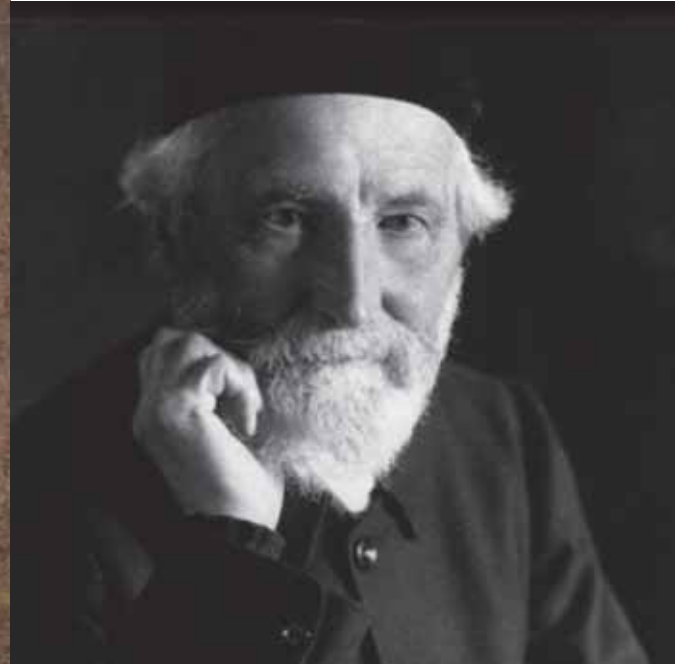
E



ORT-4 - Open Rotation Test - 4 Dimensions

"What if there were, or actually are, more than the 3 dimensions than we directly perceive?"

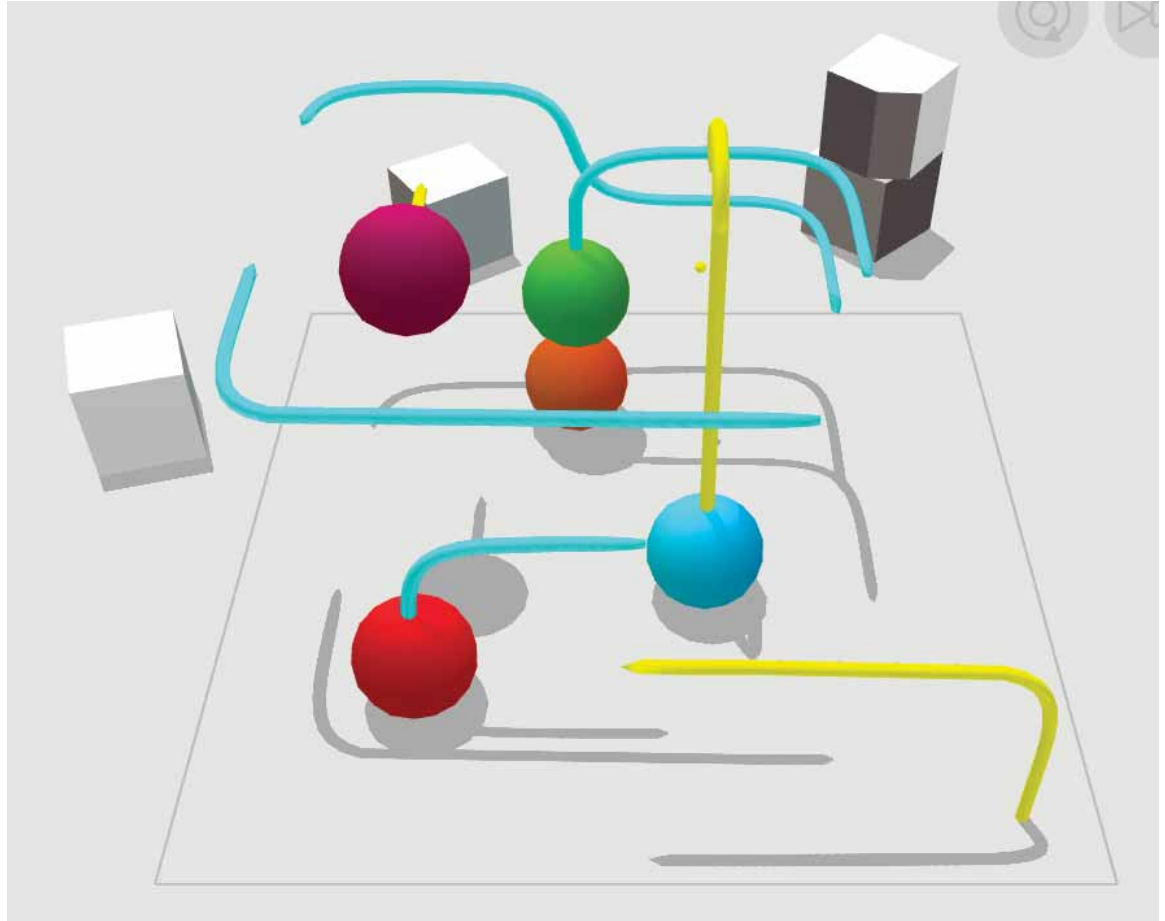
1884, The Reverend Edwin Abbott Abbott wrote *Flatland - A Romance in Many Dimensions*



ORT-4 - Open Rotation Test - 4 Dimensions

1943, "Lewis Padgett",
short story "Mimsy
Were the Borogoves"

About a 4-D beads-on-a-wire toy.



ORT-4 - Open Rotation Test - 4 Dimensions

If it were just a toy - or a test - it wouldn't matter.

4-D thinking, conceptualization, mathematics, and physics - may be materially relevant:

Greetings from the fourth dimension: Scientists glimpse 4D crystal structure using surface wave patterns.

February 13, 2025, <https://phys.org/news/2025-02-fourth-dimension-scientists-glimpse-4d.html>

A 4D Periodic Table of Elements: Unveiling Hidden Dimensions for Discovery and Propulsion Technologies.

December 21, 2024, https://www.researchgate.net/publication/387303985_A_4D_Periodic_Table_of_Elements_Unveiling_Hidden_Dimensions_for_Discovery_and_Propulsion_Technologies

A couple of papers showing "an intriguing advance towards new physics provided by topological protection in higher dimensions", <https://www.nature.com/articles/nature25000>, <https://www.nature.com/articles/nature25011>, and a lay review article: <https://www.zmescience.com/science/physics/four-dimensions-experiments-0432423/> - all from 2018.

Black Lenses in Kaluza-Klein Matter. July, 2023, <https://arxiv.org/abs/2212.06762> - this is more of a pure math paper, but it does posit a multi-dimensional framework for understanding black holes.

Northern Michigan for Talented Youth



Using the tools

Support materials & presentation available at 4ty.org

