

Otis Quick-Scoring Mental Ability Tests

by Arthur S. Otis

MANUAL OF DIRECTIONS FOR GAMMA TEST Forms AM and BM and New Edition: Forms EM and FM

The Quick-Scoring Series

The *Otis Quick-Scoring Mental Ability Tests* comprise three tests, called Alpha, Beta, and Gamma. The three tests are designed for grades as follows:

- Alpha Test Grades 1-4
- Beta Test Grades 4-9
- Gamma Test . . . High Schools and Colleges

The Alpha Test, both in the regular and the short form, consists entirely of pictures. The Beta and Gamma Tests originally were revisions and extensions of the Intermediate and Higher Examinations, respectively, of the *Otis Self-Administering Tests of Mental Ability*. New forms EM and FM of both the Beta and the Gamma Tests have been equated to the older forms.

Purpose of the Tests

The purpose of the three tests in the series is to measure mental ability — thinking power or the degree of maturity of the mind.

It should be understood from the outset that it is not possible to measure mental ability directly. It is possible only to measure the effect mental ability has had in enabling the pupil to acquire certain knowledge and mental skill. Of course, the answering of some types of questions depends less upon schooling and more upon mental ability than the answering of others, and in making up the test the aim has been for the most part to choose that kind of question which depends as little as possible on schooling and as much as possible on thinking.

However, in the interest of variety it has been found necessary and even advantageous to include in verbal tests of mental ability, such as the Beta and Gamma Tests, certain questions which might seem at first glance to be mere measures of achievement. This type in-

cludes questions on vocabulary, arithmetic reasoning, etc. It must be remembered, however, that any test which involves the use of language can measure mental ability only to the extent to which we may assume that pupils of the same age have had approximately the same opportunity to learn. Consequently, if a pupil has grown up with limited educational opportunities, especially with reference to language, his mental ability is not fairly measured by any test involving language. But in a given community in which all children have approximately the same educational opportunities, it is reasonable to assume that a pupil who progresses rapidly in school and learns much has greater mental ability for his age than one who progresses less rapidly and learns less. To this extent, therefore, certain achievement questions such as vocabulary and arithmetic-reasoning questions, even though depending on language, do measure mental ability.

Alternative Forms

There are six forms of the Gamma Test. Forms C and D are published in a smaller size for hand scoring only. Forms AM, BM, EM, and FM are for machine scoring or hand scoring.

Special Features

The tests are self-administering. It is necessary merely to pass out the booklets, allow the pupils time to study the first page with a minimum of directions, and then let them go ahead and take the test. A single examiner may administer the tests to all the classes of a moderate-sized school in a day, by devoting a few minutes to starting one class taking the test, leaving the class in care of the teacher, and going on to the next class, etc. This is a good way to assure reasonable uniformity of procedure in the giving of the tests.

Use the following directions with the Machine Scoring Answer Sheet.

"We are now going to give you some tests that measure your ability to think. I will pass out the test papers with the Separate Answer Sheets inserted. As soon as you receive the Answer Sheet, fill the blanks here (Point to place on Answer Sheet.), giving your name, age, etc. Do not write anything on the test booklet.

"Do not open or turn over the test booklet. Part of the test is to see if you can follow directions."

Give each pupil a test paper with the Separate Answer Sheet inserted. Pass out the mechanical pencils, and then say:

"Read this front page of the test booklet carefully. You see that there are spaces here for recording answers. (Hold up booklet and point to the spaces.) DO NOT put the answers to the samples in these spaces. You are not to mark the test booklet in any way.

"If you look in the upper left-hand corner of the Answer Sheet (Hold up an Answer Sheet and point to the spaces for answers to sample.), you will see spaces for the answers to sample questions *a*, *b*, and *c*. Put your answers to the samples in these spaces. Read the front page of the test booklet and answer the sample questions." Allow a reasonable time for all to finish reading the first page; then say: "Is there anyone who does not understand how to answer the samples?" Be sure all do.

Then say: "All your answers are to be marked in the spaces on the Answer Sheet.

"Slip the Answer Sheet under the edge of page 3 so that the column of spaces marked 'Page 3' is alongside page 3 like this. (Show by holding up page 3 with the "Page 3" column of the Answer Sheet close to page 3 of the booklet.) Notice that the arrow tips on the Answer Sheet point directly toward the arrow tips on page 3. In answering the first question, you put a mark in one of the spaces in the first row, and so on.

"When you finish page 3, pull out the Answer Sheet a little way like this (Show.) so that you can see the column of answers for page 4, and do page 4. Always keep the Answer Sheet shoved under the booklet so that the column of the Answer Sheet on which you are working is close to the test paper.

"When you come to page 5, fold page 6 under like this (Show.) so that you can get the 'Page 5' column of the Answer Sheet close to page 5 of the booklet like this. (Show.)

"Never put more than one mark in any row of spaces.

"In making your marks on the Answer Sheet, move your pencil up and down two or three times so as to make a heavy black mark filling the space between the two dotted lines in each case.

"Is there anyone who does not understand what to do?" (Answer any questions about how to take the test.) Then say:

"As explained in the paragraph below the samples, the test contains eighty questions. You are not expected to be able to answer all of them, but do the best you can. You will be allowed a half hour. Try to get as many right as possible. Be careful not to go so fast that you make mistakes. Do not spend too much time on any one question. No questions about the test will be answered after the test begins.

"Now go ahead and answer the questions. Remember to make heavy black marks."

(Continue here.)

Write immediately on the board the exact time when the pupils begin to take the test. It is helpful to write on the board also the time the pupils must stop work. Thus, if pupils are started at 1:17, write this on the board and under it write 1:47. Or set your watch exactly on the hour and when it is exactly half past the hour by your watch, the time will be up.

It should be understood by the examiner that no questions about the test are to be answered which might give the pupils the slightest help in answering the questions; that is, the examiner or teacher may not explain the meaning of any word or give any hints. It is permissible at the beginning of the examination for the examiner to move quietly about the room to make sure that the pupils are indicating their answers in the proper manner (making heavy black marks), and if during the examination a pupil becomes confused on account of the use of the Separate Answer Sheet, it is permissible, of course, to explain to him how to proceed. Thereafter it is better for the teacher to remain seated at her desk so that the room is quiet and the pupils may work undisturbed.

The one in charge of timing the test should be particularly impressed with the need to watch the time carefully, for it is very easy to forget the time and let the pupils work more than the time allowed.

After exactly 30 minutes, say: "Stop! Lay your pencil down."

If the Attached Answer Sheet is used, have the Answer Sheets collected, then have the pupils write their names at the top of page 3 of the booklet, and have the booklets collected. If the Machine Scoring Answer Sheet is used, have the Separate Answer Sheets and the test booklets collected at once.

Directions for Scoring

Hand scoring

A Key for scoring the Attached Answer Sheet is included in each package of tests.

The pupils have been instructed not to put more than one mark in any row of spaces. However, if in the case of any item two marks have been put in the same row of spaces, draw a colored line through the row of answer spaces and give no credit for that item.

Local norms for different localities differ markedly. The norms in Table 1, therefore, should not be thought of as necessarily representative of any particular section of the country but rather as representative of the country as a whole.

These norms apply to a first test. If a pupil takes a second form of the test later, it is necessary to make a correction for familiarity with the test before using Table 1. (See "Practice Effect" below.)

Practice Effect

When a pupil takes a second form of a test within a short time after the first form, he tends to make a better score on the second test. This increase in score is generally called "practice effect."

It was found that when a second form of Gamma was given two days after the first form, the practice effect was about 4 points. This means that to render the second score of a pupil comparable to the first score if the tests were taken two days apart, 4 points should be subtracted from the second score.

Practice effect decreases, of course, as the length of time between tests increases. Possibly the amount of practice effect would drop to about 3 points if the interval were a week; to 2 points if the interval were a month; to 1 point if the interval were three months or more.

Whenever it is desired to find an IQ (see below) from the score of a pupil in a second test, the proper correction should be made for practice effect in the second score before comparing it with the norm for the pupil's age in Table 1.

Measuring Brightness

A measure of a pupil's brightness, called an Intelligence Quotient (IQ), is sometimes found by dividing the pupil's Mental Age by his "Chronological Age."

A measure of brightness of a pupil comparable to an intelligence quotient (IQ) obtained on the Binet Scale may be found by comparing his score in the Gamma Test with the norm for his age, as explained below. A measure so found is not a quotient, but it is called an "IQ" because it has the same significance as an IQ.

How to Find a Pupil's "Gamma IQ"

To find a pupil's "Gamma IQ," proceed as follows:

1. Find the norm for the pupil's age from Table 1.
2. Find the amount by which the pupil's score exceeds (or falls below) the norm for his age. Call this his "deviation of score."
3. Add the pupil's deviation of score to 100 (or subtract from 100 if the deviation is downward). The result is the pupil's "Gamma IQ."

For example, suppose a pupil of the age of 14 years 6 months makes a score of 45. The norm for 14 years

6 months in Table 1 is 35 points. The pupil's score of 45 points exceeds his norm of 35 by 10 points. Hence his "Gamma IQ" is $100 + 10$, or 110.

"Gamma IQ's" found by this method tend to be somewhat less variable than ordinary IQ's; that is, they tend to be somewhat nearer to 100. This fact should be borne in mind if comparisons are made between "Gamma IQ's," found as above, and ordinary IQ's, found by the division method.

Reliability and Validity of the Gamma Test

By "reliability" is meant the degree of precision with which a test measures what it measures.

One common measure of reliability is the coefficient of correlation between odd and even items of a single test. This is virtually a correlation between two forms of a short test each half as long as the full test, the two tests being given, we might say, simultaneously.

It is customary, then, to correct the coefficients of correlation between the half tests by the Spearman-Brown formula to obtain the corresponding coefficient for two full-length tests given under the same circumstances.

The coefficients of correlation for the odd and even items of one test (Form AM) are as shown in Table 2 a.

TABLE 2 a. Reliability Coefficients (Odd vs. Even Items) for Form AM Corrected by Spearman-Brown Formula

GRADES	10	11	12
CORRECTED COEFFICIENTS	.90	.91	.85

Table 2 b shows the coefficients of correlation for odd and even items for new Form EM. These correlations are based on approximately 100 students per grade in one community.

TABLE 2 b. Reliability Coefficients (Odd vs. Even Items) for Form EM Corrected by Spearman-Brown Formula

GRADES	10	11	12
CORRECTED COEFFICIENTS	.92	.91	.92

A corrected split-half reliability coefficient of .88 was obtained on Form EM of the Gamma Test, based on 489 college freshmen entering the College of the Holy Cross, Worcester, Massachusetts, in 1953.

Another measure of reliability which is entirely independent of the degree of heterogeneity of the group is the *standard error of measurement*. By "standard error of measurement" is meant the amount by which any pupil's actual score may differ from his "true" score in two cases out of three.

OTIS QUICK-SCORING MENTAL ABILITY TESTS

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Gamma
AM

GAMMA TEST: FORM AM

IQ.....

For Senior High Schools and Colleges

Score.....

Read this page. Do what it tells you to do.

*Do not open this booklet, or turn it over, until you are told to do so.
Fill these blanks, giving your name, age, birthday, etc. Write plainly.*

Name..... Age last birthday years
First name, initial, and last name

Birthday..... Teacher..... Date..... 19.....
Month Day

Grade..... School..... City.....

This is a test to see how well you can think. It contains questions of different kinds. Here are three sample questions. Five answers are given under each question. Read each question and decide which of the five answers below it is the right answer.

Sample a: Which one of the five things below is soft? 1 2 3 4 5

① glass ② stone ③ cotton ④ iron ⑤ ice..... ||| ||| | ||| |||

The right answer, of course, is *cotton*; so the word *cotton* is underlined. And the word *cotton* is No. 3; so a heavy mark has been put in the space under the 3 at the right. This is the way you are to answer the questions.

Try the next sample question yourself. Do not write the answer; just draw a line under it and then put a heavy mark in the space under the right number.

Sample b: A robin is a kind of — 6 7 8 9 10

⑥ plant ⑦ bird ⑧ worm ⑨ fish ⑩ flower.... ||| ||| ||| ||| |||

The answer is *bird*; so you should have drawn a line under the word *bird*, and *bird* is No. 7; so you should have put a heavy mark in the space under the 7. Try this one:

Sample c: Which one of the five numbers below is larger than 55? 11 12 13 14 15

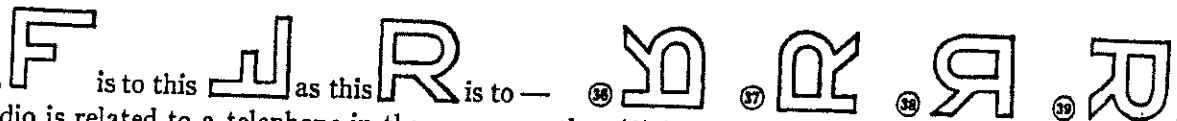
⑪ 53 ⑫ 48 ⑬ 29 ⑭ 57 ⑮ 16..... ||| ||| ||| ||| |||








The answer, of course, is 57; so you should have drawn a line under 57, and that is No. 14; so you should have put a heavy mark in the space under the 14.

The test contains 80 questions. You are not expected to be able to answer all of them, but do the best you can. You will be allowed half an hour after the examiner tells you to begin. Try to get as many right as possible. Be careful not to go so fast that you make mistakes. Do not spend too much time on any one question. No questions about the test will be answered by the examiner after the test begins. Lay your pencil down.

Do not turn this booklet until you are told to begin.

1. The opposite of hate is —
 ① enemy ② fear ③ love ④ friend ⑤ joy
2. If 2 pencils cost 5 cents, how many pencils can be bought for 50 cents?
 ⑥ 100 ⑦ 10 ⑧ 20 ⑨ 25 ⑩ 5
3. A dog does not always have —
 ⑪ eyes ⑫ bones ⑬ a nose ⑭ a collar ⑮ lungs
4. A recollection that is indefinite and uncertain may be said to be —
 ⑯ forgotten ⑰ secure ⑱ vague ⑲ imminent ⑳ fond
5. Which of these words would come first in the dictionary?
 ㉑ more ㉒ pile ㉓ mist ㉔ pick ㉕ mine
6. A fox most resembles a —
 ㉖ pig ㉗ goat ㉘ wolf ㉙ tiger ㉚ cat
7. Gold is more costly than silver because it is —
 ㉛ heavier ㉜ scarcer ㉝ yellower ㉞ harder ㉟ prettier
8. The first drawing below is related to the second in the same way that the third one is to one of the remaining four. Which one?



9. A radio is related to a telephone in the same way that (?) is to a railroad train.
 ① a highway ② an airplane ③ gasoline ④ speed ⑤ noise
10. The opposite of wasteful is —
 ⑥ wealthy ⑦ quiet ⑧ stingy ⑨ economical ⑩ extravagant
11. A debate always involves —
 ⑪ an audience ⑫ judges ⑬ a prize ⑭ a controversy ⑮ an auditorium
12. A party consisted of a man and his wife, his two sons and their wives, and four children in each son's family. How many were there in the party?
 ⑯ 7 ⑰ 8 ⑱ 12 ⑲ 13 ⑳ 14
13. One number is wrong in the following series.
 1 5 2 6 3 7 4 9 5 9
 What should that number be?
 ㉑ 9 ㉒ 7 ㉓ 8 ㉔ 10 ㉕ 5
14. A school is most likely to have —
 ⑯ maps ⑰ books ⑱ a janitor ⑲ a teacher ⑳ a blackboard
15. What letter in the word WASHINGTON is the same number in the word (counting from the beginning) as it is in the alphabet?
 ㉖ A ㉗ N ㉘ G ㉙ T ㉚ O
16. Which word makes the truest sentence? Fathers are (?) wiser than their sons.
 ㉛ always ㉜ usually ㉝ much ㉞ rarely ㉟ never
17. Four of these five things are alike in some way. Which one is not like the other four?
 ① nut ② turnip ③ rose ④ apple ⑤ potatoes
18. The opposite of frequently is —
 ⑥ occasionally ⑦ seldom ⑧ never ⑨ periodically ⑩ often
19. This  is to this  as this  is to —
 ㉑  ㉒  ㉓  ㉔ 
20. At a dinner there is always —
 ⑯ soup ⑰ wine ⑱ food ⑲ waiters ⑳ dishes
21. If 10 boxes full of apples weigh 400 pounds, and each box when empty weighs 4 pounds, how many pounds do all the apples weigh?
 ㉑ 40 ㉒ 360 ㉓ 396 ㉔ 400 ㉕ 404

46. The law of gravitation is —
 (68) obsolete (67) absolute (68) approximate (69) conditional (70) constitutional...
47. Oil is to toil as (?) is to hate.
 (71) love (72) work (73) boil (74) ate (75) hat.....
48. If $4\frac{1}{2}$ yards of cloth cost 90 cents, what will $3\frac{1}{2}$ yards cost?
 (76) \$3.15 (77) $86\frac{1}{2}$ ¢ (78) 70¢ (79) 89¢ (80) 35¢.....
49. Which number in this series appears a second time nearest the beginning?
 6 4 5 3 7 8 0 9 5 9 8 8 6 5 4 7 3 0 8 9 1
 (81) 9 (82) 0 (83) 8 (84) 6 (85) 5.....



51. If the first two statements following are true, the third is (?).
 Some of our citizens are Methodists. Some of our citizens are doctors.
 Some of our citizens are Methodist doctors.
 (1) true (2) false (3) not certain.....
52. Which one of the five words below is most unlike the other four?
 (6) fast (7) agile (8) run (9) quick (10) speedy.....
53. One who says things he knows to be wrong is said to be —
 (11) careless (12) misled (13) conceited (14) untruthful (15) prejudiced
54. If the words below were arranged to make the *best* sentence,
 with what letter would the last word of the sentence end?
 sincerity traits courtesy character of desirable and are
 (16) r (17) y (18) s (19) e (20) d.....

55. If a strip of cloth 36 inches long will shrink to 33 inches when washed,
 how many inches long will a 48-inch strip be after shrinking?
 (21) 47 (22) 44 (23) 45 (24) 46 (25) 45½.....
56. Which of these expressions is most unlike the other three?
 (26) draw pictures (27) clean house (28) come home (29) work problems.....
57. If the following words were seen on a wall by looking at a mirror on the opposite wall,
 which word would appear exactly the same as if seen directly?
 (31) MEET (32) ROTOR (33) MAMA (34) DEED (35) TOOT

58. Find the two letters in the word ACTOR which have just as many letters between them in
 the word as in the alphabet. Which one of these two letters comes first in the alphabet?
 (36) A (37) C (38) T (39) O (40) R.....
59. A surface is related to a line as a line is to a —
 (41) solid (42) plane (43) curve (44) point (45) string.....
60. One number is wrong in the following series.
 1 2 4 7 11 16 23
 What should that number be?
 (46) 3 (47) 6 (48) 10 (49) 16 (50) 22.....



62. How many of the following words can be made from the letters in the word
 STRANGLE, using any letter any number of times?
 greatest, tangle, garage, stresses, related, grease, nearest, reeling
 (56) 7 (57) 6 (58) 3 (59) 4 (60) 5.....
63. Which of the following is a trait of character?
 (61) reputation (62) wealth (63) influence (64) fickleness (65) strength.....

OTIS QUICK-SCORING MENTAL ABILITY TESTS

KEY FOR GAMMA TEST: FORMS AM, BM, EM, and FM

Page 6	Page 5	Page 4	Page 3
64 ● 68	46 ● 67	22 ● 28	1 ● 3
65 ● 74	47 ● 74	23 ● 33	2 ● 8
66 ● 79	48 ● 78	24 ● 39	3 ● 14
67 ● 5	49 ● 85	25 ● 42	4 ● 18
68 ● 8	50 ● 89	26 ● 48	5 ● 25
69 ● 12	51 ● 3	27 ● 52	6 ● 28
70 ● 19	52 ● 8	28 ● 58	7 ● 32
71 ● 23	53 ● 14	29 ● 63	8 ● 36
72 ● 28	54 ● 16	30 ● 69	9 ● 42
73 ● 31	55 ● 22	31 ● 73	10 ● 49
74 ● 38	56 ● 28	32 ● 80	11 ● 54
75 ● 44	57 ● 35	33 ● 4	12 ● 60
76 ● 17	58 ● 40	34 ● 8	13 ● 63
77 ● 52	59 ● 44	35 ● 11	14 ● 69
78 ● 58	60 ● 50	36 ● 18	15 ● 73
79 ● 65	61 ● 53	37 ● 22	16 ● 77
80 ● 70	62 ● 57	38 ● 27	17 ● 3
	63 ● 64	39 ● 31	18 ● 7
		40 ● 36	19 ● 14
		41 ● 42	20 ● 18
		42 ● 48	21 ● 22
		43 ● 51	
		44 ● 56	
		45 ● 62	