Non-Verbal Group INTELLIGENCE TESTS for Primary Pupils

BY

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PART I.

A Brief Survey of Existing Examinations

The first known extensive use of group intelligence tests for primary pupils occurred during the Virginia Public School Survey in 1919, when Haggerty gave his Intelligence Examination Delta 1.[1] Almost contemporaneous with it, came the publication of the Lowell Group Intelligence Scale, The Pressey Primer Scale, and the Myers Mental Measure. Since this time, the activity in this field has been great and several other examinations have appeared at odd intervals. At the present time, there are about fifteen examinations designed to test the mental abilities of pupils from the kindergarten through the fourth grade. These tests, although all intended for group use, vary widely in the kinds of exercises they contain, the total number of items, the length of time taken to give, directions, methods of scoring, and accessory materials. They differ even more in the apparent care exercised in construction, the completeness of statistical data, and usableness as practical instruments in the hands of a teacher. The most important of these aspects will be discussed farther on as fully as this paper will permit.

Some of these examinations are not on the market, nor is there any published literature describing them. The list given below,

1—Haggerty, M. E., *Virginia Public Schools*, Part 2, pp. 115-119, 1921.

however, is believed to contain all that are in existence at the present time.[2] These have been arranged in the order of their appearance so far as this has been possible to ascertain.

(1919) Lowell Group Intelligence Scale for Primary Grades.[2]
(1919) Myer's Mental Measure.[3]
(1919) Pressey Primer Scale.[4]
Towne Picture-Game Test.[5]
(1919) Haggerty Intelligence Examination, Delta 1.[6]
Detroit First Grade Test.[7]
(1920) Holley Picture Completion Test.[8]
(1920) Otis Group Intelligence Scale, Primary Examination, Forms A and B.[9]
Seattle Entrance Class Tests.[10]
(1920) Smith Graded Intelligence Tests.[11]
(1920) Dearborn Group Tests of Intelligence, Series 1.[12]
(1921) Johnson Non-Verbal 2.[13]
(1921) Cole-Vincent Group Intelligence Test for School Entrance. [14]
(1921) Kingsbury Primary Group Intelligence Scale, Form A.[15]

2—A new group test has appeared since this study was completed; namely, the Gunnison Primary Test A, by Herschel T. Manuel.

2—Lowell, Frances, *A Group Scale of Intelligence for Primary Grades*, J. APP. Psych., Vol. 3, pp. 215-247, 1919.

3—Myers, Caroline E. and Garry C., *A Group Intelligence Test*, Sch. and Soc., Vol. 10, pp. 355-360, 1919.

4—Pressey, Luella Winifred, *A Group Scale of Intelligence for Use in the First Three Grades*, J. Ed. Psych., Vol. 10, pp. 297-308, 1919; and J. Ed. Research, Vol. 1, pp. 285-294, 1920.

5—Towne, Clara Harrison, *Towne Picture-Game Test*. Published by the Orthogenic Clinic, Public Schools, Kansas City, Mo.

6—Haggerty, M. E., *Haggerty Intelligence Examination*, World Book Co.

7—Engel, Anna M., *Detroit First Grade Intelligence Test*, World Book Co.

8—Holley, Charles E., *A Picture Completion Test, described in Mental Tests for School Use*, Univ. of Ill. Bulletin No. 28, Vol. 17, March 8, 1920.

9—Otis, Arthur S., *Otis Group Intelligence Scale, Primary Examination*, World Book Co.

10—*Seattle Entrance Class Tests*, Board of Education, Seattle, Wash.

11—Smith, Franklin O., *Graded Intelligence Tests*, University of Montana.

12—Darborn, W. F., *Dearborn Group Tests of Intelligence, Series* 1, J. B. Lippincott and Co.

13—Johnson, O. J., *Non-Verbal 2 Intelligence Examination for Primary Pupils*, Dept. of Education, Public Schools, St. Paul, Minn.

14—Cole, L. W., and Vincent, Leona E., *Group Intelligence Tests for School Entrance*, State Normal School, Emporia, Kansas.

15—Kingsbury, Forest A., *Kingsbury Primary Group Intelligence Scale*, Public School Publishing Co.

TABLE I. COMPARISONS BETWEEN PRIMARY INTELLIGENCE EXAMINATIONS

EXAMINATION.	No. Minutes to Give.	No. Tests.	Total No. of Items.	No. New Tests Not In Other Exams.	Tests Adapted from Binet.	No. Tests Having Fore-Exercises.	Grades to Which Exam. is Adapted	No. Tests Objectively Scored.	No. Tests Requiring Charts To Give.
Lowell	70	25	84	11	11	0	1-2-3	25	2
Myer's Mental Measure	20	3	51	1	1	3	1-2-3	3	1
Pressey Primer Scale...	25	4	100	0	1	4	1-2-3	4	0
Seattle	48	4	67	3	0	4	1 (Low)	4	2
Towne	23	13	26	0	11	6	1 (Low)	13	0
Haggerty Delta 1......	30	6	119	2	3	6	1-2-3	5	0
Detroit	25	15	64	0	4	0	1	14	0
Holley	8	1	20	0	1	1	1-2-3	1	0
Otis	45	8	100	3	4	8	1-2-3	8	0
Smith	35	10	100	2	2	10	1-2-3-4	10	0
Dearborn	85	14	197	10	10	0	1-2-3	12	5
Non-Verbal 2	40	5	94	1	3	5	1-2-3	5	1
Cole-Vincent	40	8	46	1	2	4	1 (Low)	6	2
Kingsbury	22	4	46	2	1	4	1-2-3	4	0
Average	37.5	7.8	79.15						

TABLE II. NUMBER OF TIMES EACH KIND OF TEST APPEARS IN 14 PRIMARY EXAMINATIONS

Name of Test.	Frequency.	Name of Test.	Frequency.
1. Oral Directions......	11	26. Common Sense......	1
2. Picture Completion...	10	27. Mixed-up Sentences..	1
3. Substitution	7	28. Word Classification ..	1
4. Classification of Pictures	6	29. Moral Judgment.....	1
5. Drawing Designs....	5	30. Identifying Eyes, Nose and Mouth........	1
6. Pictorial Identities...	5	31. Recognitieon of Sex..	1
7. Tapping	4	32. Telling Time........	1
8. Length of Lines......	4	33. Body Attitude.......	1
9. Word Comparison....	3	34. Naming Pictures.....	1
10. Maze	3	35. "Dominoes"—Numerical Quantities.....	1
11. Formboard	3	36. Dictation	1
12. Absurdities	3	37. Crossing out Letters..	1
13. Geometrical Figures..	3	38. Perception of Sound..	1
14. Counting Objects	2	39. Number of Toes.....	1
15. Dot Pattern	2	40. Tying Bow Knot.....	1
16. Spot Card	2	41. Writing from Dictation	1
17. Color Naming.......	2	42. Comprehension	1
18. Asthetic Comparison.	2	43. Drinking Cup........	1
19. Color Form	2	44. Tapping Squares.....	1
20. Ball and Field.......	2	45. Alphabet Test.......	1
21. Value of Stamps.....	2	46. Memory of Words...	1
22. Picture Sequence.....	2	47. Opposites	1
23. Pattern Completion..	2	48. Completion	1
24. Pictorial Relations...	2		
25. Memory for Digits...	2		

About several examinations, it was impossible to obtain any other information than that contained in the test booklets and in the directions for giving and scoring. From the available data, Table I has been prepared. It gives a comparison of several features of interest which will be briefly discussed. The first column shows how widely different are the periods of time taken to give the tests, the extremes being 8 and 85 minutes. The next two columns contrast the actual material of which the examinations are composed. For this, the number of items is a better measure than the number of tests as the latter differ enormously in length . The table also shows the tremendous influence of Binet in the choice of test material. The lack of fore-exercises in several instances is to be deplored, whereas the high objectivity in scoring is very encouraging, both from the standpoint of efficiency and reliability.

Distribution of Types of Tests in Primary Examination.

In Table II all tests have been classified into groups. One cannot fail being impressed by the large number of different kinds of exercises that have been devised to measure the intelligence of young children. It is interesting to note, also, the popularity of Oral Directions and Picture Completions. Of these tests, twelve are directly adapted from the Binet-Simon Scale, or its revisions. Eight others are derived from the same source, but have been greatly modified. The remaining twenty-eight are drawn from group intelligence examinations for older persons, or have been invented as new tests.

Correlations With Binet.

Table III gives the results, so far as it has been possible to ascertain them, of the correlations between various primary examinations and Binet mental ages. The differences in composition of the groups of pupils used in determining these relations make direct comparison of the co-efficients a very difficult matter, but they are at least suggestive.

TABLE III. CORRELATION OF PRIMARY EXAMINATIONS WITH BINET MENTAL AGES

Examination.	r	No. and Kind of Pupils.
Lowell	.76	76 (Public School)
Myer's Mental		Less than 30 cases (Public School)
Measure	.81 to .83	64 (Feeble-minded Children)
Pressey	.75	148 (Public School)
Pressey	.66	274 (Entering Pupils, Public School)
Seattle (16)	.738	97 (Entering Pupils, Public School)
Seattle	.447	140 (Feeble-minded)
Dearborn (17) ...	.73	88 (Public School)
Dearborn	.81	63 (Subnormal Pupils)
Non-Verbal 2.....	.765	

16—Letter to writer, Jan. 30, 1921.
17—Letter to writer, Feb. 11, 1921.

Part II.

THE NON-VERBAL 2 INTELLIGENCE EXAMINATION FOR PRIMARY PUPILS.[18]

Selection and Construction of Tests.

The first work on the Examination was begun early in 1919. It consisted of a careful study of all non-verbal tests with a view of selecting such as could be readily adapted to young children. After discarding a number which proved undesirable, the following were retained: Oral Directions, Designs, Substitution, Pictorial Completion, and Pictorial Identities. These were again revised and put into as usable form as possible and are the tests of which the Non-Verbal 2 Examination is composed.

The method of selecting or rejecting items for the tests was as follows: All tests were given to about seventy, first and second grade children. The papers were then arranged in the order of scores on all the tests combined. Each item was subjected to the following treatment: if more pupils standing above the median in all tests passed an item successfully than pupils standing below, the item was considered satisfactory in respect to significance, and if acceptable in other ways, was retained. In this manner, it was possible to eliminate items not discriminative of the kind of ability measured by the whole examination. In addition to this, each item was also checked up against Sanford-Binet scores of sixty-five first grade pupils. In the case of a few doubtful items, the combined scores of all tests and the Sanford-Binet Mental Ages were used for final disposition.

When all undesirable items had been thrown out, the remaining ones were arranged in order of difficulty, using the P. E. as a measure.[19] In a few instances where large gaps were found, other items of the desired difficulty were inserted in the required places, thus insuring a more even gradation from the easiest to the most difficult.

In order to give a more comprehensive idea of the kinds of tests included in the Non-Verbal 2 Examination, a brief description of each one will be given below.

18—This Examination is called Non-Verbal 2 to distinguish it from Non-Verbal 1 for kindergarten and first grade now being planned.

19—See Woody, Clifford. *Measurements of Some Achievements in Arithmetic.* Teachers Coll. Contr. to Educ. No. 80, pp. 29-40.

The Oral Directions Test.

The main difference between this and other directions tests is to be found in its length. It contains sixteen items graded in difficulty, besides four others used as fore-exercise. This helps to make it unusually reliable. Correlations show that the test also is very significant of the kinds of abilities measured by ordinary group examinations and those considered by teachers in judging the intelligence of pupils. The test was given first place because an exercise of this sort serves to adapt pupils to the whole testing situation, and particularly to the longer working periods of the exercises that follow.

In general, directions tests considered from one standpoint fall into two distinct classes. Some call for scarcely any specific knowledge of facts, while others verge on being tests of general information. A test like Abelson's "Geometric Figures"[20] is of the former kind, while the following necessitates specific knowledge: "If a captain is superior to a corporal, put a cross in the second circle." In making up the material to go into the Oral Directions Test of Non-Verbal 2 Examination, care was exercised that it should belong to neither of these two types. Some information of a practical nature is called for in a few instances, but usually correct responses depend on the understanding, and ability to execute the commands, with speed.

The Designs Test.

Designs tests fall naturally into two classes. In the first, the subject copies the design while looking at it; in the second, it is reproduced immediately after being observed. Both kinds were used by Binet and Simon and have later been included in almost all revisions of their scale. Most of such tests have one conspicuous disadvantage, namely, that the designs drawn by the children take multifarious shapes which are very hard to score. To remedy this defect, the figures used in Non-Verbal 2 have been constructed so as to be distinctly objective in scoring. By this plan the pupil must remember the designs, but his response takes more definite shape, because part of the figure is already on the paper. His work is to fill in the missing part. Such drawings can also be evaluated objectively by counting the missing lines which the pupil has supplied.

20—Abelson, A. R., *Mental Ability of Backward Children*, Br. J. of Psych., Vol. 4, pp. 286-314, 1911.

The Substitution Test.

It is likely that in the case of young children the most important abilities measured by this test are those involved in making the substitutions with speed rather than in the rapidity of learning the symbols. The time limit of three minutes is too short to permit any except the brightest pupils to learn the symbols, but experimentation seems to indicate that it is extremely difficult to secure maximum effort from primary pupils for a period longer than this. Most tests now used are far briefer and hence fall short of securing an adequate indication of a child's ability. A unique feature of the exercise in Non-Verbal 2 is the simplicity of the symbols. All of them, except one, can be made with one stroke of the pencil. Most symbols in other examinations require two or even three strokes and this unduly retards young children who have not yet developed adequate control over hand and arm muscles. By making the signs easy, it was believed that these defects could be minimized, thus enhancing the value of the exercise. Its high reliability and significance as shown by statistical analysis bears out this hypothesis.

The Picture Completion Test.

Picture completions as now found may be divided into three groups. In the usual kind, a part of a familiar object is missing. Here the matter is purely factual, and successful performance is conditional on acquaintance with the object represented. This becomes then virtually a test of information. In the second kind, the picture represents a natural principle; i. e., the missing shadow from one of two objects. The third is a symmetrical design, a part of which is left out.

The picture completion test in the Non-Verbal 2 Examination belongs to the first and third types. All items are either designs or pictures of objects with which children, in general, are familiar. The incomplete symmetrical design is a form of exercise original with the author, which seems to show promise of considerable usefulness.[21] Those found in this test have proven very valuable, easy to give, and objective to score.

21—This kind of item appears also in the Otis Primary Examination.

The Pictorial Identities Test.[22]

This form of exercise is one of the latest to be developed, and it appears to fill a unique place. In examining group tests for young children, one is struck with the fact that none appear to call for the higher types of thinking. They deal more with sensory ability, perception, recognition of things, motor manipulation, and so on, rather than the more conceptual abilities involved in abstract thinking. The predominance of the first mentioned kind of tests for primary pupils is undoubtedly proper inasmuch as young children have not developed the higher thought processes and hence should not be given many tests that measure them. But these processes are not entirely absent, and they become more predominant as children grow older. Not only do they increase relatively by age, but they seem to be very important for human welfare.[23] For these reasons, at least one such test ought to be included in an examination, and it seems that Pictorial Identities fills the place. The test constructed for Non-Verbal 2 has proved one of the very best all around exercises in the examination, save for the difficulty of making the directions intelligible to the more immature pupils.

Criterion of Intelligence.

In order to determine how well an examination measures the traits it is supposed to measure, it is necessary to evaluate it in terms of some adequate criterion. This important procedure in test construction seems to have been neglected by many workers. It is a thing that cannot be determined offhand, but must be ascertained through rather laborious statistical methods. The early work in establishing criteria made almost exclusive use of ratings of pupils by their teachers and fellow students. For the final criterion, the separate judgments of several persons were averaged to form a more reliable measure. In recent years greater weight has been given to more objective data, such as composite scores on several kinds of tests, grade location, age, and scholarship of pupils as shown by teachers' marks.[24] By these methods more comprehensive evaluations of pupils' native mental capacities result, and they tend to be more valuable because they give less weight to non-intellectual traits.

22—This test was made up by selecting twenty items from the preliminary forms of Non-Verbal B published by the National Research Council. The Pictorial Identities were originally devised by Dr. M. E. Haggerty and are used in this examination by his permission.

23—Terman, L. M., *Intelligence and Its Measurements: A Symposium*, J. Ed. Psy., Vol. 12, pp. 127-133, 1921.

24—See Haggerty, M. E., *Haggerty Intelligence Examination. Manual of Directions*, and Terman, L. M., *Terman Group Test of Mental Ability. Manual of Directions*, World Book Co.

The criterion against which the significance of the scores obtained by the use of the Non-Verbal 2 Examination was evaluated is given below. It consists of the pooled results of the following five measures of pupils' mental abilities: the scores on two non-verbal intelligence examinations, two reading tests, and teachers' ratings of intelligence. To the ratings numerical values were given. All of these measures were then added together to form a composite whole and the correlations between it and the Non-Verbal 2 Examination were determined for each separate test and the Total Score. The criterion is given below.

Criterion.

1. Haggerty Intelligence Examination, Delta 1.
2. Pressey Primer Scale (Scores times one-half).
3. Haggerty Reading Examination, Sigma 1.
4. Part Wholes Test (Vocabulary).[25]
5. Teachers' Ratings, using the designations to which were assigned the accompanying number values: Excellent (16); Very Good (12); Good (8); Fair (4); Poor (0).

TABLE IV.

This Table Shows the Correlation of the Separate Tests and of the Total Score of the Non-Verbal 2 Examination with Criterion.

TESTS	r	P. E.
Total Score (Present Five Tests)	.841	.019
Oral Directions	.673	.020
Designs	.546	0.46
Substitution	.739	0.30
Pictorial Completion	.503	.049
Pictorial Identities	.636	.039
Geometrical Figures	.278	.061
Total Score, Six Tests	.822	.020

In Table V below the significance of the various combinations of tests has been calculated in a way believed to be original with

25—The test contains words selcted from first and second grade readers in common use, and was devised by the writer for use in this study.

the writer. The plan was to see if the co-efficients of correlation with the Criterion would increase or decrease when tests were omitted from the examination. The results show that the co-efficients decrease when any one of the first five tests are omitted, but that it increases when the scores of the Geometrical Figures test is left out. This indicates that all the tests but this one add elements which help to increase the correlation of the whole examination with the Criterion. As a result of this study, the Geometrical Figures Test was left out.[26]

TABLE V.

This Table Shows the Correlation with Criterion of the Six Tests First Included in the Non-Verbal 2 Examination. It Further Shows the Change in the Size of the Co-Efficient Due to Successively Leaving Out the Scores of One of These Tests. 101 pupils, grades 1 high to 3 high.

TESTS	r	P. E.
Total Score, Six Tests	.822	.020
These Six Tests, but		
1. Leaving out Oral Directions	.795	.024
2. Leaving out Designs	.807	.023
3. Leaving out Substitution	.777	.026
4. Leaving out Pictorial Completion	.810	.022
5. Leaving out Pictorial Identities	.797	.024
6. Leaving out Geometrical Figures	.841	.019

Correlation With Stanford-Binet.

Opportunity was found to give the tests to a group of 63 subnormal pupils who had previous been Bineted. These children ranged in mental age from 5 years 9 months to 13 years and had been examined during a period stretching back somewhat over two years. The correlation co-efficients are given in Table VI. They are not as high as one might at first expect. Due to the difficulty in giving group tests to subnormal pupils and because of the unreliability of the mental ages themselves resulting from giving the tests, and the lapse of time, in many cases, since the individual tests were given, a high degree of correspondence between the scores can not be expected.

26—This test was included in one of the preliminary editions.

TABLE VI. CORRELATION OF TESTS WITH MENTAL AGES.

(63 subnormal pupils).

TESTS	r	P. E.
Total Score (Five Tests)	.765	0.35
Oral Directions	.625	.051
Designs	.473	.065
Substitution	.743	.037
Pictorial Completion	.356	0.73
Pictorial Identities	.610	.052

Correlation with Total Score.

Each separate test in a well-constructed examination should correlate positively and closely with the total score of all tests combined. A test showing little relation with the total score measures abilities different from the examination, and consequently is of little value, as a part of it. This problem has been discussed briefly in a recent volume giving the history, methods, and practice of psychological examining in the United States Army during the war.[27] Pictorial Identities and Substitution tests are shown to be greatly superior to the others, although no co-efficient is low.

TABLE VII. CORRELATIONS WITH TOTAL SCORE.

(107 Cases, Grades 1 high to 3 high.)

TESTS	r	P. E.
Oral Directions	.598	.040
Designs	.519	.046
Substitution	.706	.032
Pictorial Completion	.630	.038
Pictorial Identities	.757	.023

Intercorrelations.

The statement made in the preceding section that tests should correlate closely with the Total Score needs one qualification. It seems desirable only when intercorrelations between the tests themselves are low. If an exercise correlates high with the other tests,

27—*Psychological Examining in the United States Army. Memoirs of the National Academy of Sciences.* Vol. XV, 1921.

its close correlation with the Total Score would be due to its measuring the same abilities as the other tests. Low correlations, on the other hand, indicate that the exercises, although measuring essentially different functions, unite on the one point of testing the same traits as the examination itself.

Table VII reveals that the tests measure essentially different mental functions. The last column gives the average of the inter--correlation co-efficient for each test and indicates how each exercise is related to the other four. In no case is the relation close.

TABLE VIII. INTERCORRELATIONS OF TESTS.

(107 Cases, Grades 1 high to 3 high.)

	Oral Direct.	Designs	Substi-tution	Pictorial Comp.	Pictorial Ident.	Average
Oral Directions...	...	.195	.361	.272	.372	.300
	...	.063	.056	.059	.055	...
Designs	.195	...	.216	.225	.251	.219
	.062	...	.061	.060	.059	...
Substitution	.361	.216	...	.380	.357	.328
	.056	.061	...	.054	.056	...
Pictorial	.272	.225	.380	...	.467	.336
Completion	.059	.060	.054	...	.050	...
Pictorial	.372	.241	.357	.467	...	.359
Identities	.055	.060	.056	.050	...	...

Reliability of Tests.

The definition given by Burt is so comprehensive that it will be repeated here.[28] He says: "The amount of fluctuation to which a given mode of measurement is liable can be determined by finding the correlation between two sets of experimental figures obtained on different occasions or by different observers for one and the same measurement, or the average correlation if the measurement was applied more than twice. The coefficient thus obtained is called the Reliability Coefficient, and measures inversely the reduction of apparent correlation caused by errors of observation incidental to that measurement." This method has been used by several investigators, and there can be no doubt that it is of the greatest impor-

28—Op. Cit.
29—Kelley, Truman, Lee, *Reliability of Tests*, J. Ed. Research, Vol. pp. , 192.

tance to every one who tries to devise new tests of any sort, even though it has certain limitations as recently pointed out by Kelley.[29]

In the case of the Non-Verbal 2 Examination the tests were given to the pupils with an interval of one week. The medians of each test for the entire group were calculated for the two givings to determine the amount of improvement. It was remarkable that out of the 107 pupils only one made a lower score the second time.

TABLE IX. MEDIAN IMPROVEMENT IN TESTS.

(107 Cases, Grades 1 high to 3 high.)

	Median Score First Giving	Median Score Second Giving	Improvement in per cent
Oral Directions	9	11	22
Designs	9	12	33
Substitutions	8	11	37
Pictorial Completion	10	11	31
Pictorial Identities	9	12	33
Total Score	44	54	24

It is contrary to popular opinion that very constant results can be obtained in the examination of young children by the group method. The co-efficients in Table IX prove that with proper care the group method is almost as adequate for primary grades as with the upper grades or in high school.

TABLE X. RELIABILITY CO-EFFICIENTS.

(107 Cases, Grades 1 high to 3 high.)

TESTS	r	P. E.
Total Score	.832	.019
Oral Directions	.560	.044
Designs	.794	.023
Substitution	.707	.032
Pictorial Completion	.730	.030
Pictorial Identities	.302	.022

Correlation with Scholarship.

Scores in the Non-Verbal 2, and of three other intelligence examinations were correlated with teacher's ratings of scholarship.

These ratings were made by persons who had taught the children one semester or more. The scheme used was a five group classification using the designations Excellent, Very Good, Good, Fair, and Poor. The correlations of these tests with scholarship are almost as high as that found for the Army Examination Alpha in the case of high school students[30] and compares favorably with results of other studies among which may be named a recent one by Procter.[31]

TABLE XI. CORRELATION WITH SCHOLARSHIP.

(71 Cases, Grades 1 high to 3 high.)

TESTS	r	P. E.
Non-Verbal 2	.413	.065
Haggerty, Delta 1	.419	.064
Pressey Primer Scale	.322	.071
Haggerty, Sigma 1	.722	.039

It was worth while also to find the closeness of relation between the Non-Verbal 2 and the three other examinations used in this study. The co-efficients in Table XI demonstrate that these tests do to a large degree measure the same abilities as the Non-Verbal 2, this being especially true in the case of Delta 1. The closeness of the relation with the reading test, Sigma 1, is also very interesting.

TABLE XII. CORRELATION BETWEEN PRIMARY EXAMINATIONS.

(71 Cases, Grades 1 high to 3 high.)

TESTS	r	P. E.
Non-Verbal 2 and Delta 1	.726	.037
Non-Verbal 2 and Sigma 1	.695	.040
Non-Verbal 2 and Pressey	.616	.048

Tentative Standards.

The norms given below are derived from scores obtained in St. Paul, Minnesota. They probably represent typical results obtainable in cities of the middle west, as the norms are based on a fairly wide distribution of cases.

30—Psychological Examining in United States Army, *Memoirs of the National Academy of Sciences*, Vol. XV, 1921.
31—Procter, W. M., Psychological Tests and the Probable School Success of High School Pupils, J. Ed. Research, Vol. 1, pp. 258-270, Apr., 1920.

TABLE XIII. GRADE AND AGE MEDIANS.

(677 Cases.)

TESTS	Grade 1B	1A	2B	2A	3B	3A	Age 7	8	9
Oral Directions ...	4	7	8	9	10	11	7	8	9
Designs	5	6	7	9	9	11	8	9	10
Substitution ..... (Div. by 3)	3	7	9	10	11	16	7	10	11
Pictorial Comp....	6	8	9	9	10	9	9	9	10
Pictorial Ident.....	2	5	8	9	10	10	6	9	10
Total Score	19	34	42	47	50	55	36	45	50

NON-VERBAL INTELLIGENCE EXAMINATION

for Primary pupils

Devised by O. J. Johnson

My name is ______________________________

I am ____ years old. I am in the ____ half of grade ____

My next birthday will be ______________ 19__

The name of my school is ______________________________

The name of my city (or county) is ______________________________

This is the ________ day of ____________ 19__

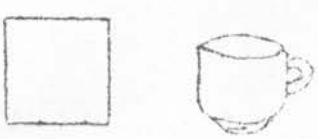
Remarks

Test	Score
1	
2	
3 (x 1/3)	
4	
Total	
Nearest Grade	
Nearest Age	

[illegible]

1

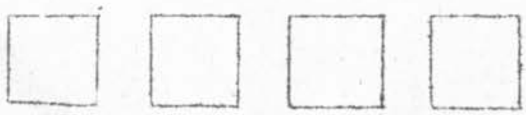
2



3

4 1 8 3 6

4



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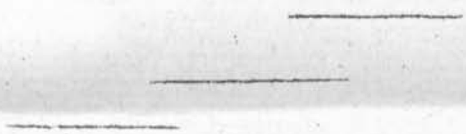

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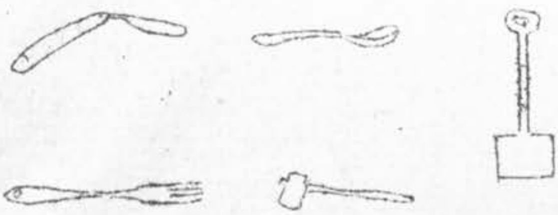

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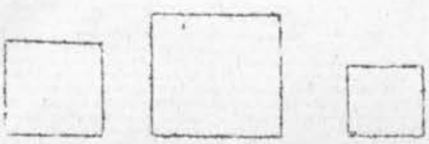

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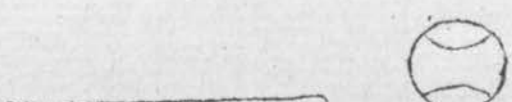

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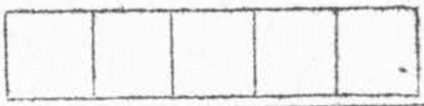

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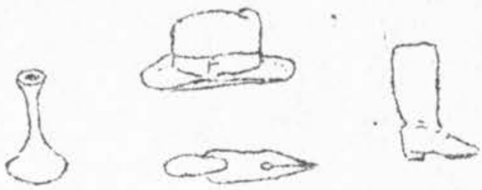

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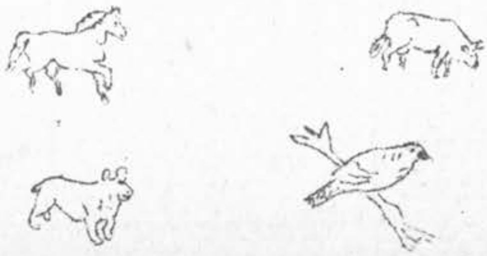

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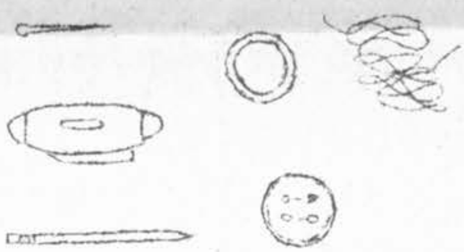

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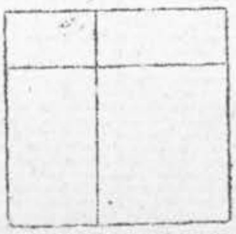

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5.	H	B	G	A	C	F	E	F	D	H	A	E	C	G	F
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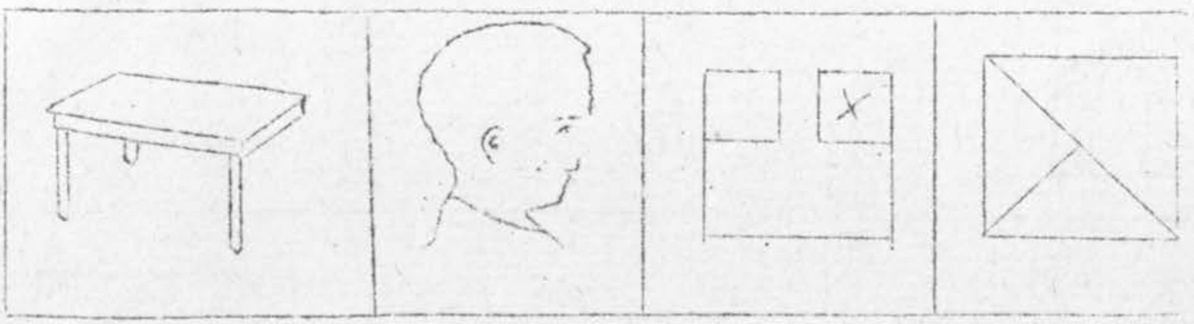

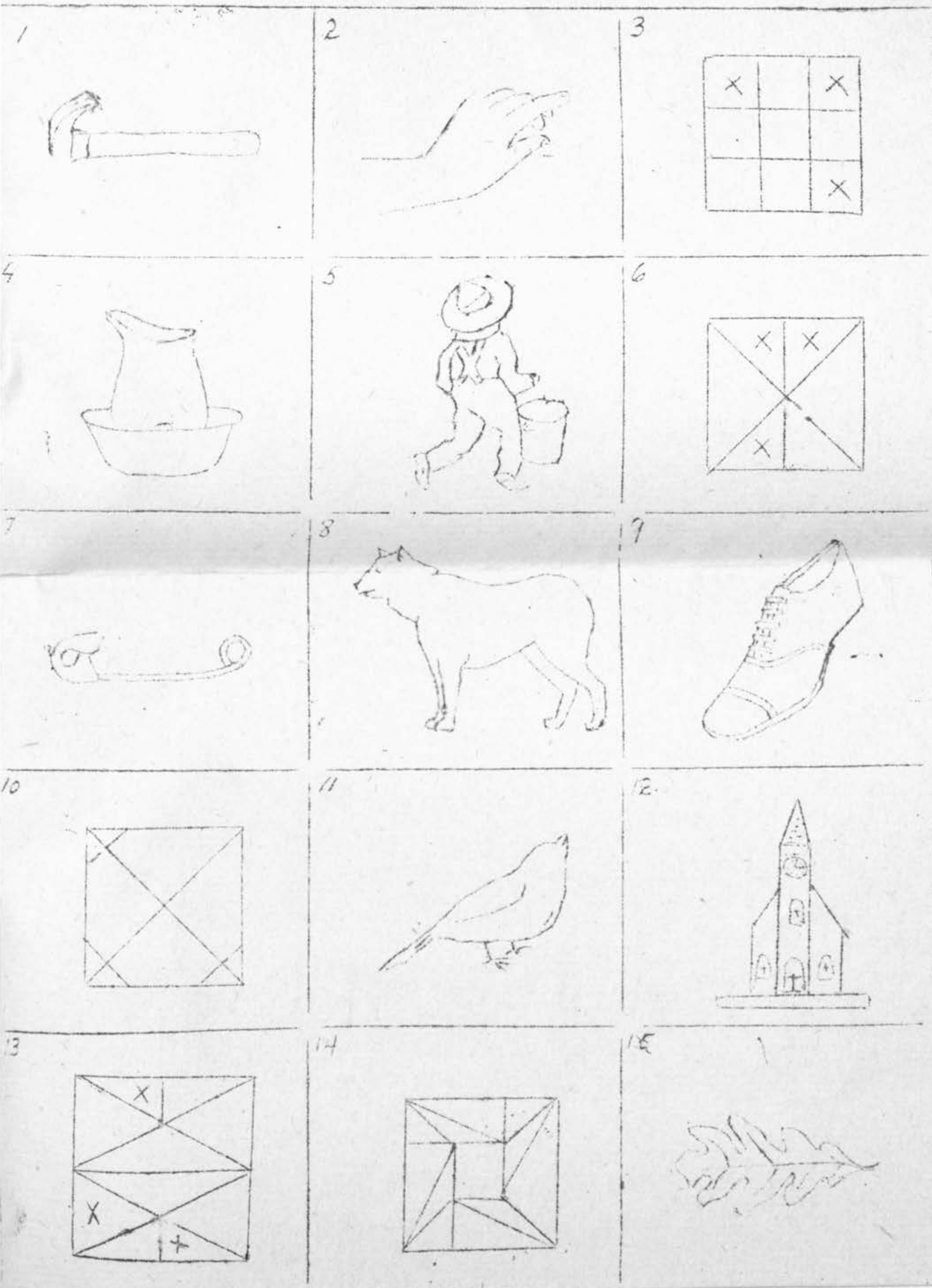
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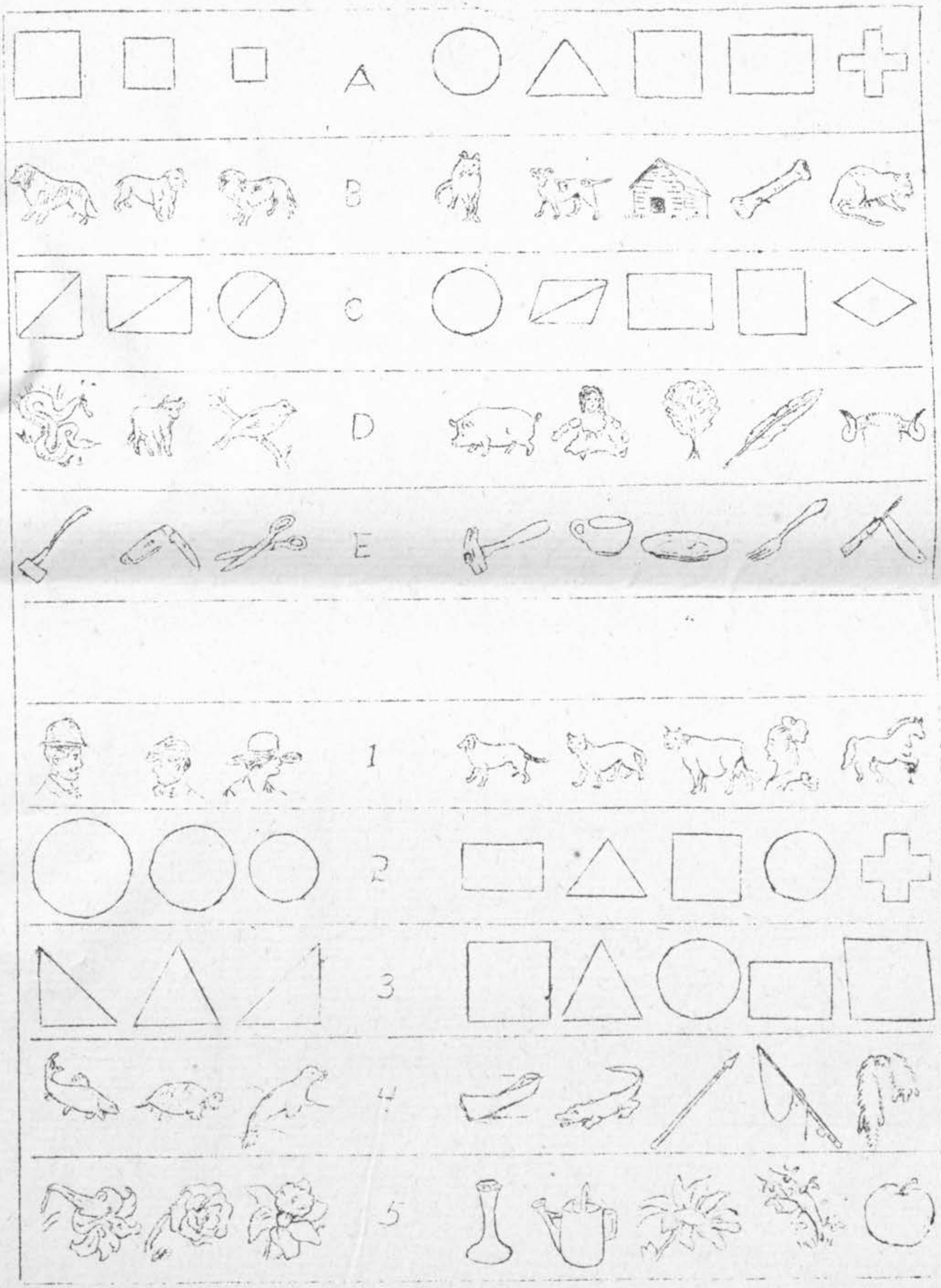
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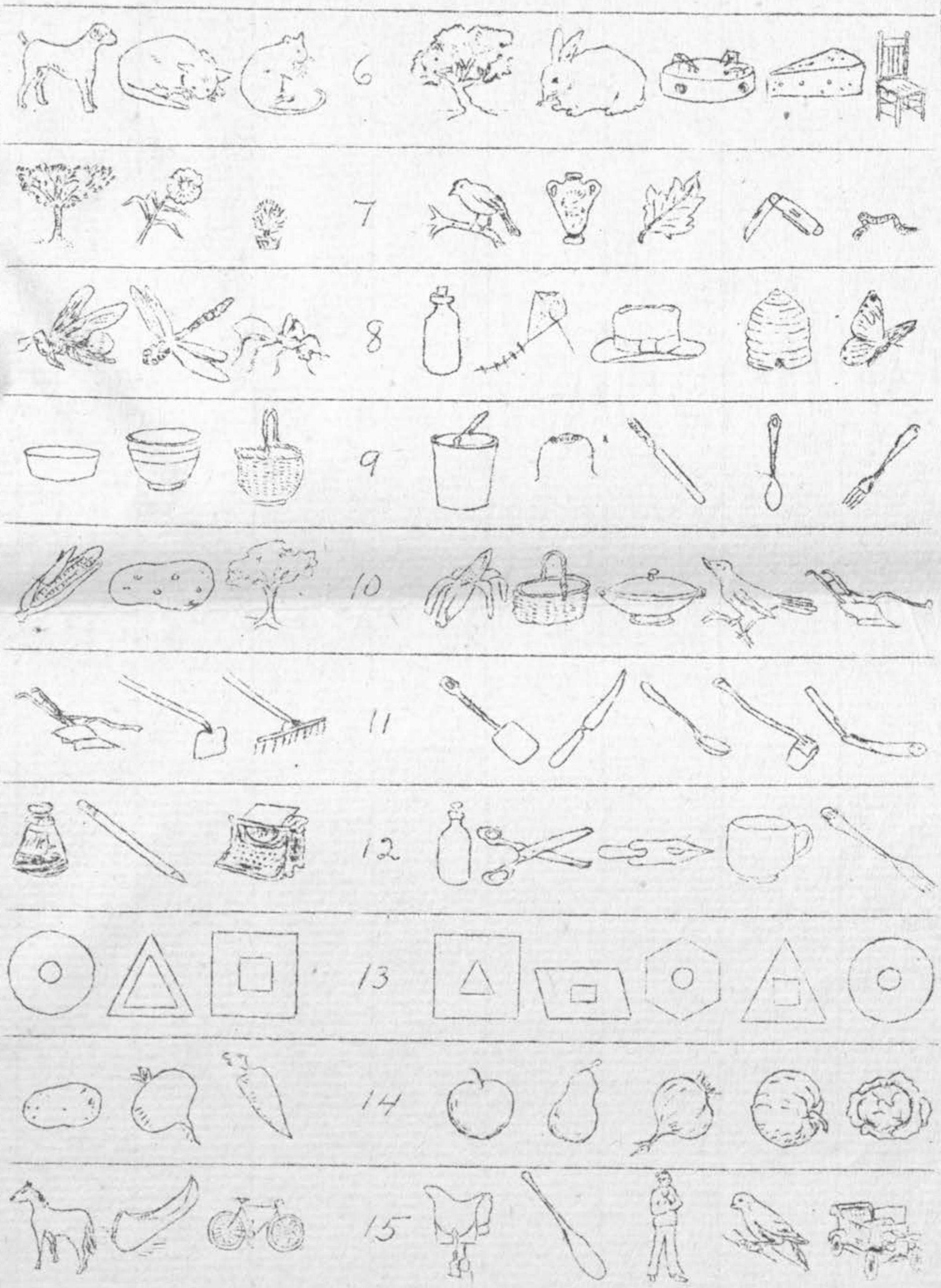
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Directions for Giving the Non-Verbal B Examination for Primary Pupils.

General Directions.

Before booklets are distributed, see to it that each child has a sharpened pencil. Pupils should not be permitted to touch pencils during distribution of papers. Begin by saying: "Here are some booklets that we are going to pass to you. Do not touch them until I tell you just what you are to do." Distribute booklets with the first page up. When this is done have pupils fill out the blanks on the first page if they can write; if not, this must be done for them. It is suggested that in the case of first grade pupils, especially, the filling out of blanks be done after the examination is over, thus saving the children this preliminary work and the resulting fatigue.

It is also suggested that a short rest period be given after the Substitution Test. This is absolutely necessary in the first grade and will insure better attention and a closer approximation of maximum effort in the case of all pupils. Teachers will be found willing to let children march around the room a few times, or to give them some simple physical exercises. After this, pupils return refreshed and eager to continue taking the test. Have pupils turn one page over to the Oral Directions Test on the second sheet. Then read the following slowly and distinctly: "Look at the papers before you. Do you see the many pictures? We are going to play a little game with them. You will make some marks on the paper with your pencils, but only the marks that I tell you to make. Don't you think this will be interesting? While I am telling you the marks you are to make, you must let your pencils lie on your desks. Don't pick them up until I have said 'Start'. As soon as I say 'Pencils Down', lay them down on your desks at once. Then, in this game you must not look at anybody else's paper. Can you remember all that?"

<u>Note to the Examiner</u>: Read directions with distinctness. Sometimes it will be necessary to pause in order that all pupils may find the right place on the page. Great care must also be exercised that pupils do not pick up their pencils and begin work before the word 'Start' is pronounced. Directions should be read <u>once</u> only.

Oral Directions Test.

1. "Find number 1 at the top of the page and pput your finger on it." (Demonstrate) "Do you see the two pictures. Now look at me. When I say 'Start' pick up your pencils and make a cross on the apple. Ready, Start." (After 5 seconds) "Pencils Down."

2. "Put your finger on 2. Look at the three pictures--a square, a cup, and a bottle. Now look at me. When I say 'Start' make a number 1 inside the square. Ready, Start." (After 5 secs.) "Pencils Down."

3. Put your finger on 3. Do you see the numbers? Look at me. When I say'start', draw a line through the number in the middle. Ready, Start." (After 5 seconds) "Pencils Down."

4."Put your finger on 4. Do you see the four squares? Now look at me. When I say 'Start', put a cross under the second square and a number 1 above the last square. Ready, Start." (After 6 seconds). "Pencils Down."

5."Put your finger on 5. Look at these three lines. Now look at me. When I say 'Start', cross out the line in the middle. Ready, Start." (After 5 seconds) "Pencils Down."

6."Put your finger on 6. There are five numbers there. Look at me. When I say 'Start' find the two numbers that are the same and draw a line under each of them. Ready, Start." (After 6 seconds) "Pencils Down."

7. "Put your finger on 7. Do you see the razor, spoon, fork, axe, and spade? Look at me. When I say 'Start' draw a ring around each of the two things we use when we eat. Ready, Start." (After 8 seconds) "Pencils Down."

8. "Put your finger on 8. Look at the three squares. Now look at me. When I say 'Start' make two crosses inside the biggest square. Ready, Start." (After 5 seconds) "Pencils Down."

9. "Put your finger on 9. Look at the row of O's and X's. Now look at me. When I say 'Start' draw a line from the first O to the last X. Ready, Start." (After 6 seconds) "Pencils Down."

10. "Put your finger on 10. See the four letters? Look at me. If it is good for boys and girls to go to school, then when I say 'Start' cross out all the letters, but if it is better for them to stay away from school, cross out the last letter only. Ready, Start." (After 7 seconds) "Pencils Down."

11. Put your finger on 11. See the bat and ball? Look at me. When I say'Start' make a number 1 above the bat and draw a line above and another line under the ball. Ready, Start." (After 8 seconds) "Pencils Down."

12."Put your finger on 12. Do you see the five squares? Look at me. When I say 'Start' make a number 1 in the first square and a number 2 in the fourth square. Ready, Start." (After 7 seconds) "Pencils Down."

13. "Put your finger on 13. Look at the pictures of a vase, a hat, a pen point, and a boot. Now look at me. When I say 'Start' draw a line above the thing we wear on the head, and cross out the thing we write with. Ready, Start. " (After 7 seconds) "Pencils Down."

14. "Put your finger on 14. Look at the O's and the X's. Now look at me. If there are more O's than X's cross out the first X, but if there are more X's cross out the last O. Ready, Start." (After 10 seconds) "Pencils, Down."

15. "Put your finger on 15. Do you see the pictures of a horse, dog, bird, and cow? Look at me. When I say 'Start' draw a line from the horse to the cow so that it goes underneath the bird. Ready Start. " (After 7 seconds) "Pencils Down."

16. "Put your finger on 16. I am going to tell you a little story. Listen carefully and try to remember what I say. Look at the pictures in 16. There are a pin, a knife, a pencil, a button, a ring, and a piece of string. All of these things a little boy had in his pocket when he went to school one morning. On the way he lost the pin, the button, and the string. When I say 'Start' cross out the things he still had in his pocket. Ready, Start." (After 8 seconds) "Pencils Down."

17. "Put your finger on 17. Do you see the four dots? Now look at me. When I say 'Start' draw a line from the first dot to the last dot that will pass above the second dot and under the third dot. Ready, Start." (After 7 seconds) "Pencils Down."

18. "Put your finger on 18. Do you see the square which is divided in large and small parts? Look at me. When I say 'Start' make a number 1 in the smallest part and three crosses in the next to the biggest part. Ready, Start." (After 9 seconds) "Pencils Down. "

19. "Put your finger on 19. Look at the many dots. Now look at me. If the moon is brighter than the sun, cross out the first three dots, but if the sun is brighter than the moon, cross out the last two dots. Ready, Start." (After 7 seconds) "Pencils Down. "

20. "Put your finger on 20. Look at the three circles. Now look at me. If a dog has four feet, two eyes, and a tail, draw a line through the second circle, but if he has three ears, put a cross in the first circle, and a number 1 in the second circle. Ready, Start." (After 6 seconds) "Pencils Down. "

Picture Completion Test (Con.)

"What is left out of the next one? Yes, a cross. Mark it in.
"What is left out of the last one? Yes a line. Mark it in.
"Listen! Do not turn the page, but take hold of the lower corner of the paper, like th is, so you can turn it quickly when I tell you to do so." (See th at each pupil takes hold of the corner of the page) "When you turn the page you will find a lot of pictures. Each one has something left out. Mark it in. See how many you can fin ish before I say 'Stop'. Ready! Turn! Go ahead!" (After 2 minutes) "Stop! Pencils Down."

Pictorial Identities Test.

"Here is a page full of pictures. Look at them. Now find the A at the top of the page and put your finger on it. Do you see th at th ere are three pictures on the left side of the letter A and five pictures on the right side?? Look at the three squares on the left." (Pause) "Now look at the five pictures on the right side. Which one of the five is most like th e first three? Yes, the square b ecause the three on the left are all squares. Cross out the square on the right side but don't make any mark on the left side. Pencils Down." (Point to pictures on test paper held up before class. Be sure pupils cross out the right picture --especially that no marks are made on the three squares at the left.)

"Put your finger on B. Look at th e three dogs on the left. Now look at the f ive pictures on the right and find the one that is most like the three on the left. Which one is it? Yes, the dog, the second picture. Cross the dog on the right out because it is most like the dogs on the left."

"Put your finger on C. Look at the three pictures on the left. Now look at the five on the right. Which one among these is most like th e first th ree? " (Wait for a correct answer and if necessary prompt a little.) "Yes, the second picture is most like the first three because it has a line drawn through it just like they have. Cross the second picture out. Don't cross any picture on the left. Pencils Down."

"Put your finger on D. Look at the three animals. Which one among the five pictures is most like the three? Yes, the pig because it is an animal, too. Cross the pig out. Pencils Down.

Picture Completion Test (Con.)

"What is left out of the next one? Yes, a cross. Mark it in.

"What is left out of the last one? Yes a line. Mark it in.

"Listen! Do not turn the page, but take hold of the lower corner of the paper, like th is, so you can turn it quickly when I tell you to do so!" (See th at each pupil takes hold of the corner of the page) "When you turn the page you will find a lot of pictures. Each one has something left out. Mark it in. See how many you can fin ish before I say 'Stop'. Ready! Turn! Go ahead!" (After 2 minutes) "Stop! Pencils Down."

Pictorial Identities Test.

"Here is a page full of pictures. Look at them. Now find the A at the top of the page and put your finger on it. Do you see th at th ere are three pictures on the left side of the letter A and five pictures on the right side?? Look at the three squares on the left." (Pause) "Now look at the five pictures on the right side. Which one of the five is most like th e first three? Yes, the square b ecause the three on the left are all squares. Cross out the square on the right side but don't make any mark on the left side. Pencils Down." (Point to pictures on test paper held up before class. Be sure pupils cross out the right picture --especially that no marks are made on the three squares at the left.)

"Put your finger on B. Look at th e three dogs on the left. Now look at the f ive pictures on the right and find the one that is most like these three on the left. Which one is it? Yes, the dog, the second picture. Cross the dog on the right out because it is most like the dogs on the left."

"Put your finger on C. Look at the three pictures on the left. Now look at the five on the right. Which one among these is most like th e first th ree?" (Wait for a correct answer and if necessary prompt a little.) "Yes, the second picture is most like the first three because it has a line drawn through it just like they have. Cross the second picture out. Don't cross any picture on the left. Pencils Down."

"Put your finger on D. Look at the three animals. Which one among the five pictures is most like the three? Yes, the pig because it is an animal, too. Cross the pig out. Pencils Down.

Pictorial Identities Test (Con.)

"Put your finger on E. Look at the three pictures, on the left --an ax, a knife, and scissors. What one thing can you do with all of them? Yes, you can cut with them. Now look at the five pictures on the right. With which one of them can you cut, too? Yes, with the razor. Then cross the razor out because it is most like the three things on the left.

"Look at me. Here are more rows of pictures like the ones you have just done. Cross out the one picture on the right which is most like the three on the left. When you come to the bottom of this page turn to the next page at once. Don't forget that there are two pages for you to do. Go ahead!" (After 2 minutes) "Stop! Pencils Down."