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CHAPTER I

INTRODUCTION

Factorial Invariance

In the application of the methods of factor analysis to the scientific problem of isolating the psychological "functional unities," the principle of factorial invariance has been given a place of first importance (24, p. 204; 29, p. 360; 36, p. 21, p. 28). Factorial investigations have been conducted on the assumption that the dimensions or parameters suggested by the factorial analysis will be indicative of an underlying order and that this order will be psychologically meaningful. This basic assumption is the one made by scientists in any field. "Without this faith no science could ever have any motivation" (29, p. 51). The scientific usefulness of the constructs developed by factor analysts, however, has been judged largely in terms of the consistency with which such concepts can be used to comprehend psychological phenomena, i.e., in terms of the invariance of the factors in repeated investigations (20, p. 286; 36, p. 28).

Unfortunately, evidence of the stability of the results of multiple-factor analyses has, in some cases, been obscured by differences in the treatment of the data. The development of the various techniques has been marked by controversies between devotees of the special "schools" regarding the assumptions that were to be accepted (10, 20, 29). Just as changes in the postulates of a theoretical system will lead to changes in the conclusions or deductions made, so differences in the assumptions basic to the factorial techniques will lead to variations in the conclu-

sions reached from the same set of data. Such variations, when viewed by the large number of "uninitiated" psychologists, may well appear as a chaos of conflicting claims, each apparently equally useful, or useless, as the case may be.

Since an appreciation of the comparability of the psychological concepts developed through the use of various factorial techniques requires some understanding of the theoretical formulations, an understanding limited at present to relatively few psychologists, it is fortunate that a number of investigations have been conducted, using the same method of analysis, the method of multiple-factor analysis developed by Thurstone (29), with similar test batteries on similar populations. The invariance of a number of psychological constructs can thus be considered for at least one of the more widely used methods of factor analysis (36, p. 25).

The theorem of factorial invariance (29, p. 363) requires that the factorial composition of a test in a set of primary factors found in a complete and over-determined simple structure remain invariant with changes in the battery which do not modify the simple structure. This theorem has been sustained for the cognitive factors denoted S, N, V, W, and M in studies carried out by Thurstone and by other workers using his methods (1, 2, 4, 9, 14, 15, 19, 22, 23, 30, 34). The stability of even the factor loadings of particular sets of tests, when used in different batteries with different populations, can be seen in recent studies using the newer, improved methods of analysis (4, 14, 19).

The factor designated P, perceptual-speed, however has not been so stable. Thurstone has summarized the results of several studies in which this factor appeared by saying, "the

existence of the perceptual factor seems quite certain because it appears in all the test batteries, but we are not satisfied with present attempts to interpret its nature" (30, p. 23).

Factorial Invariance and the Perceptual Factor

The application of the names, "perception," "perceptual-speed factor," and the "perceptual factor," to factors designated P in various studies by Coombs (4), Schaefer (14), Taylor (19), Thurstone (21, 22, 23), Thurstone and Thurstone (30), and Wittenborn (34) has resulted in some confusion because of the difficulty of identifying the P-factor found, for example, in the study of Coombs with that reported by Taylor, or by Thurstone.

To illustrate, the tests of Identical Forms and Word Grouping, from Thurstone's original study of the primary mental abilities (21), when used with a number of tests designed especially to check a hypothesis regarding the nature of the perceptual factor, failed to have significant loadings on the new "perceptual" variable (22). This particular example of an unexpected shift in factorial composition was considered by Schaefer (14) to be due to marked differences in the distribution of abilities in the two experimental populations used. However, two studies by Thurstone (22, 23) and one by Coombs (4) can be compared more directly. Four tests, among others, were common to these three studies in which samples of Chicago high-school seniors were utilized as the experimental populations. The factor loadings[1] of these four tests on the factor designated P in each of these three studies are presented below. The shifts in the factor loadings of these four tests, when considered in terms of the stability of the factorial composition of the remaining tests in each

[1]These data are taken from the rotated factor matrices contained in references 4, 22, and 23.

study, were so great as to call for special consideration.

Name of Test	Factor Loading on P-Factor		
	Coombs (4)	Thurstone (22)	Thurstone (23)
Identical Forms.....	.28	.32	.58
Identical Numbers.....	.31	.54	.29
Scattered X's.....	.65	.44	.35
Verbal Enumeration....	.22	.61	.54

A plausible explanation for these results, however, can be found in the concept of factorial invariance as stated by Thurstone (29, p. 363). If the factorial complexity of these perceptual tests were greater than expected, the simple structure would not be overdetermined in all dimensions. The problem would then be one of determining the bounding hyperplanes of not one, but of several factors. Furthermore, if these several perceptual factors possessed a second-order factor in common, a first-order factor corresponding to such a second-order factor would be found when each of the first-order perceptual factors were represented in a set of perceptual tests by only one variable (29, pp. 412-13). The addition of other perceptual tests to the battery would then lead to the appearance of the first-order common factors. In this case, the original perceptual factor should disappear, and two or more correlated perceptual factors should be found. Thus, the instability of the perceptual factor may be considered an indication of the existence of several linearly independent but correlated functional unities. This hypothesis appears even more plausible when considered in the light of other investigations.

Factorial Complexity of the Perceptual-Speed Domain

The results of several different investigators suggest that two or more parameters must be postulated to account for the individual differences found in the several tests reportedly high on the perceptual factor.

Whipple (33, pp. 305-06), summarizing the data from several early experiments, suggests that different abilities are required for the visual apprehension of phrases, isolated words, single letters, groups of dots, geometrical drawings, colors, etc. He further suggests that the results will be different when such conditions are varied as the kind and arrangement of symbols, the number of symbols, and the duration of the task.

Gates (7, p. 436), in a study with elementary-school children of the processes involved in reading, came to the conclusion that, "What we call visual perception is not a single unitary concept or power which operates uniformly upon all sets of data and under all conditions; perception, on the contrary, is specialized."

Stroud (17, pp. 497-98), following a line of investigation similar to that of Gates, and also with an elementary-school population, reported suggestions of a similar differentiation between rate of visual perception as measured by tests of word selection, letter selection, and paired letters and by discrimination of paired geometrical designs.

Three recent factorial investigations conducted with comparable techniques have reported at least two factors which appear to have perceptual components or processes as the common distinguishing characteristic. Thurstone (33, p. 162), in a study using a Hyde Park High School senior group, found one dimension which he labeled "P," for which the following tests had signifi-

cant loadings: Identical Forms, Verbal Enumeration, and Scattered X's. Another variable, Factor 9, for which no interpretation was offered, had its highest loadings in Identical Numbers, Scattered X's, and Repeated Letters. The suggestion was made that this second factor might be characterized by some facility in searching through rows or columns of material for some identity (23, p. 159), in contrast to Factor P which seemed to involve a "facility in perceiving detail that is embedded in irrelevant material" (21, p. 81).

Thurstone and Thurstone (30), in an extensive study based on a large eighth-grade population, reported two factors pertinent to this discussion. The first of these was identified as the perceptual factor P; and the seven tests whose highest loadings were found in this perceptual factor were Identical Numbers, Mirror Reading, Identical Pictures, Faces, Incomplete Words, Scattered X's, and Figure Grouping. The tests, Word Puzzles and Verbal Enumeration, also had significant projections on this P-factor. The second factor of immediate interest was a third verbal factor, denoted X_3, which appeared to be linearly independent of the verbal-comprehension factor V, the word-fluency dimension W, and the perceptual factor P. The new verbal factor, X_3, was characterized by the tests, Verbal Enumeration, Word Checking, and Picture Naming. Factor X_3 was not interpreted, but the similarity between this group of variables and those defining the perceptual factor of the Lane study (22), in which the tests, Concrete Association and Verbal Enumeration, had the highest projections seemed suggestive.

The third investigation reporting several perceptual factors was conducted by Schaefer (14). In a study of the hypothesis that the essential characteristic of the perceptual factor is the

simplicity or relative difficulty of the tests in the battery, Schaefer reported four factors pertinent to the problem of the possible complexity of the perceptual-speed domain. The experimental tests of Verbal Enumeration were the highest on one of these factors, those of Scattered X's defined a second factor, the new space tests were on a third factor, while on a fourth factor the simplest tests of each series had the highest projections (14, p. 41). All four of these dimensions were determined by tests from six experimental series designed for the study. These factors, however, could not be positively identified with the perceptual-speed factors previously isolated because the experimental tests all involved a change in the technique of presentation from group paper-and-pencil tests to individual slide-film-projector tests. The similarity of Schaefer's Verbal Enumeration factor to one of Thurstone's P-factor (22) and of Schaefer's Scattered X's factor to Coombs' perceptual factor (4) supports the hypothesis that two or more perceptual-speed factors may be found.

Additional evidence of the complexity of the domain more frequently associated with the term "perception" is to be found in Thurstone's factorial study of a large battery of individual tests (26). Although his monograph is entitled, A Factorial Study of Perception, none of the tests previously used as measures of the various perceptual-speed factors were included in the battery, an omission that may indicate either the unsatisfactory nature of such speed factors or the assumption that these speed factors are not related to tests of perceptual dynamics.

Formulation of Hypotheses

The evidence appeared to indicate that several perceptual-speed factors could be isolated with paper-and-pencil tasks. Since this area had been identified at various times by cancella-

tion tests (4, 34, 35), by associational recognition tests (22), or by a combination of these (21, 23, 30), the first problem suggested for investigation was the determination of the dimensionality of the domain defined by such paper-and-pencil "perceptual-speed" tests. A subsidiary problem to be studied simultaneously was the relation of changes in test content and method of presentation to factorial composition.

The first hypothesis to be investigated was that the perceptual domain represented by the perceptual factors reported by various experimenters contained at least two linearly independent parameters. Further, the correlations between these perceptual factors were believed to determine a second-order factor.

Two hypotheses as to the nature of the perceptual processes were formulated for investigation, with the expressed understanding that these were only two of several possible hypotheses. These perceptual processes were stated as: (1) a facility in perceiving elements of a category defined by formal restrictions relating to the characteristics of the stimuli, and (2) a facility in perceiving members of a category defined by meaningful restrictions of an associational nature. These hypotheses were suggested as indicative of the differentiation between the Scattered X's and Identical Forms type of test and the Verbal Enumeration and Concrete Association type of test. Highly practiced symbols were considered as extreme cases of formally restricted categories logically comparable to the category of identity of geometrical forms.

The tasks to be investigated in terms of these hypotheses were to be limited to simple speeded (time-limit) tests of the recognition form. The perceptual-speed tasks were to specify the nature of the percept completely, as having a form identical with

a given stimulus figure, as being an X or some other equally unambiguous symbol, or as having certain specified characteristics defined by the nature of the configuration or by the meaning of the symbol.

Since the relation between difficulty level and factorial composition was not to be the variable investigated, all of the experimental perceptual-speed tests were to be at a difficulty level for which rate of response would be an adequate measure of ability to perform the task. The influence of form of presentation was considered important in establishing a possible differentiation between the parameters determined by the single discrimination-response situation, as used by Schaefer (14), and those factors accounting for the variance of the time-limit paper-and-pencil perceptual-speed tests used by other investigators.

The existence of one or more second-order factors in the perceptual-speed domain was anticipated. Since the appearance of such factors is contingent upon the isolation of two or more correlated first-order factors, several tests were to be included in the study that were not directly pertinent to the investigation of the two hypothetical perceptual processes but were related to the problem of the dimensionality of the perceptual-speed domain.

Design of the Investigation

A multiple-factor analysis was considered to be the most direct method of investigating the hypotheses as stated. If tests requiring the hypothesized psychological processes could be devised or selected so that marked individual differences would be secured, then the common factors necessary to account for the matrix of test intercorrelations would be determined. Furthermore, if certain of these selected tests were to call for one of the hypothetical processes but not for the other, then a simple

structure should exist such that the variance of the tests designed in terms of one hypothesis would be explained largely in terms of that factor. If the hypotheses as to the nature of the psychological processes were to be sustained, the tests defining the new perceptual-speed factors should be designed so that the common element were not one of content, as letter X's, certain digits, or given sets of words. To accomplish this objective, a series of tests should be constructed or selected in terms of each hypothesis, utilizing a variety of content materials, such as letters, digits, pictorial drawings or geometrical figures, words, etc.

In order to establish the hypothetical factors as distinct from those previously isolated, a number of reference tests defining the well-established factors that may be related to perceptual-speed should be included. For this purpose, at least two reference tests would be required for each of the following factors: verbal comprehension, V, word fluency, W, numerical facility, N, and spatial visualization, S. The rote-learning factor, M, and the reasoning factors, R, D, and I, were omitted as relatively independent of the perceptual-speed factors.

The use of only two reference tests for a factor does not, in general, provide the overdetermination of simple structure implied in Thurstone's concept of factorial invariance. For each of the four reference factors indicated, however, the factorial composition has been so stable with marked changes in the population and test battery that the danger of indeterminacy of the test configuration appears remote.

Since Thurstone (26) had recently completed a study of a number of individually-presented perceptual tasks, it was deemed desirable to determine the possible congruence of some of his

perceptual factors and the perceptual-speed factors under investigation. Those considered as possibly related to the perceptual-speed domain were Factor A, tentatively interpreted as "speed and strength of configuration" or "ability to form a perceptual closure against some distraction" (26, p. 101); Factor E, "freedom from Gestaltbindung," or "ability to manipulate two configurations simultaneously or in succession" (26, pp. 110-11); and Factor F, "speed of perception" (26, p. 112). These factors had been determined from tests which, in the main, were presented by means of a slide-film projector, but these tests had later been prepared by Thurstone in paper-and-pencil form for group testing. These paper-and-pencil forms were used on the assumption that for these specific tests no change in factorial composition would result from the change in form of presentation.

Taylor (19) had established a differentiation between fluency tests on the basis of the kind of restriction imposed by the task. Tests of the new ideational-fluency factor were, therefore, to be included to see whether this differentiation between Factors W and F would be sustained with a new population.

CHAPTER II

THE INVESTIGATION

Testing Procedure

A battery of forty-four tests was selected in terms of the problems being considered. Thirty-four tests were presented in four one-hour group sessions, while the remaining ten of these tests were administered individually in one hour to the subjects by the experimenter. The group-testing sessions were scheduled for two-hour periods so that only three testing sessions in all would be required of each subject. For the convenience of the subjects, fifteen different two-hour sessions were scheduled between October 7 and October 29, 1946. Each subject was required to complete both two-hour group sessions before the one-hour individual test appointment could be made. The two-hour group-test sessions for each subject were arranged within an interval of five days of one another, and the individual tests were then completed within two weeks after the date of the last group test.

The experimenter personally conducted the group testing sessions; proctors were used when the size of the group was larger than twelve. Testing conditions were fairly uniform with respect to extraneous noise and to lighting. The hours of group testing were concentrated in the late afternoon from 3:30 to 5:30 P.M., or early evening from 7:30 to 9:30 P.M. A rest period of ten to fifteen minutes was provided between test sessions. Motivation of the subjects appeared to be high; the co-operation of the members of the groups with the examiner was excellent. Fore-exercises were provided with each test, and no cases were

discovered in which the subjects apparently failed to understand the tasks presented. The tests scheduled for a one-hour period of group testing were printed in a single booklet to facilitate the administration of the testing program.

The Sample

The sample used in this investigation consisted of 167 volunteers from the University of Chicago secured in response to announcements read in three psychology classes, three introductory mathematics classes, and one anthropology class.

Data on seven additional cases were discarded. Five of these had incomplete records; one exhibited slight nystagmus, and one was educated in a foreign country. Applications were considered only from students (1) enrolled in the last two years of the College or the first three years of a Division, (2) between 17 and 28 years of age, and (3) educated in the United States. The distributions of sex, age, and educational level for this selected college population are shown in Table 1.

American Council on Education Psychological Examination scores were available for 67 students in the experimental population. This sub-sample of 35 women and 32 men had been tested between 1943 and 1945 by the Board of Examinations of the University of Chicago. The distribution of derived scores[1] for this sub-sample is also presented in Table 1. This distribution, if considered representative of the sample, indicates that the subjects in this study were secured from a highly selected group of the University of Chicago students.

Further evidence of the highly selected nature of the

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[1]These derived scores are determined by a linear transformation of the raw scores to a mean of 30 and a standard deviation of 4, as computed for each successive University of Chicago freshman class.

sample is given by the fact that during the period, 1943-1945, the University of Chicago freshman class' average score was above the 80th percentile on the national norms for the American Council Psychological Examination.

TABLE 1

DATA ON EXPERIMENTAL POPULATION

Sex	f	Age		Educational Level		A.C.E. Examination	
		Years	f	College Status*	f	Derived Score	f
M	108	28	4	Grad.-1st yr.	5	30	1
F	59	26	4	Senior	38	28	3
		24	23	Junior	61	26	13
		22	46	Sophomore	52	24	6
		20	46	Freshman	11	22	12
		18	38			20	14
		17	6			18	11
						16	3
						14	2
						12	2
N	167	N	167	N	167	N	67

*In terms of the University of Chicago system, the corresponding educational levels, reading from the top down, would be: 3rd-year Divisional, 2nd-year Divisional, 1st-year Divisional, 4th-year College, and 3rd-year College.

Description of the Tests

A list of the tests in the battery with code numbers, time limits, scoring formulae, and order of testing is presented in Table 2. The test sessions are indicated by Roman numerals I, II, and III, with the third session used for the one-hour individ-

ual testing period. Copies of the test materials and fore-exercises used in this study are contained in the Appendix. Brief descriptions of the tests, ordered according to code number, are presented under the headings, Group tests and Individual tests.

Group tests.--This section includes the tasks administered in the two group-testing sessions, together with the two tests of speed of handwriting. The handwriting speed tests could have been presented as readily in a group session as in the final individual period.

Vocabulary (1).--This was a quite difficult five-choice recognition vocabulary test of one hundred items, identical with the test found by Thurstone (21) and verified by Schaefer (14) as a suitable reference test for the verbal factor V. Each item contained a short phrase, one word of which was underlined, followed by five numbered words. The subjects were instructed to write the number of the word (from the five choices) that had most nearly the same meaning as the underlined word.

Two-Digit Addition (2).--Since Coombs (4) had found that a simple test of adding two one- or two-digit numbers was the best of five tests of the number factor N, this test, identical with the one used by Coombs, was included in the battery. The test proper contained 238 simple two-digit addition problems for each of which an answer was indicated. The subject was required to cross out every wrong answer.

Flags (3).--This test had been found by the Thurstones (21, 22, 23, 30) and verified by Schaefer (14) to be a suitable reference test of the space factor S. The test contained 48 items, each showing two pictures of a flag. The subject was to mark "S" if the two pictures showed the same side of the flag, to mark "D" if the two pictures show different sides of the flag.

TABLE 2

THE BATTERY OF VARIABLES

Test No.	Test Name	Time Limit (Minutes)		Scoring Formula	Testing Order	Test Session
		Fore Exercise	Test			
1	Vocabulary	2	5	4R-W	1	I
2	Two-Digit Addition	2	3	R-W	2	I
3	Flags	2	2	R-W	3	I
4	First and Last Letters	1½	4½	No. Words	4	I
5	Name Recognition	1	2	R	5	I
6	Gottschaldt Figures	3½	4	R-W	6	I
7	Size Comparison	1½	2½	R	7	I
8	Topics--Words[a]	3	5	No. Words	8	I
9	Multiplication	1	5	R-W	9	I
10	Completion	1½	2	4R-W	10	I
11	Suffixes	1½	4½	No. Words	11	I
12	Cards	2½	4	R-W	12	I
13	Hidden Pictures	5	10	R	13	I
14	Letter "A"	1	2½	R	14	I
15	Discussion	2	6	No. Words	15	I
16	Word Checking	2	2	2R-W	17	II
17	Mutilated Words	1	2	R	18	II
18	Letters c, s, v, z	2	4	R	19	II
19	Boys' First Names	1	2	R	20	II
20	Dot Patterns	2	3	R-W	21	II
21	Identical Forms	2	5	R-W	22	II
22	Opposites	1½	2	R	23	II
23	First Digit Cancellation	2	3	R	24	II
24	Five-Letter Words[b]	2	2	R	25	II
25	Picture Squares	2	2	R	16	I
26	Writing Words	½	1	No. Words	43	III
27	Writing X's	½	½	No. Words	44	III
28	2, 6, and 9	2	3	R	26	II
29	Street Gestalt Completion	1	2	R	27	II
30	Verbal Enumeration	2	4	R	28	II
31	Letter Groups	2	3½	R	29	II
32	Figures	2	3	R-W	30	II
33	Four-Letter Words	3	2½	R	31	II
34	Letter Squares	3	5	R	32	II
35	Unfurnished House[c]	2½	2½	R	33	II
36	Designs	2	2½	R	34	II
37	Two-Hand Coordination (Ratio)[d]	1	½-½-½	...[e]	36	III
38	Letters IV	½	varied	Median Time	38	III
39	Concrete Association	½	varied	Median Time	39	III
40	Picture Comparison	½	varied	Median Time	40	III
41	Letters I	½	varied	Median Time	41	III

TABLE 2--Continued

Test No.	Test Name	Time Limit (Minutes)		Scoring Formula	Testing Order	Test Session
		Fore Exercise	Test			
42	Geometrical Figures.....	½	varied	R	42	III
43	Shape Constancy.....	2	varied	Sum of 2 trials	35	III
44	Peripheral Span.....	1	varied	R	37	III
45	Topics--Items[a,f].....	3	5	No. Items	8	I
46	Two-Hand Coordination (Sum)[d,f].....	1	½-½	Sum of 2 trials	36	III
47	Sex[f].....	..	.....	F=0, M=1	..	...
48	Age[f].....	..	.....	Age nearest birthday	..	...
49	Educational Level[f].....	..	.....	School status	..	...

[a]These variables represent alternative ways of scoring performances on Topics, a test of fluency in writing.

[b]The complete title of this variable is "Five-Letter Words Containing S."

[c]The complete title of this variable is "Words Associated with an Unfurnished House."

[d]These variables represent alternative ways of scoring performances on the Two-Hand Coordination Test.

[e]The scoring formula is $\frac{\text{No. Both Hands}}{\text{Sum of 2 trials}}$.

[f]These variables were not used in defining the common-factor space.

First and Last Letters (4).--This test has been found to be a satisfactory reference test of the word-fluency factor W by the Thurstones (31, 30) and by Taylor (19). Carroll (1) and Schaefer (14) had used similar tests as variables requiring the W-factor. The test proper required the subjects to write as many words as possible which begin with T and end with E.

Name Recognition (5).—This test was a modification of the test, Identical Names, used by Thurstone (22). A name, "Johnson, E. B.," was to be crossed out wherever it appeared in 16 columns of 27 double-spaced names. Nearly sixty per cent of the names listed began with "J," although only about ten per cent of the names were entirely correct. The test was designed to call for a facility in perceiving a word configuration in a mass of relatively ineffectual distracters. The test also may be considered as a "speed of reading" test calling for a facility in scanning a page of material for a specified discrete item on which no meaningful restrictions are placed.

Gottschaldt Figures (6).—Two forms, A and B, of a Gottschaldt Figures test were reported by Thurstone (26, p. 99) as having significant projections on two perceptual factors tentatively interpreted by him as A, "strength and speed of closure" (26, p. 103) and E, "freedom from Gestaltbindung" (26, p. 111). Both forms of the test required the subject to locate and trace the stimulus figure on a more complex design.

The form of the test used in the current study was one of Thurstone's revisions of the two original forms in which each of the eighteen items consisted of a stimulus figure and four complex designs arranged in a row. The task was to designate each complex figure in the group of four which contained a drawing congruent with the stimulus figure presented. The instructions emphasized that a drawing was to be marked only if it contained the indicated design of the exact size and shape and in the same position as the stimulus figure. The subjects were told that this was a speed test.

The multiple-choice recognition form was used to eliminate an ability to draw that might have been influential in the two

original forms of the test.

Size Comparison (7).--Coombs (4, p. 181) used a test similar to this in his battery, and it had significant loadings on only the V-factor and a residual dimension, the C-factor. It appeared, however, to be suitable for testing the hypothesis of a facility in perceiving members of a category defined by meaningful, or associational, restrictions, if the difficulty level of the items were kept low so that the variance contribution of verbal meaning or verbal closure factors would be minimized. The test was set up with 12 columns each of 23 pairs of double-spaced words. The subject was asked to draw a line through the word of each pair which referred to the larger of the two things. The extent of the discrimination required by this test can be indicated by the following pairs of words from the test fore-exercise: man-child, dollar-penny, scooter-tractor.

Topics (8).--This test is identical with one used by Taylor (19, p. 18) in an investigation of fluency in writing. It is one of the two tentative reference tests for the factor of ideational fluency, described as a facility in expressing ideas through the use of words, or a facility involving a controlled associative process in which rate of production of continuous meaningful written material is more important than quality of the production. A second method of scoring this task is represented as variable (45) listed after the individually presented tests.

The instructions called for the production of as many ideas as possible about the topic, "A man going up a ladder." A word or phrase was deemed sufficient for the expression of any one idea; the listing of all ideas, trivial or not, which were related to the topic was encouraged.

Multiplication (9).--This test had been found by Coombs

(4), Taylor (19), and Thurstone (23) to be an acceptable reference test of the number factor N. The form selected is identical with one used by Thurstone (23). The test proper contained 150 problems requiring the multiplication of a two-digit number by a one-digit number. Answers were provided for each problem, the subject being required to mark each answer as either correct or incorrect.

Completion (10).--Coombs (4), Schaefer (14), Taylor (19), and Thurstone (23), and Thurstone and Thurstone (30) had reported that a multiple-choice completion test, among others, was an adequate test of the verbal factor V. Therefore, the test included in the battery as the second reference test of the V-factor was one of the subtests from the 1945 A.C.E. Psychological Examination,used with the permission of L. L. Thurstone. The test proper consisted of thirty items of the five-choice multiple answer form. For each item the subject was to circle the one of five letters provided which is the first letter of the word best fitting a given definition.

Suffixes (11).--This test is one of the two reference tests for the word-fluency factor W. The form used is identical with the test of the same name used by Schaefer (14) and Thurstone and Thurstone (30). Taylor (19) also found a similar test to be an excellent measure of the word-fluency factor, as distinguished from the ideational-fluency factor. The task set for the subject was to write as many words as possible in the time allowed which ended with the suffix, tion.

Cards (12).--The test, Cards, had appeared with high loadings on the space factor S in several investigations (4, 21, 23, 30, 34). It consisted of 20 items each of which had one key figure and six test drawings. The subject was to indicate the one

or more test figures in each item which could be rotated in the plane of the paper so as to fit the key figure exactly. The task was the same as determining whether two pictures of a flag (Test 3) show the same or different sides.

Hidden Pictures (13).--Thurstone (26, p. 111) reported that the time required for a subject to find five of the six faces "hidden" in a picture of the puzzle type commonly found in children's magazines was an excellent measure of his E-factor, "freedom from Gestaltbindung." This test was presented individually to the subjects in Thurstone's study, but for the purposes of the present experiment a group-test form was desired. Two such forms had been prepared by Thurstone, one of which, the 1942 Experimental Edition, appeared to contain items suitable for a college population. The test directions in the group-test form require the subjects to find as many hidden faces as possible in six different pictures in the time allowed. The subjects were instructed to go through the set of six pictures and find the easy ones on each page first and to return to the harder ones if they had time. The assumption, explicitly made, was that the factorial composition of the group- and individual-form of the test was essentially the same.

Letter "A" (14).--Simple cancellation tests had been used by Coombs (4), Thurstone (22), and Wittenborn (34) as measuring a perceptual-speed factor. The present test is similar to those used previously and is one of the several perceptual tasks in which the percept sought is a highly specific familiar symbol, in this case a capital letter A. The test proper contained 50 rows of 37 double-spaced capital letters. The subject was to cross out as many A's as possible in the time allowed. The A's, constituting one-eighth of the letters used, were randomly ordered throughout the test.

Discussion (15).--Taylor (19, p. 28) had reported that this test was one of the two best tests of his ideational-fluency factor F. The task was to write as much as possible about "a parcel" in the time allowed. No practice topics were provided. The subjects were instructed to use any idea they could think of whether it seemed trivial or not. Each idea was to be developed fully in one or more paragraphs, but no restrictions of continuity of paragraph topics were made.

Word Checking (16).--This test was modified from a test with the same title used by Thurstone and Thurstone (30). The categories utilized in this test were specific, relatively unfamiliar combinations of two familiar concepts, one of size and one of living things. The subjects were instructed to draw a line through every word representing something which does not grow and is smaller than a football. It was believed that the variance of the scores from this test would be explained to an appreciable degree by a facility in classifying given objects in accordance with a system of specified associational relations. The test proper consisted of 10 columns, each of 25 double-spaced words, in which one-third of the items were to be marked.

Mutilated Words (17).--Thurstone (26, pp. 101, 112)reported that a slide-film projector test of this type had significant projections on his factor, "speed of perception," and, to a lesser extent, on his factor, "strength of a configurational closure" The subjects were to identify a word from an incomplete or fragmentary outline of the word. Since no factorial studies had been made with a paper-and-pencil form of this test, the decision was made to include this test as a measure of a possible "speed of perception" factor requiring a facility in organizing a perceptual field in line with given restrictive conditions or on

the basis of minimal cues. The test used was the 1942 revised form, prepared by L. L. Thurstone, in which 26 mutilated words were arranged in their approximate order of difficulty. The subject was to identify as many of the words as possible in the time allowed from the erased and mutilated outlines and to write these words in the spaces provided.

Letters c, s, v, z (18).--In order to provide an experimental test in which relatively fine discriminations of a set of symbols would be required in classifying the test materials, a cancellation task was devised which used only the lower-case letters not projecting above or below the height of the letter, "c." The category of letters to be cancelled was defined as "c, s, v, z," to determine whether marked changes in the factor loadings would appear with the use of multiple elements in the classification system. The test contained 40 rows of 28 double-spaced lower-case letters with one-fourth of the letters either c, s, v, or z. The subject was to cross out as many letters, c, s, v, z, as possible in the time allowed.

Boys' First Names (19).--This test was designed as another measure of a facility in classifying items in terms of meaningful associations. The discriminations required were gross. The task, constant throughout the test, required drawing a line through the words frequently used as boys' first names from 18 columns of 24 words double-spaced in each column. All words were capitalized, and one-eleventh of the words randomly ordered throughout the lists were keyed as boys' first names.

Dot Patterns (20).--This test was modified from a test of the same name used by Thurstone and Thurstone (30, p. 33) with an eighth-grade population. It was believed that a perceptual-speed component in the test would be increased with adults if the task

were reduced to comparing pairs of dot patterns. The subjects were to mark with an X each pair of geometrical patterns which contained a different number of dots. The number of dots in each paired pattern differed by not more than one dot, i.e., 4 in one pattern and 5 in the other. No pattern had fewer than 4 dots nor more than 6 dots. Eight columns of 15 pairs of patterns each were provided. Half the pairs differed in the number of dots used in the two patterns.

Identical Forms (21).--This test with slight modifications had been used in six investigations (4, 21, 22, 23, 30, 34), the loadings of the test on a perceptual-speed factor reported as ranging from .28 to .60. The test was included in the current study as one of the reference tests of the perceptual-speed domain. It was thought that if the hypothesis of a facility with categories defined by formal restrictions should be sustained, Identical Forms should have a high loading on such a factor. The test used was identical with one used by Coombs (4) and Thurstone (23). Sixty test items were provided, each with a key design followed by seven test drawings. The subject was to mark each test drawing that was identical with the key design for the item. The differences between the eight drawings of each item were confined to details within the figures.

Opposites (22).--In this test the subject was asked to draw a line through each pair of words that were opposite in meaning. Every one of the words was well within the vocabulary level of an average elementary school child. The discriminations of the correct items, one-sixth of the total, were extremely simple. Rapid, successful performance of this task was considered to depend, in part, upon a facility in classifying the pairs in terms of the presence or absence of a specified associational relation

of opposition. The test consisted of 8 columns of 24 double-spaced pairs of words.

First-Digit Cancellation (23).--Coombs (4, p. 185) reported that a test of cancelling 5's had an appreciable loading on his perceptual-speed factor along with another cancellation test, Scattered X's. Wittenborn (35) also reported a factor characterized by letter and digit cancellation tests. Therefore, a digit cancellation test was included to assist in the identification of a factor of this type if it should appear. The task imposed in this test was a modification, however, of the one used by Coombs in that the key digit to be cancelled changed from one row to the next in a random manner. This variation was made in order to determine whether shifts in a perceptual-speed component of the task would appear with gross changes in the duration of a single key stimulus symbol. The test contained 75 rows of 29 double-spaced, randomly-ordered digits. The subject was instructed to cross out each number in a row that was like the circled number (the first digit) at the beginning of each row.

Five-Letter Words[1] (24).--This test was designed to see whether classifying items according to a category defined in terms of the formal elements of words, i.e., number of letters and given letters, would appear on a perceptual-speed factor. The subjects were given a story of approximately 650 words from which they were to cross out as rapidly as they could all the five-letter words containing an s. The story was introduced as a distracting medium with the idea that the variance of the scores would reflect a facility in holding the set of searching for certain five-letter words against a closely competing set for read-

[1]The test name is abbreviated from the title, "Five-Letter Words Containing S," appearing in the test booklet.

ing the story.

Picture Squares (25).--This test was suggested by T. G. Thurstone as a perceptual-speed task not previously used. The test consisted of 18 items, each with 16 small pictures arranged in a square with four rows of four pictures each. The 16 pictures making up each item included one duplication. The subjects were instructed to cross out the two pictures in each set that had been used twice. Fine discriminations between pictures were not required. Instead of providing a specific symbol, drawing, or class of objects as the characteristic to be searched for, the test presented the constant task of looking for an identity.

Writing Words (26).--To establish the relation between speed in a highly practiced finger-movement skill and facility in the simple perceptual-speed tasks, two speed-of-handwriting tests, individually administered and timed, were included in the battery. The task presented in the test of Writing Words was to write over and over again, as many times as possible within one minute, a short specified phrase. The instructions used were as follows:

"This is a test to see how fast you can write. When I give the signal (not yet), you are to write this phrase over and over for one minute. The phrase is: 'Now is the time for all good men.' Write only those words. Legibility of your writing is not important. Write as fast as you can. Keep on writing the words, 'Now is the time for all good men,' until I tell you to stop. Ready. Go!"

Writing X's (27).--This is the second speed-of-handwriting test and differed from Writing Words (26) in that less precise motor control was required. The test was administered individually about one minute after the test, Writing Words. The instructions used were as follows:

"Now I want you to see how many X's you can make in thirty seconds. When I give the signal (not yet), start making X's as fast as you can. Do not worry about neatness. Just be sure the lines cross to make an X. Keep on making X's until I tell you to stop. Ready. Go!"

2, 6, and 9 (28).--This test was suggested by the Woodworth and Wells "Number-Group Checking Test" (37, p. 29). The size of the individual groups was reduced from six digits to three digits with at least two of these digits always a 2, 6, or 9. The task was to cross out each combination or group that contained all three digits, 2, 6, and 9, in any order. These particular digits were selected as constituting a set of reasonably similar and relatively often confused set of symbols. The category, completely defined in advance, was such that the subjects were required to attend to each item in turn. The rapid scanning so characteristic of single-letter or digit cancellation tasks was not so evident in this test which contained 30 columns of 25 three-digit groups, each separated by a double space from adjacent groups. One-fifteenth of the groups contained all three of the digits, 2, 6, and 9.

Street Gestalt Completion (29).--This test, presented by means of a slide-film projector, was found by Thurstone (26, p. 54) to have significant projections on a "speed of perception" factor and on his factor, "strength of a configuration." The paper-and-pencil test used in this study was the 1942 revised form prepared by Thurstone, which differed from Street's (16) original arrangement in that the items were reduced in size and printed as black incomplete figures on a white ground. There were 24 items arranged approximately in order of difficulty from easy to difficult. The subjects were asked to identify as many

of the pictures as possible in the time allowed by writing the class name of the picture, as sailboat or boy, on the lines provided.

Verbal Enumeration (30).--This test had been used by several investigators (4, 22, 23, 30) as a measure of perceptual speed. The test was included in the present battery as a measure of a facility in perceiving members of a category defined by meaningful restrictions, a formulation related to a "fluency of association with perceptual material," an interpretation stated earlier by Thurstone (22, p. 9). The subject was to locate and mark as rapidly as possible the words in a list which were members of a class of specified objects, as "pear," "banana," and "apple," under the class of "Fruit." Thirty different classes of objects were presented; for each class, the list contained 29 words, one-eighth of which were members of the class under consideration. The discriminations required were not close since the words used were well within the reading vocabulary of high-school students.

Letter Groups (31).--This test was designed to measure in part a facility in perceiving detail imbedded in irrelevant material (21). The task was specified as one of looking for differences, but the elements to be compared changed from item to item. The subjects were instructed to mark the paired letter groups (nonsense syllables) that were different. The differences between pairs were restricted to changes in the letters used or in the order of the letters, as, wgdj - vgdj and guhb - gubh. The general configuration of the letter combinations was similar in both groups of a pair. There were six columns of 25 paired nonsense syllables, the nonsense syllables being formed with one vowel and from three to six consonants. The number of letters used in each syllable was constant for a given column but in-

creased from four letters in the first column to seven letters in the sixth column.

Figures (32).--The test used represents a sampling of the items presented in previous tests of the same name. These items have been used as measures of the space factor S in several studies (4, 14, 23, 30, 34). The subject was instructed to mark in each row the figures that were like the first figure in the row. A figure was "like" the first figure if it could be rotated in the plane of the paper to a position such that it would be identical with the first figure. This "being like" is a restatement of the task required in the tests of Flags and of Cards discussed previously. The test proper contained 20 key figures for each of which six test drawings were provided.

Four-Letter Words (33).--This test was designed to measure a facility in perceiving elements of a category defined by formal restrictions under two conditions: (1) the category would be definite; and (2) the subject must apply the category to a relatively unstructured but homogeneous mass of material in order to find the items conforming to the stated restrictions. A task which appeared to meet these requirements consisted of rows of letters in which the subject was to locate sets of four consecutive letters which constituted a common English word. The directions specified that the subjects were to draw a circle around each set of four adjacent letters which spelled out a common English word. They were to read along the rows from left to right. A row of the letters appeared as follows:

K I Y O U R G A C S P I H A N D V Z J U X D I E D

The test consisted of 18 rows of 55 double-spaced capital letters with 70 four-letter words randomly arranged in the rows.

Letter Squares (34).--This test was first used in the

special investigation by Thurstone (26, p. 134) of the perceptual abilities of administrators. The item arrangement was similar to that used for the test, Picture Squares. The test contained 90 sets of 16 letters, each set arranged as in a square with four rows of four letters. The subjects were instructed to draw a line through the row or column which had a repeated letter in it. The repeated letter sought occurred only in the vertical or horizontal arrays; diagonal arrays could not be used. The task differed from that of Picture Squares, first, in the use of letters instead of pictorial material, and, second, in the use of several sets of repeated elements in a single item, only one set of which appeared in the nondiagonal arrays.

Unfurnished House[1] (35).--This test was designed as one of the experimental tests of the supplementary hypothesis that one of the factors in the domain of perceptual-speed was concerned with a facility in classifying items by associational relations. In this task the category, while held constant throughout the test, was intentionally vague and ill-defined. The subjects were asked to draw a line through each word in the several lists that was closely associated with an unfurnished house ready for sale. The category was specified as including such items as types of houses, the parts of a house, and the operations and materials used in the construction of a house. Items of furniture, curtains, etc., were excluded from the category. The test contained 21 columns each of 24 double-spaced words. One-sixth of the words were in the category of being closely associated with an unfurnished house.

Designs (36).--This test was used in a longer form by

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[1]The test name is abbreviated from the title, "Words Associated with an Unfurnished House," appearing in the test booklet.

Thurstone (22) in a study of the perceptual factor. The test had an insignificant projection of the perceptual-speed factor defined by the tests, Concrete Association and Verbal Enumeration, in that study. The Greek capital letter sigma, the summation sign, Σ, was defined as the model or key figure which was to be found in a number of complex drawings, a task similar to that presented in the test, Gottschaldt Figures. The Designs test contained 30 rows of 10 drawings each, only one-eighth of which contained the Σ. The subjects were to mark each drawing which contained the capital sigma, identical in size and position with the model, which was repeated at the top of each of the three pages of the test.

The similarity between the task of finding a Σ hidden, as it were, in a more complex figure and the problems of the Gottschaldt Figures test warranted including both tests in the same battery to determine whether the two tasks had a factor in common, a suggestion that has been made by Thurstone (29, p. 366). It was hoped that the variation in test form exemplified in the two tests would provide needed data on the effect of constant-key versus variable-key drawing in tasks involving the reorganization of a visual configuration.

Individual tests.--All individual tests were administered in a room eleven and one half by nine and three-fourths feet, equipped with opaque window shades and an overhead light centrally placed. The equipment was arranged so that the subjects progressed from one test position to the next with little confusion. Descriptions of the special apparatus for the Two-Hand Co-ordination and Shape Constancy tests will be presented with the discussions of those tests. The apparatus used with the tests for which the items were projected in succession on a screen is de-

scribed below. A differentiation is made between the individual tests requiring the use of response keys and those in which the items are presented tachistoscopically.

All test materials projected on the screen were photographed and printed on single or double-frame 35-mm. film by the Microphotographic Laboratory of the University of Chicago. The films were printed using synchronized feed rollers to assure positive framing in the slide-film projector. The films were projected on an aluminum surfaced roller screen four feet square from a distance of 78 inches. A 3-inch focal length lens was used in the S.V.E. Model AAA 300-watt projector[1] to secure a projected field 19 x 24½ inches for each single-frame item and a field of 21 x 33 inches for each double-frame item. The film strips for the several projector tests were spliced together and used as a single film strip. The film used was replaced after fifty sessions.

For the projector tests, the subjects were seated at a table with their backs to a window, approximately 2 feet to the left of the projector and 8 feet from the screen. The screen was placed on a table 2½ feet from the floor and turned so that a line perpendicular to the surface at the center of the field passed midway between the projector and the subject. The projected field was approximately in the center of the vertical dimension of the screen and offset to the subject's side. A neutral gray screen 80 x 52 inches was used to separate the subject from the experimenter and apparatus.

Four tests, Letters IV (38), Concrete Association (39), Picture Comparison (40), and Letters I (41) were administered by

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[1]Society for Visual Education, Model A.A.A., 300-watt lamp, Chicago, Ill.

means of the projector-response key apparatus. The procedures used in presenting these tasks follow the methods of testing by means of a microfilm projector, described by Thurstone (25). The response key, projector, and chronoscope[1] circuit used in determining the response time for each item is described by Libby and Hunsicker (12). The Standard electric clock, relays, and connections were mounted in a small case similar to the one shown by Thurstone (25, p. 247) as Item H, Figure 1. The two bakelite response keys, mounted in a bakelite frame 5 x 6 x 2 inches, activated three microswitches after movements of one-fourth inch. The microswitches were used to open the clutch circuit (to stop the clock) and to close the circuits to the pilot lights designating the key that was pressed.

The general instructions used with these four tests were as follows: "Notice the two keys on the table before you. In this test you are to indicate your answer to each item by pressing one of the two keys. As soon as you know the answer to the item, press the correct key. You do not have to press hard, but be sure you push the key all the way down. Try the keys to see how they work. You may move them around to the position which is most comfortable for you. You must watch the screen closely. Try to respond to each item as soon as you know the answer. The light will go off when you press the key so you have only one chance. I will call out 'Ready' before each test item." (Then the specific directions for the test, such as Letters IV, and several practice items were given.)

The tests, Geometrical Figures and Peripheral Span, were presented tachistoscopically by means of the slide-film projector

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[1]Standard Electric Time Clock Company, Springfield, Mass. 110-volt motor and clutch, clock reading in terms of 1/100 seconds.

and a time-delay thyratron activated relay[1] operating a solenoid-driven shutter[2] placed 1½ inches in front of the 3-inch focal length lens of the projector. The time-delay relay was operated for intervals of time ranging from 1.0 seconds to .075 seconds. A constant voltage transformer[3] was used to provide a 115-volt A.C. power supply for the time-delay relay. An auxiliary S.V.E. Model AAA 300-watt projector was utilized to provide a pre-exposure and post-exposure field, or a fixation point, as required by the test. This auxiliary projector circuit was interrupted by the time-delay relay when the shutter controlling the presentation of the test item was operated. The pre-exposure and post-exposure fields were kept at an intensity of 40/25 of the test field by the use of a density filter[4] in the shutter opening.

A general warning signal, "Ready," was given approximately 1½ to 2 seconds before the item was flashed on the screen. The subjects were instructed to watch the screen closely and not to blink their eyes between the ready signal and the appearance of the item. The specific test instructions indicated whether they were to respond with the name of the letter (Peripheral Span) or with the name of a design (Geometrical Figures).

Two-Hand Co-ordination, Ratio (37).--Thurstone (26, p. 111) found that this motor test, scored for conflict, was the best test of his Factor E, "freedom from Gestaltbindung." The test required the subject to tap, as fast as possible, in a four-

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[1]Electronic Timer, Model 406-D/S, Electronic Research Development Co., Chicago, Ill.

[2]An Air Corps photographic shutter, 38 v.D.C. solenoid.

[3]Sola Constant Voltage Transformer, No. 30887, rated output 120 volt-amperes, Sola Electric Company, Chicago, Ill.

[4]This density filter was one of a series of graduated filters prepared for this study by the Photographic Department, Billings Hospital, University of Chicago.

point pattern first, with the preferred hand, second, with the nonpreferred hand, and, third, with both hands simultaneously. The patterns provided for the right and left hands were asymmetrical, as a result of which some individuals experienced considerable difficulty in carrying out the simultaneous tapping of the two patterns in the third part of the test.

The equipment was identical with that described by Thurstone (26, pp. 49-50, Figure 18). The materials included a board for mounting two quartered circular plates, each 5 inches in diameter with electrical contacts such that either the quartered sectors with like numbers or all sectors regardless of numbered designations could be placed in series with an impulse counter and a 7½-volt battery supply. The circuits were completed through either one or both of the two insulated styli. The quartered sectors were numbered as follows (from the subject's orientation): right-hand circle--top sector 1, bottom 2, left 3, and right 4; left-hand circle--left sector 1, right 2, top 3, and bottom 4.

The ratio score, representing resistance to conflict, was used. The scores were computed according to the formula (26, p. 51),

$$S = \frac{N_{rl}}{N_r + N_l},$$

in which N_r was the number of correct taps in 30 seconds for the right hand alone, N_l, the number of correct taps in 30 seconds for the left hand alone, and N_{rl} is the number of correct simultaneous taps for both hands together in 30 seconds.

Letters IV (38).--This test, from one of the experimental series used by Schaefer (14, p. 32), provided a cancellation test of a form very different from the paper-and-pencil tests used by Coombs (4), Thurstone (22), and Wittenborn (34). The test was

included to test the hypothesis that an appreciable part of the variance of this individually-presented test would be accounted for by a factor defined by the paper-and-pencil cancellation tasks used in the group-testing situations. Each test item was constructed by placing 16 lower-case letters at random on a 3 x 5 inch white card and photographing the 36 separate cards on 35-mm. film so that each single frame contained one test item. One of the 16 letters was an "x." The test was administered by means of the slide-film projector response-key apparatus. The task required of the subject was, first, to find the x and, second, to press the right key if the x were on the right half of the field or to press the left key if the x were on the left side of the field. The score used was the median time, in hundredths of a second, of the first nineteen correct responses.

Concrete Association (39).--This test was included in the battery to determine whether an associational recognition factor would be found which transcends the type of testing condition used. The test was constructed to be similar in form to Schaefer's Enumeration II (14) and was presented by means of the projector and response-key apparatus. Each test frame, photographed from 3 x 5 inch cards, contained a single underlined word at the top and two lists of four words each, the lists placed side by side just below the underlined word. The task was to find the word in the two lists that was closely associated with the underlined word at the top. The subject was to press the right key if the closely associated word was in the right-hand column, the left key if the word was in the left-hand column. The categories used were selected from Thurstone's test, Concrete Association, which had been found to have a high projection on the perceptual-speed factor on which Verbal Enumeration also had a high loading (22).

The score used was the median time in hundredths of a second for the first nineteen correct items out of the 40 items available.

Picture Comparison (40).--This test was one of those designed to determine whether a perceptual factor would be found in tasks where the specific category was one of identity or difference of the formal configurational elements. The hypothesis represented a variation of the formal restrictions concept and was introduced to provide an indication of the scope of the factor, should the hypothesis be sustained.

Each test item was constructed by photographing on 35-mm. film two small line drawings placed on 3 x 5 inch cards. The two drawings were originally duplicates, but a part of one of the two pictures had been erased. The subject was to determine which picture had been mutilated and to press the key corresponding, in position, to the picture with the erased portion. The 32 line drawings were all representative of meaningful objects or situations and ranged in amount of detail from a simple outline to a detailed landscape. The median time, in hundredths of a second, for the first 21 correct items constituted the score.

Letters I (41).--Schaefer (14, pp. 33-34) found the choice-discrimination task represented by his test, Letters I, to have the highest projection on his Factor B which he termed a perceptual-speed factor, with speed of simple choice-discrimination as the characteristic process. The possible application of this concept of speed of simple discrimination in analyzing the nature of the processes required in simple symbol cancellation tasks warranted including this test in the battery.

In this test a single letter was presented by means of the slide-film-projector response-key apparatus. The subject was instructed to press the right-hand key if the letter appeared on

the right half of the screen, to press the left-hand key if the letter appeared on the left side. No restrictions were placed on the identity of the letter. The items were constructed by photographing successive 3 x 5 inch cards, each of which contained a single lower-case letter. The location of the letter was varied systematically, half of the letters appearing at some point on the right half of the screen and half on the left, the right-left sequence being randomized. The score used was the median time, in hundredths of a second, for the first nineteen correct responses.

Geometrical Figures (42).--This test was included to provide an indication of the factorial composition of a tachistoscopically-presented task in which a searching for identities or differences would be involved. The task selected dealt with four simple geometrical forms, a rectangle, circle, triangle, and six-pointed star. Three of these forms were duplicated and presented with a fourth design in each item, so that each frame contained seven drawings. The subject was instructed to determine for each item the design that appeared only once, i.e., if the circle, star, and rectangle were each used twice, the triangle would be the correct answer.

These test items were photographed from 5 x 8 inch cards on which the seven figures were located at the vertices and center of a regular hexagon. The seven points at which the figures were located was constant throughout the series of six practice and 25 test items, each one of the four figures appearing at each of the seven positions in a random manner. The time of presentation of each item ranged from 1.0 seconds for the first practice item down to a value of .30 second for the 25 test items.

Shape Constancy (43).--This test was one of those reported

by Thurstone (26, p. 102) as having a high loading on Factor A, tentatively interpreted as "speed and strength of configuration." The procedure used in this test was modified from that described by Thurstone (26, p. 80) in two ways: first, the set of response cards was moved from a position directly to the left of the subject to a position just beyond the stimulus card and directly in line with the card; and, second, three stimulus distances were used instead of only one.

The change in position of the response cards was made to increase the possible differentiation between the space factor S and Factor A, a differentiation that was not of immediate concern to Thurstone (26) in his investigation of perceptual tasks. The change in position used was expected to reduce the variance contribution of an ability to hold a visual configuration in mind and to increase the relative importance of an ability to take and hold a set for a sensory judgment. Using three positions of the stimulus figure was expected to give a more reliable score than would be secured from only one judgment.

The equipment for this test included a 4-inch square cut from heavy white Bristol board and a set of 18 diamond-shaped figures made of white Bristol board, numbered and mounted on a brown masonite board in order of number from the upper left-hand corner to the lower right-hand corner in rows, as shown by Thurstone (26, p. 80, Figure 43). The horizontal diagonal length of 5 5/8 inches was constant for all 18 figures, and the vertical diagonal was systematically varied from the height of $5\frac{1}{2}$ inches for Figure 1, as follows: Figures 2, 3, 4, and 5 were each one-half inch shorter than the preceding figure so that the height of Figure 5 was $3\frac{1}{2}$ inches. The vertical dimensions of the remaining figures were successively reduced by a decrement of one-fourth inch from a height of $3\frac{1}{4}$ inches for Figure 6 to a height of one-

fourth inch for Figure 18. The numbers, in white India ink, were placed below and to the right of the corresponding diamond-shaped figure. The masonite board containing these figures was placed at the end of an oak-stained plank 6-2/3 x 2/3 feet, held on a horizontal plane 2½ feet from the floor and one inch below the bottom of the masonite board by a convenient frame.

The subject was seated behind a neutral-colored screen 8½ feet from the masonite board containing the response figures. He viewed the test figure through a slit, 4-5/8 inches wide by one inch high, placed 42 inches from the floor, a height of 12 inches above the plane of the plank on which the test figure was placed.

The subject was shown the white test figure held in a vertical diamond position and told it was square. The change in the appearance of the diamond-shaped figure associated with changes in the position of the card rotated from a vertical to a horizontal position on a diagonal as an axis was demonstrated to the subject. The square was then placed at the farthest of the three positions on the plank from the viewing slit. The card was placed with a corner toward the subject, and the subject was told that it now looked like a diamond somewhere between a square and a straight line. The task was then explained. The subject was to select the one of the eighteen response figures on the board at the end of the plank which would correspond most closely in shape to a photograph of the diamond-shaped card. The camera was to be considered as aimed directly at the test figure from a position at the viewing slit. Three such judgments were secured with the white square located successively 88, 40, and 56 inches from the viewing screen. The score used was the sum of the numbers of the two response figures selected when the square was

placed 40 and 56 inches from the viewing screen.

Peripheral Span (44).-- This test, described by Thurstone (26, pp. 34-37), was found to have a significant projection on the factor, "speed of perception." The test was presented by means of the slide-film projector with the electronic-timer apparatus set for a projection interval of .075 seconds. The test items were photographed on 35-mm., double-frame film and projected from the negative, white on black. A fixation point at the center of the projected field was provided by the auxiliary projector. The subjects were asked to use their preferred eye and cover the other with a shield fastened to an elastic headband. The task was to name each letter as it appeared. The order and arrangement of the successive items were identical with those indicated by Thurstone, except that the letter size was reduced from $1\frac{1}{2}$ inches to seven-eighths inches and the distance of the several concentric circles of position from the fixation point was fourteen-twenty-fourths of those used by Thurstone. The score was the number of correctly named letters.

Topics--Items (45).--This represented an alternative scoring of the test, Topics-Words, designated Variable (8). This score, the number of items listed, was not used in determining the common-factor space of the battery. It was included to determine whether the two scores of quantity would show comparable factorial patterns.

Two-Hand Co-ordination, Sum (46).--This score was computed as the total number of taps made by the right hand in 30 seconds plus the total number of taps made by the left hand in 30 seconds and represents an alternative method of scoring this test, the ratio score of which appears as Variable (37). This score was not used in determining the common-factor space of the battery.

The score was included in the battery in order to provide some additional evidence on the nature of the factor, "speed and strength of a configuration." Thurstone (26, p. 105) had suggested that a change in the scoring formula from the ratio form (Variable 37) to the sum (Variable 46) might lead to a shift in the factorial composition, with the sum score having a higher projection on the "speed and strength of configuration" factor.

Sex, Age, and Educational Level (47), (48), (49).--Data on three additional variables secured from the subject's application forms were included in the correlational analysis. These three variables were not used in determining the common-factor space, but were carried in the factor analysis as supplementary variables of incidental interest. If these variables should prove to be significantly related to the common factors defined by the first forty-four variables listed above, the information would be of value in interpreting the results.

Factorial Analysis of the Data

All test-score distributions were normalized (29, p. 369) and assigned single-digit code values from zero to nine inclusive. Standard scores below -2σ were coded "zero," those above $+2\sigma$, "nine." The scores in the interval -2σ to $-1\frac{1}{2}\sigma$ were coded "one," $-1\frac{1}{2}\sigma$ to -1σ, "two," etc., to the interval $+1\frac{1}{2}\sigma$ to $+2\sigma$ in which the scores were coded "eight." Sex was coded as follows: females, 0; males, 1.

Pearson product-moment correlation coefficients were determined from the necessary sums and cross-products computed by means of punched cards and the I.B.M. tabulating equipment. The correlation matrix is shown as Table 5 in the Appendix.

Twelve factors were extracted from the correlation matrix by means of the multiple-group method of factoring (27). The

initial estimates of the communalities were made by means of a centroid formula (29, p. 300), and the factoring carried through two cycles to stabilize the communalities. A thirteenth centroid factor was extracted from the twelfth-factor residuals. The distribution of the thirteenth-factor residuals is given in Table 7 (Appendix). The extraction of additional factors was not indicated. After thirteen factors, the value of .969 for Tucker's criterion for the number of significant factors (21, p. 66) was nearly equal to the critical value of .977 for a battery of forty-four variables. The residuals ranged from -.12 to +.13 with a root mean square deviation of .036. This evidence that more factors had probably been extracted than could be given psychological interpretation was substantiated by the appearance during the rotations of a residual plane of low variance.

The projections of supplementary Variables (47), (48), and (49), inclusive, on the common-factor space defined by the forty-four variables were determined by the summational procedure of the multiple-group method. This procedure was not adequate, however, for estimating the projections of Variables (45) and (46) on the common-factor space. Variables (45) and (46) were experimentally dependent on the same test performance resulting in Variables (8) and (37), respectively. This experimental dependence would lead to a spuriously high correlation between the paired variables through the introduction of correlated specific and error factors, which would, in turn, result in poor estimates of the factor loadings of these variables. The estimated factor loadings used for Variables (45) and (46), therefore, were determined by a successive approximation method in which the spurious correlation coefficients were replaced by estimated values computed from the correlations of Variables (45) and (46) with the

remaining forty-three variables, eliminating the Variables (8) and (37) in turn from the computations. The successive estimates of the correlation coefficients were then used to determine sets of estimated factor loadings of the supplementary variables. The successive sets of estimated values converged fairly rapidly to the final set of factor loadings used to represent the location of the supplementary variables.

The factor loadings of the forty-nine variables on an arbitrary orthogonal reference frame, together with the communalities of the variables, are presented in Table 6 in the Appendix.

The projections of the test vectors on the rotated reference axes and the matrix product $\underline{FF}'$ used in determining the thirteenth factor residuals were computed by means of a matrix multiplier (31). These values may be in error by ±.01.

An oblique simple structure was obtained for the thirteen factors through the use of both the radial and single-plane methods of rotation (28, 29). On every factor more than half of the entries were within the range ±.10, the number of such entries varying from 27 for Factor X to 35 for Factor N for the forty-four variables. Three negative projections greater than -.10 remained in the table; one value of -.12 was found on Factor C, and the other two values of -.11 and -.25 appeared on Factor N.

Two solutions for the location of the residual plane, Z, are indicated in the rotated factorial matrix, Table 9 in the Appendix. The first of these solutions, Z_1, was determined by the methods of rotating to simple structure. Since the projections on the Z_1 axis were too small to be interpreted, the plane was considered to be a residual plane and arbitrarily set orthogonal to the remaining twelve reference axes as Z_2 before the correlations between the primary vectors were computed.

The transformation from the arbitrary orthogonal matrix to the rotated factorial matrix is given by the final transformation matrix in Table 8 in the Appendix. The columns of this matrix are the direction cosines of the reference vectors with respect to the original orthogonal reference frame. The cosines of the angles between the reference axes are shown in Table 10 in the Appendix.

The correlations between the primary axes, i.e., between the vectors defined by the intersection of (r-1) hyperplanes, are shown in Table 11 in the Appendix. The residual plane, Z_2, was not used in locating the primary vectors. These correlations were factored by the centroid method (29). Three cycles were used to stabilize the communalities of the primary vectors. The final set of five centroid second-order factors and the communalities for the twelve primary vectors are given in Table 12 in the Appendix.

An oblique simple structure of the first-order primary vectors in the second-order domain was found. The final rotated factor matrix of the primary vectors and the transformation matrix for this simple structure are shown in Tables 13 and 14, respectively, in the Appendix. The correlations between the five second-order primary axes for the simple structure defined by the twelve first-order primary vectors appear in Table 15 of the Appendix.

In order to present the simple structure of the first-order factors more clearly, a simplified rotated factor matrix was constructed from the data of Table 9 (Appendix). This simplified rotated factor matrix, shown in Table 3 below, was obtained by omitting entries below .30 in Table 9 and then rearranging the order of the columns (the factors) and of the rows (the tests).

TABLE 3

SIMPLIFIED FIRST-ORDER FACTORIAL PATTERN*

Test No.	Name of Test	C	A	P	S	N	V	G	F	W	H	Y	X	Z_1
14	Letter "A"	68	..	..	..	..	..	..	..	..	..	..	..	..
18	Letters c, s, v, z	51	..	..	..	..	..	..	..	..	..	..	..	..
23	First Digit Cancellation	50	..	..	..	..	..	..	..	..	..	..	..	..
5	Name Recognition	36	..	..	..	..	..	..	..	..	..	..	..	..
4	First and Last Letters	36	..	..	..	..	..	..	..	31	..	..	..	..
28	2, 6, and 9	29	..	..	..	..	..	..	..	..	..	..	..	..
16	Word Checking	..	66	..	..	..	..	..	..	..	..	..	..	..
7	Size Comparison	..	56	..	..	..	..	..	..	..	..	..	..	..
35	Unfurnished House	..	55	..	..	..	..	..	..	..	..	..	..	..
22	Opposites	..	46	..	..	..	40	..	..	32	..	..	..	..
19	Boys' First Names	..	41	..	..	..	..	..	..	..	..	..	..	..
30	Verbal Enumeration	..	38	..	..	..	..	..	..	..	..	..	..	..
41	Letters I	..	..	60	..	..	..	..	..	..	31	..	..	..
39	Concrete Association	..	..	55	..	..	..	..	..	..	..	..	..	..
38	Letters IV	..	..	34	..	..	..	..	..	..	..	..	..	..
44	Peripheral Span	..	..	24	..	..	..	..	..	..	..	..	..	..
12	Cards	..	..	..	77	..	..	..	..	..	..	..	..	..
32	Figures	..	..	..	76	..	..	..	..	..	..	..	..	..
3	Flags	..	..	..	66	..	..	..	..	..	..	..	..	..
6	Gottschaldt Figures	..	..	..	34	..	..	..	..	..	..	..	..	..
9	Multiplication	..	..	..	..	63	..	..	..	..	..	..	..	..
2	Two-Digit Addition	..	..	..	..	59	..	..	..	..	..	..	..	..
20	Dot Patterns	..	..	..	..	42	..	..	..	..	..	..	..	..
29	Street Gestalt Completion	..	..	..	..	25	..	..	25	..	..	..	..	..
10	Completion	..	..	..	..	..	63	..	..	..	..	..	..	..
1	Vocabulary	..	..	..	..	..	54	..	..	..	..	..	..	..
33	Four-Letter Words	..	..	..	..	..	..	48	..	..	..	..	..	..
17	Mutilated Words	..	..	..	..	..	..	47	..	..	..	..	..	..
36	Designs	..	..	..	..	..	..	32	..	..	..	..	..	35
24	Five-Letter Words	..	..	..	..	..	..	29	..	..	..	..	..	..
13	Hidden Pictures	..	..	..	..	..	..	28	..	..	..	..	..	..
45	Topics-Items[a]	..	..	..	..	..	..	..	56	..	..	..	..	..
8	Topics-Words	..	..	..	..	..	..	..	55	..	..	..	..	..
15	Discussion	..	..	..	..	..	..	..	51	..	..	..	..	..
11	Suffixes	..	..	..	..	..	..	..	..	53	..	..	..	..
43	Shape Constancy	..	..	..	..	..	..	..	..	33	..	..	..	32
27	Writing X's	..	..	..	..	..	..	..	..	..	69	..	..	..
26	Writing Words	..	..	..	..	..	..	..	..	..	55	..	..	..
46	Two-Hand Coordination (Sum)[a]	..	..	..	..	..	..	..	..	..	49	..	..	..
37	Two-Hand Coordination (Ratio)	..	..	..	..	..	..	..	..	..	..	48	..	..
42	Geometrical Figures	..	..	..	..	..	..	..	..	..	..	42	..	..
25	Picture Squares	..	..	..	..	..	..	..	..	..	..	41	..	..
21	Identical Forms	..	..	..	..	..	..	..	..	..	..	32	..	..

TABLE 3--Continued

Test No.	Name of Test	C	A	P	S	N	V	G	F	W	H	Y	X	Z_1
31	Letter Groups.....	..	..	..	..	..	..	..	..	..	..	..	50	..
34	Letter Squares.....	..	..	..	..	..	..	..	..	..	..	..	32	..
40	Picture Comparison..	..	..	..	..	..	..	..	..	..	..	..	28	..
47	Sex (F = 0, M = 1)[a].	..	..	..	42	..	..	..	..	..	..	-32	..	..
48	Age[a].....	..	..	..	..	..	..	40	..	..	..	..	..	..
49	Education[a].....	..	..	..	..	..	..	..	..	..	..	..	..	..

*All values were multiplied by 100 to eliminate the decimal point.

[a]These variables were not used in defining the common-factor space.

For the tests with no loadings of .30 or greater, the highest projection is given. The number of entries between .26 and .29 for the thirteen factors exclusive of the orthogonal residual dimension, Z_2, ranged from zero for Factors A, W, and N to four for Factors F and X. The other factors had either one, two, or three entries in the range from .26 to .29, inclusive. Except as noted above, these loadings were excluded from the simplified rotated factor matrix as being of little value in the interpretation of the factors.

The second-order simple structure for twelve primary vectors is shown in the simplified rotated factor matrix, Table 4 below. This table was constructed from the data of Table 13 in the Appendix by omitting all entries below .25 and then rearranging the order of the columns (the second-order factors) and of the rows (the first-order primaries).

In Table 4, the entries between .25 and .29 are considered to be of doubtful interpretative significance. These data are considered as only suggestive of the type of results to be found in the second-order domain. The effect of multivariate

TABLE 4

SIMPLIFIED SECOND-ORDER FACTORIAL PATTERN*

First-Order Primaries	Second-Order Factors				
	K	J	L	O	Q
N	74	..	..	..	..
C	56	..	..	..	..
H	39	..	..	..	..
X	37	26	..	..	..
Y	..	63	..	..	..
S	..	31	..	..	..
G	..	..	48	..	..
V	..	..	63	54	..
A	..	..	..	60	..
F	..	..	..	25	55
M	..	..	..	..	64
P	..	27	..	28	..

*All values were multiplied by 100 to eliminate the decimal point.

selection in the population and of the stability of the first-order simple structure on the correlations of the first-order primary vectors has been indicated by Thomson (20) and by Thurstone (29). However, the location of the simple structure indicated in Table 4 does not appear to be a chance affair. The existence of such a structure which appears to be psychologically meaningful cannot be summarily dismissed as an artifact of the particular sample of individuals used.

CHAPTER III

INTERPRETATION AND DISCUSSION

The First-Order Domain

A factorial investigation of psychological variables is conducted with the hope that the results will be psychologically meaningful. Since Thurstone's concept of simple structure (29) is a criterion that has been found to lead to meaningful results in previous studies, this concept was used in locating the reference frame represented by the simplified rotated factor matrix of Table 3. The factors so found will now be considered as to their possible interpretation in terms of psychologically useful concepts.

Factor C.--Five tests appeared on this factor with projections above .30, and one other test had its highest loading on this axis. These tests are listed below, together with their code numbers and appreciable loadings.

Code No.	Name of Test	Factor Loadings	
		C	Other Factors
14	Letter "A"	.68	
19	Letters c, s, v, z.....	.51	
24	First Digit Cancellation	.50	
5	Name Recognition.....	.36	
4	First and Last Letters..	.36	.31 (W)
26	2, 6, and 9.....	.29	

This factor is interpreted as "speed of recognition of a predetermined symbol, or symbols, in a context of irrelevant distracters," a formulation expressed by Schaefer (14, p. 1) as being implied by Whipple's early discussion of perceptual speed

(33). It is suggested that Factor C is to be identified with the "perceptual factor" reported by Coombs (4) and by Wittenborn (34).

The highest loading occurs in the simplest of the cancellation tests, Letter "A," a test in which one-eighth of the letters are to be marked on a test form in which the distracters, i.e., other capital letters, are discrete and conceptually distinct. Increasing the number of symbols to be cancelled to four and reducing the disparity of form of the set of distracters, as in the Letters c, s, v, z test, apparently reduces the contribution of Factor C in a test situation. Furthermore, the shift from cancelling a constant single letter, in Letter "A," to crossing out a digit that differs from row to row, as in First Digit Cancellation, results in a lowering of the test loading on Factor C.

The effect of this variable extends to the recognition of word configurations since the Name Recognition test has a projection of .36 on this factor. A single name, Johnson, E. B., is to be selected from columns of names, of which the larger number are similar to some extent in form, letters used, and length.

The test, First and Last Letters, included as a reference test of word fluency, presents the only anomaly in this interpretation. This test has, clearly, a significant loading on Factor C; the structure is determinate in both Factors W and C, with the reference test of word fluency dividing on Factor C. It is suggested that the interpretation of Factor C as "speed of recognition of some predetermined symbol in a context of irrelevant distracters" is consistent with the projection of .36 for the word-fluency test, First and Last Letters. The introspective reports of subjects taking the test offer a clue to the factor loadings secured for this fluency test. Performances in produc-

ing words which start with T and end with E appeared to be facilitated by a process which, in this test, might be described as a facility in recognizing the congruence of a conceptual configuration in terms of formal restrictions on the symbols used. That process is not considered so essential for the other word-fluency test, Suffixes, in which either subvocal auditory rhyming cues as well as systematic word analysis work-method will lead to successful performance. The insignificant loading of Suffixes on Factor A, to be discussed later, supports further this hypothesis.

Thurstone (22) had found insignificant projections (.21) for a cancellation test on a factor designated as a word-fluency factor and a more significant loading (.41) for a test, Identical Names, on the same factor. Since neither the P-factor nor the W-factor of his investigation were identical with the factors designated C and W in the current study, the data from Thurstone are offered as only suggestive of the finding herein reported. Neither Coombs (4) nor Wittenborn (34) utilized any reference tests for Factor W. Had such reference tests been used, the results would have been pertinent to this discussion.

The loadings of three other tests included in this battery indicate further limitations of the process involved in Factor C. The test, 2, 6, and 9, appeared with its highest loading on C, an entry, however, of only .29. In this test, the symbols are specified in advance, but the distracters are not irrelevant. Each three-digit number in the test contains two of the three numbers, 2, 6, and 9. Successful performance in this task appeared to require a "change in pace," in the rapid scanning so characteristic of the behavior in the test, Letters "A." A subject may exhibit a poor performance if he completes a configuration readily and makes a number of false moves resulting from an incorrect

perception of the symbols in a group. Another subject's performance may al: be inefficient if he scans too rapidly the sets of digits and fails to perceive all of the correct three-digit groups he encounters. Introspective analyses by subjects taking the test suggested that both kinds of errors were operating to some extent.

The Designs test is the second test which indicates the importance of the nature of the distracters for tests of Factor C. This task presents a constant predetermined symbol, Σ, to be sought in a series of test figures in which the symbol is masked by auxiliary lines in the test figures. This test has an insignificant loading on Factor C.

The third test operating in this fashion is Five-Letter Words. This test is a cancellation test in which the category of items to be marked is defined by formal restrictions on the number of letters (5) and the presence of a given letter (s). The distracters are other words constituting an interesting story. The distracting effect of the story was intentional; successful performance of the task was predicted as involving both an ability to overcome or break a meaningful configuration and a facility in classifying elements by categories of formal restrictions. The test had zero loading on Factor C. It is suggested that the nature of the distracters was probably more influential in determining the factorial composition of this test than the formal nature of the category. Further investigation of the effect of changes in the nature of distracters upon the factorial composition is needed.

The restriction of this factor to a facility with symbols rather than with visual configurations in general is based upon the absence of any definite indication of the broader psychologi-

cal concept. Dr. H. J. A. Rimoldi has provided further evidence of the possible restrictive character of this factor.[1] In a recent unpublished study of a battery of tests administered to an elementary-school population, he secured a correlation of .05 between a test of cancelling A's (comparable to the Letter "A" test in the present study) and a test requiring the cancellation of a simple geometrical design, ⊏ , from rows of similar but distinct distracters. The distracters included the key design rotated 90°, 180°, and 270° from the correct position.

The test, Letters IV, in which the score is the median time required to locate an "x" in a visual field of 16 letters, has a loading of .28 on this factor, a finding that could be predicted from the interpretation of this factor as "speed of recognition of a predetermined symbol." The greater part of the common-factor variance of this test is attributed to Factor P.

The low loading of Letters IV on Factor C may be traceable to the relative importance for this factor of the continuing rate of performance required in the paper-and-pencil tests, of the visual-span aspect found in the paper-and-pencil tests, or of the presence of a rowed or columnar form of presentation. The effect on the task of the presence or absence of a form of organization has not been investigated. Not only may the form of the test lead to changes in the work methods, but the lack of explicit directions as to the exact procedures to be employed by the subjects may lead to increased variance contributions of variables associated with speed of adaptability to the task or with facility in maintaining a spatial orientation to the presented task. The fact that both Coombs (4) and Wittenborn (34) reported the

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[1]Statement by Dr. H. J. A. Rimoldi in a personal interview, June 6, 1947.

Scattered X's test (pied) as having lower projections on their perceptual-speed factors than the rowed cancellation tasks may be due to the absence of a compelling test organization in the pied form of the test rather than to the relative amount of scanning required by the different tests, as suggested by Coombs (4, p. 185).

In the current battery, neither the hypothesis of scanning nor of test organization was systematically investigated. The relative proportions of cancelled items to the total number presented for the four tests having the highest projections on Factor C, however, were one-eighth, one-fourth, one-tenth, and one-ninth, in order from highest to lowest loadings. The test, 2, 6, and 9, was constructed with one-fifteenth of the digit groups correct. Letters IV contained one "x" in a field of sixteen letters.

The high loadings of the paper-and-pencil tests on Factor C suggest that the process, if not confined to paper-and-pencil tasks, may be associated with a freedom from blocking, a facility in establishing a rate of performance suited to the nature of the task, or a physiological limit of speed of a recognition process. An investigation of these suggestions with individual tests in which the test material is presented at varying rates of speed and with varying amounts of material visible at any one moment would seem fruitful. In one series of tasks, the rate of presentation should be controlled by the experimenter, the rate progressively increased until the subject's limiting speed of perception is reached. In another series, the subject should control the rate of presentation in terms of his rate of responding.

One of the characteristics of the tests having appreci-

able loadings on Factor C, as isolated in this study, is the searching for a predetermined symbol, or set of symbols, both in continuing and in discontinuous responses, the specified symbol being either constant throughout the task or varying to some extent from item to item, with distracters presented as discrete and distinct from the specified symbol. The determination of the extent to which the factor includes searching for visual configurations other than familiar symbols will require further experimentation.

One hypothesis that should be investigated is that the specified configuration must be readily verbalized, a restriction that would differentiate between Factor C and a possible visual-memory factor involving no manipulation of a visual configuration. A series of three cancellation tests is suggested in which the specified configurations might be , , and , for the three tasks, respectively. If the distracters are similar but distinct, such a series should show progressive shifts in factor loadings from Factor C to a visual-memory factor. The use of Greek letters, either lower or upper-case, or of Chinese characters as the specified symbols in the midst of similar distracters would provide further evidence of the nature of Factor C. The possible extension of the underlying process of Factor C to the recognition of elements of a category defined by formal elements in a set of irrelevant distracters might be investigated by the use of tests requiring the cancellation of curved letters (18), of words in list form containing an "a" (22), or some other letter or set of letters and of designs containing specified elements as curved, straight, or broken lines.

The speed component of Factor C is clearly indicated by the correlations of the primary vector C with those for Factors

A, N, H, and X. The correlations are .33, .42, .33, and .35, respectively. This finding will be considered in more detail in the interpretation of the second-order factors. The speed component appears to be more than a speed of simple choice discrimination since the individually presented tests in which time of response on single items is important have their highest loadings on Factor P. Furthermore, the speed element is such that the three highest loadings on Factor C are on tests whose time limits are $2\frac{1}{2}$, 4, and 3 minutes, respectively, while a shorter test, Name Recognition, of 2 minutes duration, is in fourth position. The effect on the factorial composition of systematically varying the time limits over a wide range of times has not been investigated.

Factor A.--The following six tests had loadings of .30 or greater on Factor A:

Code No.	Name of Test	Factor Loadings	
		A	Other Factors
17	Word Checking.....	.66	
7	Size Comparison...	.56	
33	Unfurnished House.	.55	
23	Opposites.....	.46	.40 (V) .32 (W)
20	Boys' First Names.	.41	
28	Verbal Enumeration	.38	

All of the six tests high on Factor A were selected in accordance with the hypothesis that one of the factors in the perceptual-speed domain was concerned with the speed of recognition of a predetermined category defined by meaningful or associational restrictions. Not only are the significant projections of five of these tests confined to this factor, but no other test in the battery has a projection as high as .25 on this factor. The appearance of these tests with significant projections on a

single factor is considered as evidence sustaining the hypothesis of a process termed "speed of recognition of associational categories in word materials," or as "fluency of associational recognition in perceptual materials."

It is suggested that Factor A can be identified as Factor X_3, reported by Thurstone and Thurstone (30, p. 20) and as the perceptual-speed factor reported earlier by Thurstone (22, p. 9).

The tests of Factor A are such that "speed of reading" might be suggested as a convenient name for the factor. "Speed of reading" tests, however, will probably prove to be factorially complex with such components as speed of word-symbol recognition, speed of association, and facility in conceptual organization, visual span, and others appearing with changes in the form, content, and instructions of reading tests (8). The absence of Name Recognition from the above list of tests and the appearance of that test on Factor C is offered as evidence of the importance of specifying the kind of "speed of reading" which is being investigated. The test of Five-Letter Words is another "speed of reading" test in which the subject does not look for meaningful associations; it has a zero loading on A.

The absence of the individually administered test, Concrete Association, from the list above probably indicates that Factor A, as well as Factor C, appears most conspicuously in tasks of a continuing nature. In the paper-and-pencil form, this test, which was used as the source of material for the projector form, as well as the test of Verbal Enumeration had high loadings on a "perceptual-speed" factor (22).

Factor A is characterized in this study by tests in which a facility in a controlled associative process is demanded, four of the tests specifying a class for which members are to be found,

as in Word Checking and Verbal Enumeration, while two of the tests specify a relation of size or of opposition. The category is held constant throughout five of the tests but varies from column to column in Verbal Enumeration. The "list of words" form of test construction is not a crucial differentiation because the tests, Size Comparison and Opposites, are presented in paired-item form. The set in these two tests, however, is a constant one of looking for a specific relation.

The tests high on Factor A include three in which a rapid scanning process is required (Boys' First Names, Verbal Enumeration, and Unfurnished House), as well as three tests in which close attention is required of each item (Word Checking, Size Comparison, and Opposites). The categories used range from a vague, intentionally ill-defined one in Unfurnished House to the more precise ones of the other five tests. The category used in Word Checking is a two-fold one of size and living objects, while the categories of the other tests are defined in more familiar unitary concepts.

Speed in a continuing process appears as a component of Factor A. The time limits are only 2 or $2\frac{1}{2}$ minutes for five of the tests, while 4 minutes are allowed for Verbal Enumeration. Factor A has significant positive correlations (each .33) with Factors C and H, two other "speed" factors, and positive but lower correlations with five other factors.

The A-factor is restricted in this study to speed of associational recognition with words. If the associational process is the crucial one, it should also be found in tasks involving pictures of objects, numerical concepts, etc. Some evidence is available from other investigations of the general nature of an associational parameter, but the data are only suggestive. The

Thurstones (30) report moderate projections of two tests of naming forms and of naming pictures on their X_3 factor with a population of eighth-grade school children. Carroll (1) reports a "naming" factor characterized by tasks calling for the production of names of colors, figures, first names, as well as phrases having some degree of meaningful restriction. The relation of Carroll's naming factor to the present factor of speed of recognition of meaningful relations should be investigated.

Carroll's (1) speed of association factor appears to be more like one of the word-fluency factors than like Factor A. He reports that the tests Suffixes and Disarranged Words have significant projections on his speed of association factor, while in the current study a similar form of the Suffixes test had a negligible projection (.21) on Factor A.

The identification of speed of production of associations under meaningful restrictions with the speed of recognition of members of a class defined by meaningful relations should be the object of a further investigation. The study of the parameters in a speed of association domain should include a variety of controlled association tasks of various types with oral and written responses to verbal and pictorial materials in which both recognition of associational relations and the production of associations is required.

Factor P.--Only three tests of the battery had loadings of .30 or above on this factor, as shown below. These were the three individually presented tests designed to measure the Factor B isolated by Schaefer (14).

This factor is identified as Schaefer's Factor B which he interpreted as perceptual speed in simple discrimination (14, pp. 34-35). The interpretation is restricted here to speed of percep-

tion in simple choice-discrimination tasks since the factor is restricted to the individually presented projector tests. However, the factor is not considered as a "projector" factor since two projector tests, Picture Comparison and Geometrical Figures, have insignificant projections on the P-axis.

Code No.	Name of Test	Factor Loadings		
		P	Other Factors	
41	Letters I.....	.60	.31 (H)	
39	Concrete Association	.55	.25 (F)	.28 (X)
38	Letters IV.....	.34	.28 (C)	.29 (Y)

The relatively complex nature of these simple tasks is indicated by their loadings of .25 to .29 on several other factors, a finding indicated by Schaefer's results in which four "perceptual" factors appeared.

The highest loading on this factor is for Letters I, a finding sustaining Schaefer's results. The appearance of Letters I on the motor-speed factor, H, with a loading of .31 is not unexpected. As the perceptual processes of searching for an association or a given symbol are reduced in importance, the relative contribution of an ability to move quickly is increased and the simplest test appears with a moderate projection on a motor-speed factor. The low projections of Concrete Association on the ideational-fluency factor, F, and on Factor X may be due to chance. The projection on Factor F may be indicative of a fluidity of set component in that factor. The loadings for Letters IV of .28 and .29 on Factors C and Y, respectively, are reasonable; Factor C was interpreted as speed of recognition of a predetermined symbol in a context of distracters and Factor Y considered tentatively as a facility in organizing simultaneously presented configurations into a pattern which is then used for the solution of the

task.

The fact that Factor P does not contribute to the variance of a fourth projector test, Picture Comparison, is in accordance with Schaefer's results (14, p. 37). He reported that, as the difficulty level of the test increased, i.e., as more time was required by the subject to complete the task, the loading of the test on his B-factor decreased. The test, Picture Comparison, proved to be much more difficult for the experimental population than was the hardest of the three tests appearing on Factor P. The median times per item for Picture Comparison and Concrete Association, for example, were 4.3 and 1.5 seconds, respectively. In Picture Comparison the determination of the difference between the two pictures in each item often required repeated successive comparisons of the parts of the paired pictures, a process that did not appear in the other tasks.

It had been expected that the test, Peripheral Span, would have a significant projection on this factor. The test, as given, was not difficult enough to show any significant individual differences, although the highest factor loading of this test was on Factor P, an entry of .24.

Two of the three high tests of Factor P were included in the battery to determine the relation between simple choice-discrimination reactions and the continued discriminations required in paper-and-pencil tasks. The two projector tests, Letters IV and Concrete Association, however, had either insignificant or zero loadings on the two factors, C and A, defined by the symbol cancellation and speed of association tests, respectively. A fundamental difference appeared to exist between tasks requiring a rapid discrimination response to a single presentation and tasks requiring a series of successive discriminations and

responses. The rate of perceiving an "x" in a visual field and of responding to this percept did not depend to any appreciable extent on the factors that accounted for the variance in the task of perceiving and crossing out "A's" in rows of letters. Neither were the individual differences in the individually given form of Concrete Association accounted for by the parameters defined by the continuous associational tasks of Factor A.

These findings are not new. As early as 1911, Woodworth and Wells (37, p. 19) suggested that ". . . . continuous reaction to a series of stimuli is a more complex process than the reaction to a single stimulus. . . . ." Schaefer (14, p. 35), discussing the appearance of four new perceptual factors, has pointed out that ". . . . it implies that conditions imposed on the stimulus and response situation by the apparatus may require special abilities." The results of the current investigation were considered as sustaining Schaefer's conclusion. A further implication of these data relative to factorial investigations was that the generality of factors defined by a restricted set of test conditions should be checked by introducing systematic changes in the form and method of presenting the task and in securing the subject's response.

Factor S.--The three reference tests for the space factor, S, had the highest loadings on this factor. Four tests appeared with loadings above .30 and two other tests had loadings of .24 and .27, respectively, as shown below.

This factor was identified as the space factor, S, found by Coombs (4), Schaefer (14), Thurstone (22, 23), Thurstone and Thurstone (30), and Wittenborn (34). The loadings for the three reference tests were comparable to those reported by Schaefer and by Wittenborn. However, the entry of .34 for the Gottschaldt

Figures was higher than had been expected.

Code No.	Name of Test	Factor Loadings			
		S	Other Factors		
12	Cards.....	.77			
30	Figures.....	.76			
3	Flags.....	.66			
6	Gottschaldt Figures	.34	.29 (G)		
34	Designs.....	.27	.32 (G)	.25 (F)	
22	Identical Forms....	.24	.27 (F)	.32 (Y)	.29 (Z)
47	Sex (F = 0, M = 1).	.42	-.32 (Y)		

Whether the change in the form of this test or in the time limits from those used by Thurstone (26) resulted in a change in the factorial composition of the test cannot be determined from this study. Gottschaldt Figures had a loading of .29 on Factor G, a projection that was lower than had been anticipated for that factor. Two other tests, Designs and Identical Forms, had projections of .27 and .24 on Factor S, a finding that corroborated previous work with these tests. A sex difference was found; men made higher scores on the Space tests.

The primary vector of the S-factor showed only moderate correlations (less than .30) with all but one of the other primaries. The correlation between vectors S and Y, the highest correlation, was .25.

Factor N.--This factor was represented by three tests with factor loadings greater than .30 and by one test with a negative projection of -.25. The tests and their loadings follow.

Code No.	Name of Test	Factor Loadings	
		N	Other Factors
9	Multiplication.....	.63	.26 (P)
2	Two-Digit Addition.....	.59	
30	Dot Patterns.....	.42	
29	Street Gestalt Completion	-.25	.25 (F)

Since the number-factor reference tests, Multiplication and Two-Digit Addition, had the highest loadings, the factor is identified as the number factor, N, previously isolated. It is interpreted as a facility with simple numerical operations. Two-Digit Addition had been found by Coombs (4) to be a better test of the number factor than Multiplication, but in this study the difference between the loadings of the two tests was certainly inconsequential. One of the more interesting entries on this factor was that of Dot Patterns. This was a test in which the subjects were to determine whether paired dot patterns contained the same or a different number of dots. The differences in the number of dots was never greater than one, the dot patterns being restricted to 4, 5, or 6 dots each. The reports of several subjects, secured after the test was taken, indicated that they had counted the number of dots since the differences in the numbers were too small to be immediately obvious. From the factorial composition of this test, it appeared that the speed with which the subjects could determine the number of dots in a simple pattern (between 4 and 6) was significantly related to the facility they possessed in simple addition and multiplication problems. This interpretation had been anticipated by Thurstone and Thurstone (30) when they included a series of dot-counting tests in their investigation of abilities in an eighth-grade population. The dot-counting tests in that study had, however, determined a separate factor which was not sufficiently diversified to permit psychological interpretation. The present test, modified from the Thurstone test of the same name, when used with an adult population, apparently gave the results the Thurstones had anticipated.

The projection of Dot Patterns on the N-factor, if sustained by later studies, and the high correlation between the

primary vectors of Factors C and N (.42) suggested that the number factor represents a very restricted type of functional unity, one that has a definite speed component and which appears to be related to a manipulation of a special set of highly practiced symbols rather than to highly practiced controlled associations, as suggested by Coombs (4, p. 164) and to some extent by Whipple (33, p. 460).

While Factor N appeared most strongly in simple continuous tasks, it was not confined to such tasks, since Schaefer found that his experimental projector addition tests had high loadings on the N-factor. These loadings, moreover, decreased with a reduction in the complexity of the tasks from that of adding three-digit numbers to adding one-digit numbers.

A loading of -.25 for the Street Gestalt Completion test on the N-factor was the only negative projection in the rotated factor matrix greater than -.12. The zero-order correlations of the Street test with Two-Digit Addition and Multiplication were -.15 and -.19, respectively. These negative correlations and the negative factor loadings might be explained in terms of the effect of the short time limits used with this experimental population. Since a factorial analysis is concerned with the test variances and co-variances (in standard scores), any change in the task that changes the relative variance contribution of the variables that may be considered as operating will be reflected in the results of the factor study. Specifically, if the time limits are so short that a relatively slowly developing perceptual process does not have time to operate, the test will be performed, if at all, by other more rapidly acting variables. These perceptual processes may be related to the set or attitude assumed by the subjects. Some of these components may be effec-

tive in number tasks but may lead to incorrect closures in the Street test. If this hypothesis is sustained, increasing the time limits should reduce the negative projection on the N-factor and increase the loading on a factor characterized by a process of completing an unorganized perceptual field. Thurstone (26, p. 121) has reported a low negative correlation of -.15 between the composite tests for the Number Factor and for his "speed of perception" factor on which the Street Gestalt Completion test had a significant loading. These results did not contradict the findings of the current study.

Factor V.--This factor was represented by three tests with projections over .30 and by one test with a projection of .26, as follows:

Code No.	Name of Test	Factor Loadings		
		V	Other Factors	
10	Completion.....	.63		
1	Vocabulary.....	.54	.29 (F)	
22	Opposites.....	.40	.46 (A)	.32 (W)
30	Verbal Enumeration	.26	.38 (A)	.28 (X)

The two tests with the highest projections were those selected as reference tests for the verbal factor, V. This factor was, therefore, identified as the verbal factor, V, reported by Coombs (4), Schaefer (14), Taylor (19), and Thurstone (23). The factor is considered similar to the factor designated C by Carroll (1). Both metric and configurational invariance of comparable tests with comparable populations were found for Factor V; for example, Schaefer (14, p. 30) reported verbal-factor loadings of .61 and .56 for his similar tests of Vocabulary and Completion, respectively. Somewhat greater shifts in the magnitude of the loadings of similar tests have been reported for other population samples.

The V-factor, as herein isolated, has been variously interpreted as a verbal factor (22), a verbal-comprehension factor (19, 30), a measure of the richness of the individual's stock of linguistic responses (1), and a verbal relations factor (14). None of these interpretations appeared to be adequate to account for the variety of tests reported as having high projections on Factor V. They have been quite varied in form and method of presentation.

Acceptable tests of the V-factor apparently included both recognition and production responses, with scores determined either from the time to respond to individual items or from the continuing responses in time-limit tests ranging in difficulty from easy to quite hard. In the current study all the tests high on Factor V were time-limit recognition tests with a marked range in difficulty from a hard five-choice Vocabulary test to the simple Opposites test in which pairs of words opposite in meaning were to be crossed out. Schaefer (14) found that the median time in responding to the separate items of an easy Same-Opposite test presented by a slide-film projector had a factor loading of .55 on his V-factor defined by a difficult time-limit Vocabulary test and a less difficult time-limit Completion test. Taylor (19) reported that a test requiring the production of pairs of opposites--any opposites were accepted--had a loading of .43 on his verbal factor, V, defined by three time-limit tests of the recognition type, Same-Opposite, Completion, and Disarranged Sentences. Carroll (1) had reported a Factor C with three recognition tests, Word Choice (selecting proper word in terms of meaning), Vocabulary, and Grammar, and two "production tests," Phrase Completion (writing in an appropriate ending to a phrase), and Rhyming (a fluency test).

A tentative hypothesis as to the nature of the verbal factor that may account for this diversity is that it is a composite factor. One component might involve a facility in producing a specific ideational structure in accordance with quite rigorous meaningful restrictions, as of opposition or of a meaningful completion. Another component might have to do with the facility in producing associations. This hypothesis represents a restatement of Carroll's formulation (1) but is suggestive of differential levels of organizational ability that are indicated by the current study. This interpretation will be developed further in the discussion of the second-order factors, L and O.

Factor G.--Only three tests having loadings of .30 or greater appeared on this factor, but two other tests had their highest projections on this factor, while a third also had a loading of .29. The tests, together with their loadings, are listed below:

Code No.	Name of Test	Factor Loadings			
		G	Other Factors		
33	Four-Letter Words..	.48			
17	Mutilated Words....	.47	.27 (H)		
36	Designs.....	.32	.27 (S)	.25 (F)	.35 (Z)
24	Five-Letter Words..	.29			
6	Gottschaldt Figures	.29	.34 (S)		
13	Hidden Pictures....	.28			
48	Age.....	.40			

The variance contribution represented by this factor is relatively slight. The tests, however, appeared to possess a common characteristic which has been tentatively interpreted as a speed in restructuring or reorganizing a visual configuration possessing a weak intrinsic structure. The organization was made in terms of formal restrictions as contrasted to the production of conceptual associational structures; a facility in changing or

shifting set might be important. The new closure was formed in the presence of a set of external distracters in all tests except Mutilated Words. The distracters, in general, did not form a strong configuration which was difficult to break. If this factor is sustained, the differentiation of Factor G and Thurstone's Factor E (26) may be in terms of the strength of the distracting medium.

This factor may be a composite of Thurstone's factors, E and F (26), the collapsing of the vectors resulting from the modification of the tests for use in this study. Factor G was not identified, however, with any one of Thurstone's factors.

In the test with the highest loading on this factor, Four-Letter Words, the subject had to find, in rows of letters, the four-letter words hidden, as it were, in the mass of letters. The category was such that any set of four adjacent letters spelling an English word was acceptable. All of the words were within the vocabulary range of an eighth-grade child. Speed and flexibility in pulling the words from the rows, a process of reorganizing the material, of forming a new closure, not a knowledge of words, was demanded in this test.

The Mutilated Words test was another one in which a speed of structuring of a visual configuration appeared to be important. The subject had to determine, from small portions of the letter configurations, the original word. No meaningful sequence or underlying order was available to provide clues as to the solution of the problem. Those subjects who could call up a variety of possible words in terms of the presented configuration and check each one quickly against the given portions of the letters appeared to achieve more successes than did the subjects who attempted to analyze each part of the visual configuration for the

component letters. The time limit for the test was apparently too short, as a consequence of which the test had a low projection of .27 on Factor H, motor speed, an entry reflecting the importance of speed of handwriting required by the test response.

In the Designs test, a simple visual form, Σ, occurred in a few of the 300 somewhat more complex designs provided, the task being to locate the designs containing the Σ form. It is suggested that the simplicity and constancy of the key figure, the Σ, and the relatively loosely structured nature of the designs combined to place a premium upon a speed process of pulling the simple form from the complex drawing. If this model were to be verbalized and the task made one of finding "a summation sign," this task would be even more like "finding the four-letter words" in a row of elements. The interpretation of Factor G would then be restricted to a facility with formal verbal closure, a speed in organizing a word configuration from elements having no intrinsically strong structure.

The loadings of Five-Letter Words appeared to be consistent with the general interpretation of Factor G. Individuals who were able to move rapidly over a mass of material (words), pulling from this material new configurations in terms of a set of formal restrictions, secured higher scores. The ability to resist the distraction offered by the story would be the process differentiating this task from one in which the cancellation of five-letter words from nonmeaningful arrangements was required. The loading of .29 on this factor, however, was too low to be more than suggestive.

The tests, Hidden Pictures and Gottschaldt Figures, presented an anomaly in that these tests were expected to have significant projections on a factor requiring a facility in breaking

a set, a "freedom from Gestaltbindung" (26). The tests were expected to have a moderate projection on Factor G, as they did. However, the tests were expected also to have appeared on a factor of "breaking a configuration" or on "strength of a configuration." A change in the form of these tests was made on the assumption that a corresponding change in factorial composition of the tests would not occur. If the assumption was valid, then the explanation of the failure of these tests to appear with significant projections on a factor similar to Thurstone's Factor E (26) may be traced to the changes in the instructions, to the time limits used, or to the nature of the experimental population.

The score used by Thurstone (26, p. 83) for Hidden Pictures was the time required to locate five of the six hidden pictures in one drawing. The median time for his sample population was less than 2 minutes. In the present form of the test, six different drawings were presented and the subjects were instructed to find the easy hidden pictures in all the drawings first and then to look for the harder items. In the ten minutes allowed, a uni-modal distribution of scores with a median of 13 correct pictures out of a possible number of 29 was secured. The scores ranged from 3 to 20 correct.

The use of a short time-limit for Hidden Pictures appears to have placed a premium on a facility or speed in reorganizing the relatively weakly structured portions of the several drawings, since the hidden pictures in each drawing were not all equally difficult to find. The use of six pages of drawings increased the number of easy hidden pictures that could be found with a relatively small amount of reorganization of the parts of the drawing. A number of the hidden pictures proved to be so difficult to find, however, that the speed of restructuring process

could achieve only a limited degree of success in the time allowed.

If the process contributing to "breaking a configuration" were a relatively slow-developing activity which, in a short time interval, could be masked by a more rapidly acting speed of closure process, then increasing the time per drawing would reduce the variance contribution of the speed process and increase the relative contribution of the slower "power or level" process. A further change in the instructions is indicated on the assumption that two closure processes could be used in the task as presented. In order to increase the scores of the subjects who are able to break these "strong" configurations although they may form a given structure relatively slowly, the directions might specify that all but one of the hidden pictures in each drawing in turn must be found before the subjects can proceed to the next item.

The test of Gottschaldt Figures should also be used with longer time limits. The change in test form from tracing a design on a complex drawing to marking the drawing to indicate that the design could be traced does not appear as drastic a modification as was made with Hidden Pictures.

Another problem of interpretation arose in terms of the tests of Street Gestalt Completion and of Mutilated Words. When these tests were presented by means of a slide-film projector (26), they both had significant projections on a single factor interpreted as "speed of perception" (26, p. 112) or "quickness of closure" (26, p. 9). The median time of vocalizing each response to the Street Gestalt test was about two seconds (26, p. 11), and the times for the Mutilated Words items were apparently of the same order of magnitude as those for the Street test (26, p. 14). These times were such that the two minutes allowed in

the current study for each of the two paper-and-pencil tests seemed reasonable. The score distributions secured from the experimental population for the two tests appeared to be satisfactory. For Mutilated Words, the median score was 17 correct out of 26 possible, the scores ranging from 6 to 25 correct. The results for the Street Gestalt test gave a median score of 16 correct with 24 possible, the scores ranging from 7 to 23.

The two tests, however, did not appear on a single factor, as expected. Mutilated Words had a significant projection (.47) on Factor G, while the highest loadings secured for the Street Gestalt test were -.25 on Factor N and .25 on Factor F.

No interpretations of these discordant results are offered other than that these data may reflect the changes in the time limits, the changes in the method of presentation, or the existence of a pattern of responses unique to the experimental sample. The results of further investigations in which these tests are used with increased time limits and presented both in paper-and-pencil and in slide-film-projector form will provide the data required to solve this problem. The apparent absence of factorial invariance for these closure tests will probably be resolved when the underlying processes and their limitations are known with more exactness.

Factor F.--This factor was identified as Taylor's factor of ideational fluency (19). The two tests, Topics and Discussion, selected in terms of Taylor's analysis as best characterizing his new fluency factor, were the only tests having projections of .30 or larger. These results can, therefore, be considered as sustaining the isolation of an ideational-fluency factor.

Both scoring formulae for the Topics test proved equally effective as measures of Factor F (loadings of .55 and .56), while

the Discussion test, with a loading of .51, was nearly as satisfactory. Taylor (19, p. 31) had described this factor of ideational fluency as "a facility in expressing ideas by the use of words and their meanings, wherein quantity and not quality is emphasized."

Factor W.--The word-fluency factor, W, previously reported by Coombs (4), Taylor (19), Thurstone (21, 22, 23), and Thurstone and Thurstone (30) was represented in this study by the tests, Suffixes and First and Last Letters. These two tests had been found by these investigators to be among the best tests of this factor, and since they had significant projections on a single common factor in the current study, that factor was identified as the word-fluency factor, W, previously reported. This factor was described by Taylor (19, p. 29) as a "facility in producing single, isolated words that contain one or more formal restrictions, without reference to the meaning of the words." Suffixes had a loading of .53 on Factor W, while First and Last Letters had a projection of only .32, in contrast to Taylor's results, in which the two tests, administered to a high-school population, had projections of .50 and .56, respectively, on the word-fluency factor.

The two fluency factors, W and F, were significantly correlated in the present population; the correlation between the primary traits was .36.

Two anomalies appeared in the present study in connection with the W-factor. First, the test, First and Last Letters, had its highest loading (.36) on Factor C. Second, the tests, Shape Constancy and Opposites, had loadings of .33 and .32, respectively, on this W-factor. The loading of .36 for First and Last Letters on Factor C has already been discussed, but no reasonable

explanation has been found for the projections on Factor W for Shape Constancy and Opposites. The change in the task of Shape Constancy, discussed in Chapter II, was apparently effective as this test had no significant projection on the space factor, S, but the resulting score distribution also had little in common with the remainder of the battery.

Factor H.--This factor appeared to be a motor-speed factor conspicuously present in finger-dexterity tasks which required some degree of motor control. The tests and their loadings on the H-factor were as follows:

Code No.	Name of Test	Factor Loadings	
		H	Other Factors
27	Writing X's.....	.69	
26	Writing Words.....	.55	
46	Two-Hand Co-ordination (Sum)	.49	
41	Letters I.....	.31	.60 (P)
17	Mutilated Words.....	.27	.47 (G)

The tests, Writing X's and Writing Words, were of short duration, 30 and 60 seconds, respectively; the subject was instructed that speed of writing not legibility, was important. The scores for Two-Hand Co-ordination (Sum) were also secured from two short trials (30 seconds each) of tapping out a pattern, first with the preferred hand and then with the other hand. Two errors were allowed in the 30-second trials, but few subjects made any errors in the task since the movement pattern required was restricted as to range but not to precision. Letters I involved a short finger or wrist movement in closing the response key to indicate whether the letter (not specified) appeared on the right or left side of the field.

In all of these tasks, individuals who possessed a neuromuscular apparatus (hand, fingers, and wrists) that could be

operated rapidly for short intervals of time were able to make higher scores. Longer testing intervals probably could not be used without introducing fatigue factors; slight decrements in the rate of tapping and of writing were noticeable in the last 5 to 10 seconds of the current tasks for some of the subjects. A facility in continued hand-finger movement appeared to be more important than speed of movement in single discrete operations, as pressing a response key. The H-factor was, therefore, interpreted as an ability to operate hand-finger neuromuscular response mechanisms at a high rate of speed for short periods of time. This factor appeared to be similar to the general motor-speed factor, T, reported by the Staff, Division of Occupational Analysis (15).

Three of the primary traits in this study showed significant correlations with Factor H, a fact which may reflect a general process operating in simple speeded tasks under conditions of good motivation. The factors referred to and their correlations with Factor H are as follows: C, .33; A, .33; and N, .29. The correlation of Factors H and G, however, was -.22. These results suggested the operation of a trait which permitted the subject to rush through a task at a high rate of speed while maintaining a certain amount of control. The negative correlation of Factor H with G and the zero correlation of H with V would suggest that the trait, whether temperamental, cognitive, or a test Einstellung factor, was detrimental to successful performance of tasks requiring the organization or restructuring of the material in a new configuration.

Factor Y.--This factor was one of the most interesting variables psychologically since it was not restricted to a given form of test presentation. The tests and their projections on

Factor Y were:

Code No.	Name of Test	Factor Loadings			
		Y	Other Factors		
37	Two-Hand Co-ordination (Ratio).....	.48			
42	Geometrical Figures....	.42			
25	Picture Squares.....	.41			
21	Identical Forms.....	.32	.24 (S)	.27 (F)	.29 (Z)
38	Letters IV.....	.29	.28 (C)	.34 (P)	
47	Sex (F = 0, M = 1).....	-.32	.42 (S)		

A sex difference was found, the women performing somewhat better than the men.

A definitive interpretation of the psychological process common to the variables listed above and absent from the other variables of the battery was not indicated. One interpretation was that the factor was similar to Thurstone's Factor E (26, p. 110), "freedom from Gestaltbindung" or "ability to manipulate two configurations simultaneously or in succession." Thurstone's tests, Gottschaldt Figures and Hidden Pictures, had significant projections on his Factor E, as did also his Two-Hand Co-ordination (Ratio). The sex difference in his study was also in favor of the women, the factor loading for the sex variable being .36 (26, p. 111). The possible identification of Factor Y as Thurstone's Factor E would be made on the basis of only two variables, Two-Hand Co-ordination (Ratio) and Sex, since the other two tests, Gottschaldt Figures and Hidden Pictures, modified from Thurstone's forms, did not appear on this factor as had been expected. However, a modification of Thurstone's hypothesis appears to be more descriptive of the process common to the tests of Factor Y. The restatement was that the underlying process involved a facility in organizing several simultaneous or successive configurations into a larger conceptual pattern under the distraction of further

activity. Neither the ability to manipulate a given configuration nor the strength with which the configuration could be held in mind would be as important as the ability to develop and use simultaneously a new organization or structure in further activities. This process, as conceived, would operate so as to permit a subject to form from several separate competing units a single configuration which would then be the basis of operation for solving the task. The process may represent in part an attentional-span ability since several simultaneous or successive visual configurations were to be attended to as a single percept.

In the Two-Hand Co-ordination test, the two competing movement patterns appeared to be united in a pattern of higher order which the subject used to advantage. In the performances of the more successful individuals, a smooth, continuous movement of both hands was conspicuously present, while the less capable individuals seemed to look back and forth from one disk to the other to keep track of their position. The slower subjects made more errors and spent more time correcting false moves of one hand or the other. At times, the movements of one hand seemed to be pulled into the movement patterns of the other hand.

The Geometrical Figures test is superficially entirely different from that of Two-Hand Co-ordination. A set of seven drawings was presented tachistoscopically on the screen for .30 second, and the task was to determine which one of four separate designs occurred only once in the seven drawings. The observation of the performances of the more capable and less capable subjects, as well as introspective analysis of the task, seemed to support the hypothesis that a factor was operative which led to differential facility in a process of holding in mind the entire visual field and of determining, after the screen was blank,

which design was not duplicated. The better subjects waited an appreciable period of time before responding, and a number of them commented on the fact that they looked over their memory images of the projected field to determine the nonduplicated design.[1]

In the Picture Squares test, the subjects were given a task of finding two paired pictures in a set of sixteen, a process similar to the Geometrical Figures in that a category of likeness was specified in terms of the relations of some of the elements. For most subjects the solutions were not perceived until after the pictures were scanned and compared, one with the other, for a period of time. The solutions would frequently "snap" into place, the subjects responding with a start and reporting that the paired pictures were so obvious that they felt foolish for having taken so long to find them. The facility with which these sets of pictures were scanned and the duplicated pictures found is considered a reflection, in part, of the subjects' ability to hold a series of configurations in mind and to operate selectively in terms of a specified task. The subjects who painstakingly compared each picture in turn with all of the other pictures would ultimately achieve success, but they required much more time than was allowed. The subjects who could, as they glanced over the rows of pictures, retain them and compare each new one with the ones previously seen would be the high scoring individuals. Since the pictures were chosen intentionally to be easily discriminated, the process of "pulling out" from the total set of pictures the

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[1] Since the pre-exposure and post-exposure fields were nearly twice as bright as the test field, the reported figures black on white as projected, and the exposure time 0.30 seconds, it is suggested that these results are not consistent with the suggestion that the subjects were securing positive after-images.

two identical ones was thought to depend more on an ability to organize and manipulate the configurations than on the ability to hold the configuration in mind.

The test, Identical Forms, appeared on Factor Y with a loading of .32, but it also had smaller loadings of .24 and .27 on Factors S and F, respectively. The test, as used previously, showed high projections on a perceptual-speed factor (15, 21, 23) or on a space factor (4, 22). The loading on Factor Y appears reasonable in terms of the tentative hypothesis as to the ability characterizing Factor Y. If a subject can pull together a number of discrete configurations and operate on them in terms of looking for duplicates of one of them, he should make a somewhat higher score than the individual who, lacking this ability, has to look down the row, comparing each item with the key figure or with one identical with it. The same process would seem to lead to faster times and higher scores on Letters IV, a test in which a letter "x" is to be located in a field of 16 lower-case letters.

Factor X.--This factor, with only two tests having projections of .30 or greater, has an insufficient number of high loadings to permit interpretation. Four other tests, however, had projections of .28. These six tests with their loadings are listed below.

Code No.	Name of Test	Factor Loadings		
		X	Other Factors	
31	Letter Groups.....	.50		
34	Letter Squares.....	.32		
40	Picture Comparison..	.28		
30	Verbal Enumeration..	.28	.38 (A)	.26 (V)
39	Concrete Association	.28	.55 (P)	.25 (F)
43	Shape Constancy.....	.28	.33 (W)	.32 (Z)

Three of the tests, Letter Groups, Letter Squares, and

Picture Comparison, provided tasks in which a systematic work method of comparing successive parts would seem to be important since the differences to be perceived are such that close attention to the details is required. In these tests the subject is looking for an identity, or difference which changes from item to item. The critical process may require a statement in terms of the closeness of the distracters, the searching for identities, or the shifting of the task from item to item. This factor appeared to be similar to the Factor Q reported in a series of factorial studies by the Staff, Division of Occupational Analysis, War Manpower Commission (15). The hypothesis, stated by Thurstone (21, p. 81), of a perceptual process of speed of perceiving superficially apparent relations is suggested as a tentative interpretation of this factor for use in further investigations.

In the test, Letter Groups, the occasional differences between the paired nonsense syllables were not obvious; they consisted of letter reversals or letter substitutions that did not change the over-all configuration of the syllables. In the Picture Comparison test, the parts deleted were chosen as elements that would tend to be overlooked in a cursory analysis. The Letter Squares test items were constructed with several repeated letters, only one set, however, occurring in a vertical or horizontal array. The other repeated letters in the item had to be "rejected" or "inhibited," as it were, in the searching process. The use of either a systematic row or column analysis or of an ability to disregard these distracting duplicated items would lead to successful performance. The Letter Squares test differed from the Picture Squares test in the use of letters rather than of pictures and in the presence of repeated items.

The tests, Verbal Enumeration and Concrete Association,

were concerned with meaningful relations between items and not with details of a formal nature. The category used changed from item to item. In the Concrete Association the subject must look through two columns of three words each for a word closely associated with a key word, while in Verbal Enumeration the subject is to find in a long list the items belonging to the class of objects specified at the head of the list.

The Shape Constancy test required the subject to compare one form with a given set of figures as to their correspondence in shape. The experimenter noted that the subjects used the procedure of alternately comparing the square lying on the plank with the diamond-shaped figures at the end of the plank until a decision was made. The task of making a sensory judgment was the same for the three positions of the square, but the response, of course, was different for each position.

The Second-Order Domain

The development of the concept of second-order factors as parameters that are determined by the correlations of the first-order factors represents a recent addition by Thurstone (29) and Tucker (32) to the theory of multiple-factor analysis. In spite of the recency of the theoretical formulation and of the difficulty of experimental identification of second-order factors, a number of studies have reported one or more such super-factors (2, 9, 13, 23, 30). The interpretation of these factors has, however, been made most cautiously. Factor analysts (20, 29) are keenly aware of the effects on the inter-correlations of the first-order primary vectors of changes in the sample population, in the test battery, and in the factorial procedures. But, as Thurstone points out (29, p. 412), ". . . . the fact that correlations between variables, or between factors, can be caused by

scientifically trivial circumstances does not guarantee that all correlations between variables are of trivial significance." The establishment of invariance of the second-order factors by replicated investigations should eventually provide the data necessary to distinguish between the trivial and the psychologically useful factors.

Second-order factors have failed to appear in several factorial investigations because the experimenters either explicitly or implicitly assumed that the best orthogonal simple structure constituted the preferred solution. With the acceptance of the concept of correlated factors (29, 32) (i.e., oblique primary vectors) and with the development of rotational procedures which led to a more rigorous definition of the bounding hyperplanes (29, p. 343), the problem of second-order factors has assumed greater importance. Since the maximum number of second-order factors that can be isolated is determined by the number of first-order factors in a given correlation matrix, large test batteries are necessary for investigations of the second-order parameters. This condition has tended to preclude the appearance of several second-order factors in any one study.

The twelve nonresidual oblique factors determined from a battery of forty-four tests provided a sufficient number of variables to determine a maximum of seven second-order factors (29, p. 294). Five second-order factors were found necessary to account for the intercorrelations of the twelve factors. The residual plane, Z, was excluded from this part of the study. Five oblique factors with twelve variables does not lead to a structure as convincing scientifically as would a structure in one or two dimensions, but fewer factors were insufficient to reproduce the correlations of the primary factors. The interpretation of

these results is, therefore, offered as only suggestive. Though the interpretations of several of the factors may appear to some degree to be psychologically meaningful, it is emphasized that an interpretation of a factor characterized by only two high loadings is not at all convincing.

The tentative interpretations of the five oblique second-order factors are presented below. These interpretations expressedly exclude the trivial but equally pertinent explanations in terms of restrictions on the population or of accidents of test battery design. Further studies will determine the usefulness of these interpretations. The factors will be discussed in the order of their appearance in the second-order rotated factor matrix, Table 4 (p. 48). The letters used to designate the first-order factors were listed in the first column of Table 4, while the headings of Columns 2 to 6, inclusive (K, J, L, O, Q), were the arbitrary designations for the second-order factors.

Factor K.--In Column K of Table 4, four nonvanishing entries were found. These entries and the first-order factors are:

First-Order Factor	Factor Loadings	
	K	Other Factors
N	.74	
C	.56	
H	.39	
X	.37	.36 (J)

These four factors were described in the first-order interpretations as N, facility with simple numerical operations; C, speed in recognizing a predetermined symbol in a context of distracters; H, speed of controlled finger-hand movements; X, tentatively identified as speed of perception of superficially apparent relations. The first-order factor, P, speed of response in simple choice

discriminations, has a zero projection on Factor K.

It was suggested that Factor K reflected a general ability to operate efficiently at a high rate of speed over a period of time in simple restricted or repetitive tasks. Speed of discrimination for a single stimulus presentation did not call for this factor. This ability seemed to involve facilities in highly practiced perceptual and response mechanisms in which the range of possible alternatives is restricted. The mechanism was conceived as one in which continuous operation without serious blocking was crucial. Whether the ability is associated with the physiological limit of operation of stimulus-response circuits or with other similar hypothetical speed mechanisms will require further investigation specifically designed to test such possibilities. The mental speed factor reported by Swineford and Holzinger (18, p. 33) appeared to be very similar to Factor K. Their speed factor was defined by tests of the addition of single-digit numbers, of three-element code substitution, of counting groups of dots, and of coding letters of the alphabet as straight and curved capital letters. The factor of speed of judgment and ideomotor skills reported by Cattell (3, p. 422) also appeared very similar to Factor K.

While most conspicuous in simple tests of arithmetical operations and symbol cancellation, Factor K is not confined to cognitive processes since the factor of speed of handwriting and of tapping in a predetermined pattern had significant loadings on this factor.

Factors K and O are positively correlated (r = .28 in this structure). Since Factor O is tentatively interpreted as a facility in manipulating associational materials, Factors K and O might be described in either of two ways. First, if the several

possible association factors were located and used to define Factor O, the structure might be more nearly orthogonal and the speed of association factors might appear with appreciable projections on K. This hypothesis, if sustained, would result in Factor K's being interpreted as a general speed factor appearing in all simple, continuing perceptual or controlled motor-speed tasks. If a positive correlation should be found to represent the way in which the two second-order factors, K and O, operated, then the postulation of a third-order speed factor would be necessary. The differentiation between Factors K and O might then be made in terms of the relative degree of restriction or predetermination of the task presented or of the relative amount of practice in the specific operations or associations involved.

Factor K, or a vector formed by Factors K and O, is considered as the source of the perceptual-speed component reported in simple speeded paper-and-pencil tasks. The lack of invariance of the perceptual factors previously noted in Chapter I could be explained as due to differential samplings of the first-order factors in the areas of the second-order factors, K and O.

Factor J.--Two variables had projections of .30 or more on this factor, while two other variables had loadings in the range, .25 to .29. These are as follows:

First-Order Factor	Factor Loadings	
	J	Other Factors
Y	.63	
S	.31	
P	.27	.28 (O)
X	.26	.37 (K)

The tests high on the first two factors, S and Y, were restricted to those dealing with nonverbal materials. Factors S

and Y were interpreted as ability to manipulate given visual configurations and facility in organizing visual configurations into a larger pattern. The highest tests on Factor X were concerned with formal or configurational relations. Only one associational test, Concrete Association, had a significant projection on any of the four factors, Y, S, P, and X. Tests of highly practiced symbolic or neuromuscular patterns, of continuing associational processes, of fluency, and of speed of restructuring a configuration have zero projections on Factor J.

These results were suggestive of an underlying order representing differences in a facility of organizing or manipulating formal visual configurational elements. The only two tests dealing with configurational materials which had vanishing loadings on the first-order factors, Y, S, and X, were the tests, Hidden Pictures and Street Gestalt Completion. Although the factorial results of these two tests were different from those expected, the fact that the crucial configurations involved in these tests were not presented directly but were specified as a hidden face or figure and as a picture of something to be named may account for their absence on Factor J.

Factor J appeared to be similar to Thurstone's Factor A, "speed and strength of a configuration" (26, p. 101). The data did not, however, warrant identifying Factor J as Thurstone's Factor A. Factor J was tentatively interpreted as a facility with visually-presented formal configurations. Further investigation of this domain is needed.

Factor L.--This was a doublet factor with the two first-order factors, G and V, having loadings of .48 and .63, respectively. The first-order Factor V also had a projection on the second-order Factor O of .54. The appearance of the two variables,

G and V, on a single second-order factor appeared so plausible that Factor L, although only a doublet, was tentatively interpreted as a facility in forming or completing a conceptual structure in the absence of intrinsically strong configurations. Factor L was considered as representing a speed of closure process operating in situations in which rapid and repeated formal or conceptual restructuring was required. The factor may be restricted to verbal configurations.

The tests of both Factors G and V required the subject to find a configuration that met a precise set of conceptual restrictions. The tests highest on Factor G involved formal restrictions of four-letter words, of words fitting the set of mutilated letters, or of the model, Σ. Those of Factor V posed ideational restrictions of words fitting a definition, of being most like another word, or of being opposites.

In the tests of the verbal factor, the words were probably all within the reading vocabulary of the subjects, i.e., if they had been used in sentences, the meanings of the words could have been secured from the context. By presenting only a short phrase or definition, however, the tests required the subjects to pull from a mass of associations specific items that met the restrictions of the task. Those subjects who were slow in perceiving the similarity in meaning of the Vocabulary materials tended also to be slow in finding a word that fitted the definitions of the Completion test. To some extent, they were also slow in marking out pairs of opposites like <u>black-white</u> or <u>up-down</u> when these pairs were mixed with other pairs of words like <u>soft-easy</u> or <u>door-open</u>. The speed with which these associational relations were formed or perceived was considered crucial in determining a subject's score. Speed of associational recognition

was the process that was most important in the tests of Factor A, but the speed of making a precise closure from a set of associations was the distinguishing element in Factor V. The verbal tests did depend, in part, on a fluency of associations, an aspect that will be considered in the discussion of Factor O.

Evidence of two or more correlated verbal-meaning factors has been reported by Carroll (1). His Factor C has been mentioned in the first part of this chapter as being related to the Factor V of this study. He has also reported a Factor B (2) similar to a Factor J in a previous study (1), which he interpreted as speed of serial reasoning. The tests high on this factor were Verbal Analogies, Verbal Reasoning, Completion, Morpheme Recognition, and Minnesota Speed of Reading. The anomaly of the Speed of Reading test on a speed of reasoning factor was pointed out by Carroll with an alternative interpretation of the factor as Speed of Reading. It is suggested that this factor of Carroll's might be interpreted as a facility in associational closure, a speed process of integrating associations into a meaningful configuration. This interpretation would include all of the tests in Carroll's Factor J or B. This facility in associational closure was interpreted as representing a major component of the verbal factor V. The location of Carroll's factor of speed of associational closure in the second-order domain would be predicted as being lower on Factor O and higher on Factor L and other reasoning factors than would Factor V.

The differentiation of Factors G and V was suggested in terms of formal, as opposed to meaningful, configurations. The use of tests of disarranged words, of reading prose printed without spacing or punctuation, and of distorted English (1), together with closure tasks using nonverbal materials should aid in

clarifying this interpretation.

Investigations in the area of problem-solving with a variety of tasks may establish several second-order closure factors differing in the type of material, the distractions to be overcome, and the restrictions, formal or associational, imposed.

If the interpretation of Factor C should eventually be restricted to a speed of verbal closure under formal restrictions, the appearance of both of these variables, G and V, on Factor L would be interpreted as evidence of a verbal-closure factor which transcends formal and meaningful restrictions. Since Factor G may be sustained as a component in nonverbal tasks, the broader interpretation of Factor L as a speed of closure has been retained.

Factor O.--Four first-order factors, V, A, F, and P, have projections of .25 or greater on this factor, as follows:

First-Order Factor	Factor Loadings	
	O	Other Factors
A	.60	
V	.54	.63 (L)
F	.25	.55 (Q)
P	.28	.27 (J)

Three of the first-order factors, A, V, and F, were interpreted as having to do with meaningful associational relations. They were differentiated in terms of recognition versus production of associations, of the precision of the conceptual structure formed, and of the continuity of associations under meaningful restrictions. All but one of the tests of the battery concerned with meaningful associations were high on the three factors, V, A, and F. The one test, Concrete Association, had a high loading on Factor P, which, in turn, had a projection on the

second-order Factor O. The process of Factor O common to these four first-order factors was, therefore, interpreted as a facility in manipulating associational materials under meaningful restrictions. Factor P was the only one of the four factors which had any non-associational tests with significant loadings. The projection of Factor P on this second-order associational factor may reflect the influence of the Concrete Association test on the factorial results. The loading of the variable P on Factor O may also indicate an overlapping of the mechanisms of speed in simple choice-discriminations and of speed in manipulating associational materials.

The appearance of the verbal factor, V, on the two second-order factors, L and O, was anticipated in the interpretation of Factor V. Factor L was considered as representing the closure process of the verbal factor, while Factor O was interpreted as the associational component. This associational process appeared conspicuously in the current battery with the speeded continuing tasks of Factor A, in which the stimuli calling up the associations were presented to the subjects.

The appearance of the second-order Factor O was interpreted as suggestive of several correlated associational factors differing in the mode of presentation, in the associational operations, and in the extent of integration of associational materials required by the task. The general cognitive speed factor reported by Davidson and Carroll (5) was tentatively interpreted as one of these functional unities; the vector corresponding to their speed factor was considered as representing a composite of two second-order speed factors, K and O. Cattell (3) discussed a factor of "fluency of associations under restrictions" that appeared in several aspects to be similar to Factor O. However,

Cattell included a number of word fluency and ideational fluency tests in his description; such tests have loadings in the current study on Factor Q.

Factor Q.--The two first-order fluency factors, F and W, appeared on the second-order factor doublet, Q, with loadings of .55 and .64, respectively. Taylor (19, p. 24) had found that these first-order factors, in an overdetermined structure, were orthogonal ($r = -.03$), in a senior high-school population, so that no second-order fluency factor was found in his study. The shift in the correlations of the first-order fluency factors in these two studies may be due to the use of a restricted number of reference tests in the current study. The change in the character of the experimental population used in the two studies may also account for the shifts in the location of the two primary vectors for F and W. The hypothesis of two first-order fluency factors has been sustained with marked changes in both the test battery and in the populations used. The stability of this second-order fluency factor will require further investigation.

The tentative interpretation of this doublet factor, Q, as a writing fluency factor appears reasonable. The differentiation between Factors O and Q has been made in the current study on the basis of the relatively greater ambiguity or lack of restriction in the tests of Factor Q. If this second-order factor is sustained in future studies, Factor Q might be identified with the fluency factor used by Cattell (3) in his investigations of the relations between fluency and temperament.

Discussion

The results of this study confirmed the existence and the interrelations of the factors, N (number facility), V (verbal comprehension), S (spatial manipulation), and W (word fluency), pre-

viously reported by Coombs (4), Thurstone (21, 22, 23), and Wittenborn (34, 35). Schaefer's isolation of a factor associated with speed of simple choice-discrimination (14) and Taylor's separation of two fluency factors (19) are also sustained by the present investigation.

A single perceptual-speed factor defined by the paper-and-pencil tests did not appear. Instead, three factors, C, A, and X, were indicated on which the paper-and-pencil perceptual-speed tasks had appreciable projections. Two of these factors, C and A, were identified with the perceptual factors reported by different investigators, while Factor X was suggestive of still a third perceptual factor. Thus the factorial invariance of the perceptual factors was comparable to that of other functional unities. These results were also considered as sustaining the hypothesis of a factorially complex domain in the paper-and-pencil perceptual-speed tasks.

The appearance of Factor A, interpreted as facility in associational recognition, was considered as sustaining one of the hypotheses being studied. Factor C, because of its restriction to a facility with predetermined symbols, was interpreted as sustaining only in part the other hypothesis of a category defined by formal restrictions. Further research on Factor C was indicated to determine the possible extension of this process to formally restricted configurations in which the distracters are distinct from the item sought. However, a factor restricted to the perception of configurational detail has been reported in one study (15). The existence, therefore, of two factors, one limited to a facility with highly practiced symbols and another limited to perceptual speed in pictorial material, as opposed to a single factor of fluency in perceiving elements defined by formal

restrictions should be considered in future investigations.

The effect of variations in the nature of distracters on the factorial composition of a test has perhaps not been adequately emphasized. The factorial composition, for example, will probably be quite dissimilar for such tests as cancelling a's in spaced pied material, in rows of unspaced letters, in lists of random words, in an interesting story, in geometrical or meaningful designs in which the a's are masked, or in pages of scrambled letters rotated at various angles. These various forms may call for various abilities on which marked individual differences would appear. These abilities, in turn, may be quite specific or quite general in their application.

The fact that a shift in the factor loading of a test might be associated with changes in the stimulus-response conditions was indicated by Schaefer (14). The marked change in the factorial composition of the perceptual-speed tasks resulting from the introduction of the slide-film projector method of presentation was not anticipated, however. The ability to make a rapid single choice-discrimination response does not appear to be correlated with the ability required to perform comparable choice-discriminations in continuing paper-and-pencil tasks.

Whether similar shifts will appear in other factors when the mode of test presentation or response is modified remains to be determined. In the current study, changes in the time limits and in the form of presentation of perceptual closure tasks were considered as affecting the factorial composition of such tests. The speed of associational recognition factor, A, furthermore, may not be the factor representing a facility in producing controlled associations of various kinds. In fact, changes in the type of controlled association specified, as part-whole, opposites, size

relations, agent-function, genus-species, etc., may result in changes in the factorial composition of the tests within a given mode of presentation. Changing the coding responses in a cancellation test may introduce new factors. Usually, a specified symbol or set of symbols is assigned one designation, i.e., to be crossed out, and the remaining items are designated as "not to be marked." Changing the task by requiring all items to be positively coded in a multiple code system or by varying the nature and size of each category may lead to the introduction of factors associated with an immediate memory ability or with a facility in manipulating a series of conceptual elements, as Coombs (4) suggested for an interpretation of the Number Factor.

Even a change in the form of the item used may call for a change in the ability required. Gates (7) and Stroud (17), working on the visual perceptual factors involved in reading, secured results indicating that materials arranged as multiple-choice items or as paired items may be factorially different.

Some factors, such as N and V, have been shown by Schaefer (14) to transcend the mode of presentation, but appear, in turn, to be restricted to specific content. Factors V, W, A, and F appear to be limited to word materials, and Factors Y and S to spatial configurations. These restrictions of a factor may be an artifact of an educative program, a fundamental source of individual differences, or a parameter that has been conveniently expressed in terms of these materials (29, 32). The fact of their invariance is the crucial matter. When these factors reappear in successive investigations with different experimental populations, the results cannot be disregarded. The interpretation of these parameters poses a different problem. As Lashley (11) has pointed out, these functional unities do not correspond to the

conventional rubrics of academic psychology; their existence may require a reformulation of some of the theories of the behavioral processes. As the limitations and scope of these factors become clearer, the theoretical constructs will also be clarified.

The implication of this discussion of sources of factors is that the number of functional unities that eventually may be isolated is not small. Certainly, the ways in which individuals differ are great in number, so great that a reasonably large number of parameters could be postulated without reducing the scientific usefulness of the formulation. It is not expected that all of these parameters will be equally important. Those that are restricted to a particular situation or type of content can be so designated. The others, more general in their application or scope, can then be used in the development of the theories of behavior. The judgments of the triviality or significance of a factor would be made eventually on the basis of the experimental data which established the limitations of the factor.

The concept of higher-order factors is considered as of first importance to the problem of isolating psychologically useful parameters. The second-order factors which transcend the restrictions of content and of test form may prove to be the variables of greatest psychological interest in the current study. In the area of perceptual speed, for example, a second-order factor, K, was found on which the number factor N, the controlled motor-speed factor, H, the symbol cancellation factor, C, and the X factor all had appreciable projections. This K-factor, interpreted as a general speed factor in repetitive or restricted tasks, was correlated with a possible speed of association variable, Factor O. The second-order factor, J, was suggestive of a facility with formal visual configurations that may be indica-

tive of the visual-minded, verbal-minded differentiation. Still another second-order factor, L, was tentatively identified as involving a speed of closure process which transcends the type of restriction, formal or associational, placed upon the task.

It is conceivable that these second-order factors, if sustained by further investigators, will be related to temperament or personality traits. Downey (6), for example, discusses a trait of speed of decision, freedom from load, etc., expressed in handwriting performances. Taylor (19) has pointed out the possible isolation with normals of an element of amnesic aphasia in the speed of naming factor of Carroll (1). The second-order fluency factor may represent the temperamental trait of surgency, as suggested by Cattell (3), even though the domain of fluency itself may be factorially complex.

Problems for Further Investigation

Studies of Factor C have been indicated to determine the restrictions on the process, i.e., whether it must be confined to a facility with symbols or whether it may be extended to the recognition of configurations in a context of discrete distracters. An investigation of the effects of changes in the response system from a two-category code to a multiple-coding task is also suggested.

The associational factor, A, was isolated in the present study with word tasks of a recognition form. The extension of the factor, or the determination of new factors, in tasks requiring the production of controlled associations from both pictorial and word materials will require additional investigations that have been suggested.

A further study of fluency of production of associational materials is necessary to differentiate Taylor's ideational

fluency with connected discourse (19) and Carroll's naming factor (1) from the fluency of production and of recognition of disconnected associational materials under various degrees of restriction on the categories used. Several associational factors may be isolated by future investigations.

The possible isolation of several parameters having to do with a facility in organizing perceptual materials into new configurations has been indicated. Suggestions have been made for modification of the tests and of the test procedures for future studies. The effect of variations in the testing conditions and the form of the tasks upon the factorial composition of the variables should be systematically investigated in this domain. Schaefer (14) has established the importance of test conditions in the area of simple perceptual tests, and the current study suggests that similar influences may be operative in the field of closure tasks.

Perhaps the most important problems for further investigation from psychological considerations will deal with the factors herein termed second-order factors. The effects of restricted sampling on the stability of the second-order domain should be studied with experimental populations at different age levels. If such factors are sustained by further experimentation, the psychological interpretations of such factors may be of the greatest theoretical and practical value.

CHAPTER IV

SUMMARY AND CONCLUSIONS

This study was designed to investigate the hypothesis that the perceptual-speed domain was a complex with several linearly independent factors. Hypotheses as to the nature of two of these factors were considered, and the two hypothetical processes were defined as, first, a facility in recognizing easily discriminated elements of categories defined by formal restrictions, and, second, a facility in recognizing easily discriminated elements of categories defined by associational or meaningful restrictions. Changes in the method of test administration, changes in the test content, and changes in the closeness of the distracters were introduced into the test design.

A battery of forty-four tests was administered to 167 students at the University of Chicago. The test battery contained eleven reference tests for the nonperceptual factors, N, S, V, W, and F, previously isolated with paper-and-pencil tests. The remaining thirty-three test variables were designed for this study, selected from previous investigations, and modified forms of tests reported as having appreciable projections on perceptual-speed factors. The tests were administered in four one-hour group sessions and a one-hour individual test session to 108 men and 59 women, from seventeen to twenty-eight years of age, their college status ranging from that of college freshman to first-year graduate student. Data on three nontest variables, age, educational level, and sex, were secured and added to the battery. Two tests, Topics and Two-Hand Co-ordination, were scored in two

ways, so that forty-nine variables in all were used.

Pearson product-moment correlations were computed for all possible pairs of forty-nine variables by means of the I.B.M. tabulating equipment. The test scores were first transformed to normalized standard scores and then coded to single digits for use in computing the intercorrelations. Simple linear score transformations were used for the age and educational status variables and a two-valued code for sex.

The table of intercorrelations of the forty-four experimentally independent test variables was factored by Thurstone's multiple group method to twelve factors; the factoring was carried through two cycles to stabilize the communalities. A thirteenth centroid factor was then determined from the twelfth-factor residuals. The thirteen factors were rotated to an oblique configuration in accordance with the concept of simple structure. One residual factor and twelve factors with significant loadings were found in the first-order domain.

The correlations between the twelve nonresidual first-order factors were determined and factored by the centroid method to five second-order factors. Three cycles of the centroid method were used to stabilize the communalities of the primary vectors in the second-order domain.

The five second-order factors were rotated to an oblique simple structure configuration.

This study confirmed the existence of the reference factors, N, S, V, W, and F, reported in previous investigations. The finding of a perceptual factor characterized by speed in simple choice-discrimination reactions as independent of speed in continuing simple discrimination tasks was sustained. The appearance in perceptual materials of separate speed factors associated

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The table of intercorrelations of the forty-four experimentally independent test variables was factored by Thurstone's multiple group method to twelve factors; the factoring was carried through two cycles to stabilize the communalities. A thirteenth centroid factor was then determined from the twelfth-factor residuals. The thirteen factors were rotated to an oblique configuration in accordance with the concept of simple structure. One residual factor and twelve factors with significant loadings were found in the first-order domain.

The correlations between the twelve nonresidual first-order factors were determined and factored by the centroid method to five second-order factors. Three cycles of the centroid method were used to stabilize the communalities of the primary vectors in the second-order domain.

The five second-order factors were rotated to an oblique simple structure configuration.

This study confirmed the existence of the reference factors, N, S, V, W, and F, reported in previous investigations. The finding of a perceptual factor characterized by speed in simple choice-discrimination reactions as independent of speed in continuing simple discrimination tasks was sustained. The appearance in perceptual materials of separate speed factors associated

with variations in the stimulus-response conditions was indicated.

The hypothesis that the perceptual-speed domain was factorially complex was considered to be sustained in this study by the appearance of three perceptual-speed factors. Two of the perceptual factors isolated were identified as the perceptual-speed factors reported by previous investigators. One of these factors, C, was interpreted as a facility in recognizing a predetermined symbol, or symbols, in a context of discrete and distinct distracters. Another factor, A, was interpreted as a fluency of associational recognition in perceptual materials, i.e., of recognizing members of a category defined by associational restrictions. A third perceptual-speed factor was considered to be indeterminate in the present battery. A tentative interpretation of the factor was that the process may be a facility in perceiving superficially apparent relations. One of the two initial hypotheses as to the nature of the components in the perceptual-speed domain was considered to be sustained by the appearance of Factor A. The test of the second hypothesis proved indecisive. Factor C appeared to be restricted to a facility with symbols but further research was suggested as necessary to determine the scope of this factor.

Two visual perceptual factors appeared which were interpreted as abilities required for the organization of percepts at a conceptual level. One of these factors, G, was tentatively interpreted as a speed of closure of a visual configuration defined by formal restrictions. It appeared most clearly in tests requiring a reorganization of word materials possessing a weak intrinsic structure. The process may involve a facility in shifting set. The other factor, Y, was most conspicuously present in non-verbal configurations, i.e., pictorial material. Factor Y

was interpreted tentatively as a facility in organizing several simultaneous or successive configurations into a larger pattern which is retained under the distraction of further activity. These two factors, G and Y, were considered as probably representing a composite of the factors, A, E, and F, reported by Thurstone. The tests used in the current study were modified from those used by Thurstone. Further study of the effect on perceptual-closure tests of changes in the form of the task and in the time limits was suggested.

A motor-speed factor, H, was found conspicuously present in hand-finger dexterity tasks which required some degree of motor control. The tasks ranged from speed of handwriting to speed of tapping in a four-point pattern. The factor was interpreted as an ability to operate hand-finger neuromuscular response mechanisms at a high rate of speed for short periods of time.

A second-order general speed factor appeared on which four first-order speed factors had appreciable projections. This second-order speed factor was interpreted as an ability to operate rapidly highly practiced perceptual and response mechanisms in which the range of possible alternatives was restricted. The possible extension of this facility to a general speed of reactivity with temperamental components was suggested.

Four other second-order factors were tentatively interpreted as: a facility with formal visual configurations, speed of association, speed of closure, and fluency in writing. Suggestions for further study of these factors were made. The stability of the second-order domain has not been sufficiently investigated for these results to be more than provocative of possible relations.

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APPENDIX

TABLE 5

PRODUCT-MOMENT CORRELATIONS BETWEEN THE VARIABLES*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1		18	14	24	-01	21	30	28	17	57	21	05	04	02	25	24
2	18		21	29	31	04	36	08	67	10	22	07	-03	27	18	24
3	14	21		22	14	43	04	14	26	25	14	68	13	07	06	11
4	24	29	22		24	17	27	27	25	27	44	08	03	25	30	15
5	-01	31	14	24		-04	27	05	21	07	08	09	01	47	11	28
6	21	04	43	17	-04		02	10	04	25	11	39	24	-01	07	11
7	30	36	04	27	27	02		10	25	16	22	-03	-04	15	14	61
8	28	08	14	27	05	10	10		04	18	34	04	-07	-01	53	17
9	17	67	26	25	21	04	25	04		14	19	16	00	19	09	09
10	57	10	25	27	07	25	16	18	14		20	16	05	-07	12	12
11	21	22	14	44	08	11	22	34	19	20		10	-06	-03	34	09
12	05	07	68	08	09	39	-03	04	16	16	10		18	04	-05	07
13	04	-03	13	03	01	24	-04	-07	00	05	-06	18		07	-06	04
14	02	27	07	25	47	-01	15	-01	19	-07	-03	04	07		11	24
15	25	18	06	30	11	07	14	53	09	12	34	-05	-06	11		19
16	24	24	11	15	28	11	61	17	09	12	09	07	04	24	19	
17	-03	12	27	15	15	25	-04	06	08	10	13	25	25	16	02	02
18	13	39	16	31	46	12	35	03	19	03	10	15	12	58	14	44
19	30	28	13	27	38	10	50	14	20	22	20	08	14	35	13	46
20	23	53	38	25	22	23	35	05	46	22	28	30	-08	21	18	37
21	01	07	24	06	36	34	18	06	-04	02	-08	34	17	27	11	32
22	44	31	18	33	25	21	55	17	15	39	27	12	03	21	22	47
23	10	34	23	28	41	10	23	11	25	09	01	18	13	62	21	34
24	22	26	16	29	30	17	28	-05	27	24	07	12	12	39	08	30
25	-02	15	16	07	26	15	19	-07	14	00	04	07	14	25	07	16
26	09	27	18	18	38	05	16	30	16	17	18	00	01	19	43	19
27	06	24	11	03	28	03	11	09	07	10	10	-10	16	14	25	23
28	06	41	05	27	45	02	41	-08	28	11	02	04	02	44	05	29
29	21	-15	10	07	00	20	04	23	-19	28	07	06	17	-03	15	22
30	39	26	14	28	27	20	44	10	13	30	05	08	17	28	21	45
31	17	36	20	30	39	04	29	16	26	10	11	15	16	29	21	20
32	08	-01	54	02	04	28	06	11	05	15	02	63	03	-02	-11	18
33	23	16	22	26	10	22	24	07	06	25	23	08	13	20	18	21
34	11	33	24	32	32	06	24	08	25	13	19	30	03	23	10	16
35	27	18	08	26	23	12	39	14	09	09	08	-04	09	22	19	51
36	16	09	32	14	12	39	11	13	14	21	01	28	18	12	05	21
37	09	-01	14	05	00	10	19	-07	07	02	09	24	11	14	-01	11
38	03	20	19	22	22	25	11	-04	11	02	-01	23	06	32	03	18
39	23	23	08	31	11	31	30	12	16	17	12	06	12	15	22	29
40	04	03	15	02	10	10	08	-05	10	-03	-03	13	20	-11	-05	06
41	16	26	19	17	18	24	17	09	26	18	13	11	-03	07	06	17
42	-05	-05	04	09	16	08	17	-03	-12	-16	07	11	06	26	-06	15
43	05	04	16	12	-01	08	-06	05	03	-04	05	00	15	00	03	-08
44	02	11	08	-01	06	20	05	-02	02	05	-03	11	01	06	-01	11

*All entries were multiplied by 100 to eliminate the decimal point.

TABLE 5—Continued

	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
1	-03	13	30	23	01	44	10	22	-02	09	06	06	21	39	17	08	23
2	12	39	28	53	07	31	34	26	15	27	24	41	-15	26	36	-01	16
3	27	16	13	38	24	18	23	16	16	18	11	05	10	14	20	54	22
4	15	31	27	25	06	33	28	29	07	18	03	27	07	28	30	02	26
5	15	46	38	22	36	25	41	30	26	38	28	45	00	27	39	04	10
6	25	12	10	23	34	21	10	17	15	05	03	02	20	20	04	28	22
7	-04	35	50	35	18	55	23	28	19	16	11	41	04	44	29	06	24
8	06	03	14	05	06	17	11	-05	-07	30	09	-08	23	10	16	11	07
9	08	18	20	46	-04	15	25	27	14	16	07	28	-19	13	26	05	06
10	10	03	22	22	02	39	09	24	00	17	10	11	28	30	10	15	25
11	13	10	20	28	-08	27	01	07	04	18	10	02	07	05	11	02	23
12	25	15	08	30	34	12	18	12	07	00	-10	04	06	08	15	63	08
13	25	12	14	-08	17	03	13	12	14	01	16	02	17	17	16	03	13
14	16	58	35	21	27	21	62	39	25	19	14	44	-03	28	29	-02	20
15	02	14	13	18	11	22	21	08	07	43	25	05	15	21	21	-11	18
16	02	44	46	37	32	47	34	30	16	19	23	29	22	45	20	18	21
17		19	12	17	14	14	08	21	05	16	20	20	12	02	28	13	30
18	19		42	34	36	36	55	38	27	25	24	48	05	35	36	18	20
19	12	42		27	27	58	47	41	21	25	19	42	13	68	39	06	44
20	17	34	27		18	36	27	49	24	18	11	33	-05	24	24	20	20
21	14	36	27	18		25	39	25	36	23	13	20	24	41	26	35	16
22	14	36	58	36	25		40	28	21	25	22	34	10	58	35	14	33
23	08	55	47	27	39	40		38	25	28	25	40	10	51	35	15	30
24	21	38	41	49	25	28	38		24	12	08	44	02	35	32	00	32
25	05	27	21	24	36	21	25	24		26	08	19	11	21	36	11	04
26	16	25	25	18	23	25	28	12	26		57	26	16	19	30	00	12
27	20	24	19	11	13	22	25	08	08	57		28	16	23	25	00	16
28	20	48	42	33	20	34	40	44	19	26	28		02	42	34	03	24
29	12	05	13	-05	24	10	10	02	11	16	16	02		24	11	17	25
30	02	35	68	24	41	58	51	35	21	19	23	42	24		38	07	42
31	28	36	39	24	26	35	35	32	36	30	25	34	11	38		06	23
32	13	18	06	20	35	14	15	00	11	00	00	03	17	07	06		02
33	30	20	44	20	16	33	30	32	04	12	16	24	25	42	23	02	
34	09	31	31	32	22	26	33	32	25	24	06	36	-01	30	47	10	13
35	02	33	50	17	18	37	31	28	15	17	23	23	19	53	22	07	18
36	18	13	23	26	34	22	24	26	15	12	13	12	13	30	-01	30	31
37	06	19	18	12	26	09	12	16	36	00	-08	08	05	15	19	13	06
38	19	39	17	18	33	20	33	15	32	13	-02	19	08	17	16	20	11
39	-01	22	42	18	18	33	30	14	24	13	13	20	19	43	26	05	31
40	08	04	21	08	12	16	14	14	24	01	-01	08	13	18	18	09	12
41	13	14	26	20	22	22	31	04	05	22	23	03	09	21	17	07	12
42	13	28	16	12	31	02	10	25	28	00	-01	18	04	06	16	10	15
43	11	-05	02	-04	03	07	07	00	08	07	03	-15	-06	06	14	-03	15
44	02	10	09	13	08	03	11	04	07	03	02	03	-06	08	04	11	09

TABLE 5--Continued

	34	35	36	37	38	39	40	41	42	43	44	45[a]	46[a]	47[a]	48[a]	49[a]
1	11	27	16	09	03	23	04	16	-05	05	02	21	16	12	12	01
2	33	18	09	-01	20	23	03	26	-05	04	11	03	30	00	09	32
3	24	08	32	14	19	08	15	19	04	16	08	16	07	35	07	06
4	32	26	14	05	22	31	02	17	09	12	-01	33	10	01	01	20
5	32	23	12	00	22	11	10	18	16	-01	06	13	28	05	13	11
6	06	12	39	10	25	31	10	24	08	08	20	19	08	13	01	02
7	24	39	11	19	11	30	08	17	17	-06	05	10	26	-10	04	13
8	08	14	13	-07	-04	12	-05	09	-03	05	-02	64	08	04	04	13
9	25	09	14	07	11	16	10	26	-12	03	02	05	17	03	07	21
10	13	09	21	02	02	17	-03	18	-16	-04	05	19	08	24	17	-05
11	19	08	01	09	-01	12	-03	13	07	05	-03	36	17	00	06	14
12	30	-04	28	24	23	06	13	11	11	00	11	08	00	20	-01	06
13	03	09	18	11	06	12	20	-03	06	15	01	00	07	-17	-01	00
14	23	22	12	14	32	15	-11	07	26	00	06	06	15	-06	03	14
15	10	19	05	-01	03	22	-05	06	-06	03	-01	46	27	-11	-02	09
16	16	51	21	11	18	29	06	17	15	-08	11	12	33	-07	16	05
17	09	02	18	06	19	-01	08	13	13	11	02	07	08	13	19	17
18	31	33	13	19	39	22	04	14	28	-05	10	17	37	-01	10	14
19	31	50	23	18	17	42	21	26	16	02	09	08	26	-09	08	02
20	32	17	26	12	18	18	08	20	12	-04	13	06	25	10	16	17
21	22	18	34	26	33	18	12	22	31	03	08	10	21	-09	-07	04
22	26	37	22	09	20	33	16	22	02	07	03	15	22	-07	13	17
23	33	31	24	12	33	30	14	31	10	07	11	18	29	07	-01	07
24	32	28	26	16	15	14	14	04	25	00	04	10	14	-04	15	11
25	25	15	15	36	32	24	24	05	28	08	07	-12	30	-29	-12	00
26	24	17	12	00	13	13	01	22	00	07	03	23	37	06	23	15
27	06	23	13	-08	-02	13	-01	23	-01	03	02	-02	48	00	21	11
28	36	23	12	08	19	20	08	03	18	-15	03	06	20	01	15	07
29	-01	19	13	05	08	19	13	09	04	-06	-06	21	07	10	15	-18
30	30	53	30	15	17	43	18	21	06	06	08	14	22	-08	01	-03
31	47	22	-01	19	16	26	18	17	16	14	04	08	33	-22	-06	12
32	10	07	30	13	20	05	09	07	10	-03	11	06	-01	28	05	-08
33	13	18	31	06	11	31	12	12	15	15	09	10	13	10	20	06
34		13	07	15	19	18	05	11	16	-01	12	05	15	-11	-14	03
35	13		27	08	08	24	04	17	-02	04	02	11	20	-10	12	-04
36	07	27		10	20	14	09	05	06	13	10	13	-01	24	19	02
37	15	08	10		32	15	16	10	34	-03	00	-02	25	-26	-25	-01
38	19	08	20	32		37	10	26	25	09	20	-02	24	07	-05	08
39	18	24	14	15	37		26	43	07	11	15	09	26	-20	-05	06
40	05	04	09	16	10	26		12	12	08	12	-06	11	14	-02	03
41	11	17	05	10	26	43	12		-03	-03	15	06	30	04	02	07
42	16	-02	06	34	25	07	12	-03		-08	11	00	16	-11	00	05
43	-01	04	13	-03	09	11	08	-03	-08		01	04	03	00	-09	09
44	12	02	10	00	20	15	12	15	11	01		-02	14	07	07	06

[a]These variables were not used in defining the common-factor space.

TABLE 6

ARBITRARY ORTHOGONAL FACTORIAL MATRIX OF THE VARIABLES*

Test No.	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	h^2
1	45	15	-06	-07	-12	52	-09	-17	-16	00	06	-13	11	61
2	54	-12	-05	64	-10	-04	-04	05	-01	11	-05	03	-07	75
3	37	02	66	05	-17	-08	06	-05	00	-01	-15	03	03	64
4	61	06	-07	-04	15	-11	-04	-18	-03	08	-11	-22	08	53
5	32	09	12	32	41	-05	-10	01	13	-08	-07	11	-07	45
6	29	04	43	-14	-07	06	28	-12	-16	20	11	03	10	48
7	56	-09	-09	13	08	31	-08	38	10	-03	21	09	02	66
8	33	59	-01	-12	-16	-07	-05	07	-07	-02	-06	-21	-07	57
9	42	-19	02	59	-22	-05	-06	-05	00	13	-02	-12	-07	65
10	44	12	05	-12	-13	41	-03	-45	-17	-03	-09	01	15	67
11	63	10	-16	-23	-24	-29	00	05	02	-03	08	05	05	64
12	24	-11	81	-05	-11	-09	-02	-07	-02	-02	-09	-05	11	78
13	-03	04	20	-02	15	12	30	-05	16	-06	-07	08	15	24
14	26	-02	05	31	70	-12	-04	-03	-12	-01	-03	-10	-09	71
15	42	57	-17	02	-04	-12	-03	03	-10	01	06	-08	-08	57
16	44	13	10	10	23	31	-08	60	-10	-03	11	09	13	79
17	24	04	21	04	10	-21	37	-24	-02	-13	-11	15	20	45
18	45	-02	16	25	54	-03	-13	13	-03	-01	01	09	07	63
19	53	01	02	08	36	37	22	13	13	02	-09	-04	-04	65
20	58	-15	20	33	-06	-02	05	04	-06	-08	10	-03	07	54
21	17	21	48	07	39	13	10	00	18	03	17	-08	-12	57
22	65	-01	03	-06	16	41	02	10	09	02	-11	18	-16	71
23	39	13	21	28	53	07	04	00	-07	16	-19	-14	-13	68
24	46	-18	04	24	28	07	14	04	-02	-20	11	-10	17	50
25	23	06	17	15	25	-04	04	00	32	07	32	03	-10	39
26	32	54	01	29	10	-07	01	-08	16	-02	-02	28	-11	61
27	19	41	-03	29	11	04	11	05	-01	-03	-14	53	08	63
28	39	-09	-01	38	38	13	05	-05	07	-18	-03	11	10	53
29	08	36	17	-18	08	25	11	-01	02	05	02	00	19	32
30	46	10	09	11	30	51	19	13	10	05	-07	-13	-06	68
31	40	16	10	26	21	08	05	-10	55	-06	-10	-02	12	66
32	15	00	76	-07	-09	06	-14	11	-15	-01	03	09	-04	68
33	41	07	04	-05	15	16	48	-07	-09	-02	-06	-06	14	50
34	44	-05	17	18	14	-05	-12	-11	34	-03	-08	-16	10	46
35	36	13	-02	03	24	29	14	42	04	-05	-18	-09	-06	53
36	25	07	37	06	05	15	35	01	-23	-09	08	-03	-20	46
37	14	-09	24	-05	17	07	03	04	19	13	46	-02	05	39
38	24	-04	27	07	34	-07	02	-07	04	35	21	06	-05	44
39	38	11	00	06	14	19	20	04	09	51	03	-18	12	57
40	09	-03	15	03	03	10	24	01	25	17	06	-06	08	21
41	29	06	12	11	01	09	02	07	00	59	-07	28	06	56
42	12	-09	17	-09	38	-16	07	04	15	-10	41	-01	22	49
43	08	00	04	-14	00	-06	28	-09	24	08	-25	-02	-27	32
44	05	-06	12	07	07	05	09	05	08	21	-08	-06	10	11
45[a]	36	47	00	-12	02	-13	-14	-09	-35	-09	04	-28	07	63
46[a]	30	21	-02	24	17	04	-08	19	19	22	15	37	19	55
47[a]	02	03	27	04	-08	03	00	-20	-57	-08	-27	-01	14	55
48[a]	15	11	-05	13	-02	03	21	-02	-38	-24	-11	24	14	39
49[a]	27	-06	-06	12	-04	-20	03	-07	-07	00	08	26	-16	25

*All entries were multiplied by 100 to eliminate the decimal point.

[a]These variables were not used in defining the common-factor space.

TABLE 7

DISTRIBUTION OF THIRTEENTH FACTOR RESIDUALS DISREGARDING SIGN*

|P|	f
.00	112
.01	209
.02	195
.03	130
.04	109
.05	80
.06	47
.07	22
.08	21
.09	10
.10	5
.11	4
.12	1
.13	1
N	946

*Computed for variables 1 to 44, inclusive.

TABLE 8

TRANSFORMATION MATRIX FOR THE FIRST-ORDER DOMAIN*

	C	A	P	W	F	S	N	V	G	H	X	Y	Z_1	Z_2
I	16	34	07	49	07	06	16	25	04	04	-02	10	07	-22
II	-09	-16	-05	-19	72	06	-21	-09	-01	45	23	01	14	-03
III	02	-09	-01	-13	04	88	-08	-07	03	-01	11	08	10	18
IV	-04	-18	17	-55	12	00	73	-22	11	21	06	-10	-06	17
V	78	02	-02	-02	-01	-22	-41	04	02	-03	-04	16	01	24
VI	-30	29	-05	-38	09	-06	-04	62	-06	-11	11	04	15	20
VII	-31	23	10	03	06	-16	21	-35	82	06	20	08	33	40
VIII	-19	77	-02	-04	-10	19	-05	-57	-06	-11	10	-05	-09	-18
IX	-24	-10	-13	27	-25	-19	-09	10	-27	20	71	11	15	-01
X	02	-22	95	-04	09	-06	-07	-14	-23	04	07	-06	-07	12
XI	-23	00	-02	-24	20	-24	32	-03	08	-08	-32	91	19	-28
XII	-15	10	-04	23	-55	01	-19	09	02	78	-49	11	11	17
XIII	06	-10	20	-27	-15	05	-14	00	41	24	13	-27	-86	-69

*All values were multiplied by 100 to eliminate the decimal point.

TABLE 9

ROTATED FACTORIAL MATRIX FOR THE FIRST-ORDER DOMAIN*

Test No.	C	A	P	W	F	S	N	V	G	H	X	Y	Z_1	Z_2
1	-08	14	03	-07	29	-02	05	54	00	-08	-01	04	-01	-17
2	01	09	24	-01	01	02	59	-05	00	11	-01	-07	00	01
3	-02	00	04	14	02	67	07	00	10	09	11	-08	05	04
4	36	-01	14	31	18	-05	00	18	01	-08	09	-07	-09	-18
5	36	03	-06	05	01	05	03	04	-07	20	05	05	07	13
6	-06	03	25	05	13	34	01	03	29	03	-04	14	09	05
7	-07	56	-01	09	-07	-07	17	15	-06	00	-02	24	04	-20
8	-04	06	-04	11	55	13	-06	-04	-06	07	13	-05	09	-17
9	-05	-04	26	-07	05	07	63	-03	-03	-03	04	-07	-02	-01
10	00	-08	02	04	18	06	-03	63	09	07	-06	-06	-02	-07
11	-04	21	00	53	03	-04	04	00	03	10	-07	09	-01	-39
12	06	-06	02	07	-04	77	-02	01	07	-05	09	-04	-05	-01
13	-03	03	-04	-03	-06	08	-11	01	29	15	21	00	04	15
14	68	-01	05	-04	12	-06	01	-04	03	-06	-08	08	02	19
15	04	05	02	12	51	-07	04	-04	-01	18	03	07	12	-16
16	05	66	00	-09	08	18	-03	-05	01	05	-03	12	-07	-20
17	13	-08	-02	16	-05	14	02	-05	47	27	02	-05	-02	07
18	51	18	05	05	-03	10	-03	03	-01	10	-08	10	-08	-01
19	15	41	04	12	06	-07	-01	22	13	-02	22	07	19	17
20	03	19	05	05	01	21	42	02	18	00	-05	10	-02	-13
21	18	01	-01	-09	26	26	-08	04	02	02	22	32	29	24
22	05	46	-02	32	-06	02	-08	40	-09	08	03	08	26	14
23	50	05	20	-03	26	13	-01	02	00	-02	13	-05	12	29
24	23	25	-07	00	-02	-03	24	07	29	-08	00	13	-07	-11
25	07	00	04	05	07	-03	10	00	-05	10	13	41	23	06
26	02	-08	-02	07	26	00	05	02	-02	55	08	09	23	12
27	-03	08	02	-02	01	02	-02	-03	16	69	-08	-07	05	13
28	29	13	-08	-02	-09	-09	17	17	16	16	00	05	-02	06
29	-05	04	03	-01	25	12	-25	14	13	16	17	04	00	-04
30	07	38	06	-03	21	00	01	26	08	-07	28	07	22	20
31	09	-04	-04	12	03	-02	05	18	00	27	50	01	04	00
32	-01	09	-03	-03	02	76	-07	01	-07	-01	-10	08	07	04
33	05	23	08	10	15	-03	03	07	48	02	11	01	08	09
34	22	-07	01	17	-01	10	08	17	-10	01	32	-02	-07	-12
35	06	55	-05	06	12	03	-08	-02	05	-06	23	-08	11	08
36	-05	22	-05	-05	23	29	17	-03	32	-07	-06	19	35	30
37	-01	05	10	-03	01	02	03	04	00	-06	02	48	10	-08
38	28	-08	34	05	04	08	-02	-01	-04	05	-05	29	11	12
39	05	08	55	-01	25	-09	04	02	08	-01	28	03	-01	00
40	-12	03	18	-01	00	02	05	-02	13	02	28	09	07	07
41	-01	03	60	06	-04	12	-03	-01	-08	31	-01	-05	-03	09
42	23	05	-08	04	-07	-03	-08	-07	18	-01	-02	43	-07	-21
43	-04	01	01	33	-04	-02	-09	-02	02	00	27	-08	32	34
44	03	01	24	-05	-02	08	00	-06	04	-01	17	-08	-07	04
45[a]	25	-05	-03	02	57	12	-06	05	03	-06	-08	00	-09	-29
46[a]	01	12	24	-01	-05	-05	00	-03	-04	49	00	15	-08	-14
47[a]	18	-12	04	-18	13	40	00	07	23	-03	-28	-32	-20	04
48[a]	00	15	-11	-07	02	06	10	-02	40	24	-28	-12	-07	01
49[a]	02	03	02	23	-11	-05	19	-03	03	19	-26	14	15	06

*All entries were multiplied by 100 to eliminate the decimal point.

[a]These variables were not used in defining the common-factor space.

TABLE 10

COSINES OF THE ANGLES BETWEEN THE FIRST-ORDER REFERENCE AXES*

	C	A	P	W	F	S	N	V	G	H	X	Y	Z_1
C	100												
A	-22	99											
P	05	-23	101										
W	15	21	-16	100									
F	00	-19	10	-41	100								
S	-02	05	-04	-08	03	100							
N	-38	-03	10	-35	17	-09	100						
V	08	-16	-22	11	-08	-15	-21	100					
G	-14	16	00	-18	05	-05	26	-30	100				
H	-16	-17	06	05	-17	00	-13	-02	13	99			
X	-18	-06	04	-02	20	04	-06	-08	-03	-08	100		
Y	-15	08	-16	-01	15	-23	19	07	01	-04	-29	99	
Z_1	-27	15	-25	24	21	-09	15	07	-09	-04	-01	50	99

*All values have been multiplied by 100 to eliminate the decimal point.

TABLE 11

CORRELATIONS BETWEEN THE FIRST-ORDER PRIMARY VECTORS*

	C	A	P	W	F	S	N	V	G	H	X	Y
C	100	33	-01	-13	-10	09	42	09	-04	33	35	18
A	33	100	18	-18	12	-03	20	21	-20	33	14	-03
P	-01	18	100	08	-05	12	-04	25	08	-04	04	16
W	-13	-18	08	100	36	09	19	01	14	-05	-11	-09
F	-10	12	-05	36	100	-07	-01	04	-04	14	-27	-27
S	09	-03	12	09	-07	100	10	19	12	01	10	25
N	42	20	-04	19	-01	10	100	18	-19	29	18	-08
V	09	21	25	01	04	19	18	100	23	08	11	00
G	-04	-20	08	14	-04	12	-19	23	100	-22	02	07
H	33	33	-04	-05	14	01	29	08	-22	100	17	02
X	35	14	04	-11	-27	10	18	11	02	17	100	36
Y	18	-03	16	-09	-27	25	-08	00	07	02	36	100

*All values were multiplied by 100 to eliminate the decimal point.

TABLE 12

CENTROID FACTORIAL MATRIX OF THE PRIMARY VECTORS*

	I	II	III	IV	V	h^2
C	59	20	10	-09	-13	42
A	50	32	-09	42	12	55
P	17	-19	09	21	20	16
W	-28	15	64	-04	09	52
F	-31	46	29	32	21	54
S	21	-21	30	-03	09	19
N	43	44	27	-24	-24	57
V	31	-17	33	52	-22	55
G	-14	-41	32	12	-24	36
H	39	40	04	04	04	32
X	51	-12	08	-18	-03	31
Y	39	-44	13	-23	31	51

*All entries were multiplied by 100 to eliminate the decimal point.

TABLE 13

ROTATED FACTORIAL MATRIX FOR THE SECOND-ORDER DOMAIN*

	J	K	L	O	Q
C	08	56	08	11	-06
A	05	19	04	60	-02
P	27	-11	10	28	07
W	10	11	07	-10	64
F	-09	-09	-08	25	55
S	31	12	14	06	16
N	-07	74	03	-09	13
V	-01	12	63	54	-01
G	-03	-09	48	01	01
H	03	39	-09	20	09
X	26	37	07	00	-11
Y	63	06	-06	-03	03

*All entries were multiplied by 100 to eliminate the decimal point.

TABLE 14

TRANSFORMATION MATRIX FOR THE SECOND-ORDER DOMAIN*

	J	K	L	O	Q
I	36	60	12	35	-23
II	-36	43	-37	04	33
III	28	37	38	02	75
IV	-20	-39	50	92	-02
V	79	-40	-67	19	53

*All entries were multiplied by 100 to eliminate the decimal point.

TABLE 15

CORRELATIONS BETWEEN SECOND-ORDER PRIMARY VECTORS*

	J	K	L	O	Q
J		02	33	-20	-36
K	02		-24	28	-15
L	33	-24		-47	13
O	-20	28	-47		-08
Q	-36	-15	13	-08	

*All entries were multiplied by 100 to eliminate the decimal point.

FIRST SESSION

Date_____

Hour_____

VOCABULARY

Print your name here _____
Last Name First Name

Print the name of your school here _____

In the phrase ("small box") below, small is underlined. One of the five words to the right means the same as small. That word is little, which is the second word, and therefore 2 is written in the blank space at the end of the line.

small box 1-round 2-little 3-square 4-large 5-silver 2

In the example below, write the number of the word which means the same as tall.

tall building 1-little 2-brick 3-high 4-stone 5-white _____

You should have written 3 in the blank at the right.

At the end of each line below, write the number of the word that has most nearly the same meaning as the underlined word. Go right ahead. Do not wait for any signal.

beautiful melody 1-picture 2-girl 3-gown 4-tune 5-flower _____

long journey 1-story 2-trip 3-delay 4-coat 5-river _____

right answer 1-wrong 2-last 3-worst 4-correct 5-first _____

run rapidly 1-swiftly 2-far 3-slowly 4-frequently 5-twice _____

intelligent person 1-silly 2-fat 3-short 4-shabby 5-clever _____

When the signal is given (not yet), turn the page and work more problems of the same kind. At the end of each line on the following pages, write the number of the word that has most nearly the same meaning as the underlined word. Work quickly and accurately. You may not be able to finish in the time allowed.

Stop here. Wait for the signal.

(1) luminous with spray — 1-bright 2-wet 3-salty 4-resounding 5-slippery .....

(2) prophesy dire things — 1-will 2-suspect 3-fear 4-prevent 5-predict .....

(3) trivial objections — 1-valid 2-futile 3-emphatic 4-insignificant 5-truthful .....

(4) to gain access — 1-prominence 2-admission 3-excess 4-wealth 5-weight .....

(5) accentuate vows — 1-criticize 2-punctuate 3-emphasize 4-encourage 5-make .....

(6) interrogate a witness — 1-produce 2-question 3-contradict 4-interrupt 5-recall .....

(7) a profligate life — 1-profitable 2-long 3-wicked 4-useful 5-virtuous .....

(8) thwart his plans — 1-frustrate 2-support 3-describe 4-contemplate 5-divulge .....

(9) abolish slavery — 1-denounce 2-end 3-free 4-admonish 5-renounce .....

(10) show his malevolence — 1-ill-will 2-sincerity 3-astonishment 4-training 5-teeth .....

(11) pomp of emperors — 1-rulership 2-display 3-tyranny 4-throne 5-cry .....

(12) precarious popularity — 1-undeserved 2-precious 3-lasting 4-great 5-uncertain .....

(13) placid spirit — 1-soaring 2-turoid 3-solitary 4-serene 5-fixed .....

(14) subjugated Ireland — 1-idealized 2-substituted 3-subdued 4-cheated 5-appeased .....

(15) in fear and torment — 1-anger 2-cowardice 3-rage 4-distress 5-fright .....

(16) She was a shrew. — 1-scold 2-waitress 3-bride 4-spinster 5-teacher .....

(17) slake my thirst — 1-increase 2-cause 3-quench 4-utilize 5-intensify .....

(18) majestic mien — 1-bearing 2-blood 3-temperament 4-wealth 5-size .....

(19) a subtle stratagem — 1-military 2-substitute 3-basic 4-honest 5-clever .....

(20) an effigy — 1-apparition 2-image 3-elf 4-giant 5-corpse .....

(21) an atrocious deed — 1-heinous 2-unthinking 3-atrophied 4-boisterous 5-kind .....

(22) a sinister influence — 1-harmful 2-single 3-careless 4-slight 5-powerful .....

(23) the art of subterfuge — 1-evasion 2-subtraction 3-centrifuge 4-painting 5-mimicry .....

(24) He stood abashed. — 1-indicted 2-confounded 3-debased 4-shyly 5-exposed .....

(25) gambol in the woods — 1-bet 2-frolic 3-explore 4-hunt 5-camp .....

(26) to circumvent enemies — 1-outwit 2-love 3-murder 4-detest 5-circumscribe .....

(27) a credible witness — 1-fair 2-false 3-trustworthy 4-damaging 5-expert .....

(28) void of guile — 1-humor 2-blame 3-feeling 4-sense 5-trickery .....

(29) perpetual libel — 1-noise 2-copyright 3-motion 4-fame 5-defamation .....

(30) subservient to man — 1-superior 2-useless 3-subordinate 4-gradient 5-invaluable .....

(31) archaic expression — 1-oratorical 2-apt 3-antiquated 4-artistic 5-blank .....

(32) aboriginal Britons — 1-aristocratic 2-primitive 3-albino 4-dull 5-savage .....

(33) prudent conduct — 1-questionable 2-prudish 3-proud 4-sincere 5-cautious .....

(34) straight to perdition — 1-heaven 2-perception 3-banditry 4-fame 5-hell .....

Go to the next page. Do not wait for any signal.

(35) tangible evidence 1-trumped-up 2-real 3-circumstantial 4-negative 5-good .....

(36) a perfidious agent 1-oily 2-treacherous 3-wasteful 4-foreign 5-hidebound .....

(37) loquacious race 1-greedy 2-dwarf 3-talkative 4-healthy 5-fertile .....

(38) sordid surroundings 1-foul 2-clean 3-pious 4-pleasant 5-barren.....

(39) in a testy humor 1-tested 2-pleasant 3-changing 4-irritable 5-frosty .....

(40) sacerdotal duties 1-official 2-legal 3-sarcastic 4-material 5-priestly .....

(41) furtive glances 1-angry 2-frequent 3-sheepish 4-sly 5-proud .....

(42) abridged the history 1-composed 2-rewrote 3-expurgated 4-accepted 5-shortened ...

(43) animosity is felt 1-animation 2-scorn 3-sorrow 4-enmity 5-jollity .....

(44) unfavorable prognosis 1-progress 2-diagnosis 3-result 4-offspring 5-forecast .....

(45) listed to port 1-sailed 2-hobbled 3-towed 4-steered 5-inclined .....

(46) a woman's prerogative 1-right 2-question 3-temperament 4-charm 5-ornament.....

(47) profuse apologies 1-humble 2-graceful 3-reluctant 4-copious 5-heartfelt .....

(48) convivial gathering 1-sad 2-vivid 3-learned 4-gradual 5-social .....

(49) an obese person 1-oblate 2-brawny 3-fat 4-short 5-greedy .....

(50) give a tithe 1-tenth 2-fortune 3-title 4-church 5-sacrifice.....

(51) palter with God 1-sing 2-commune 3-reside 4-argue 5-trifle .....

(52) imperial ukase 1-chariot 2-edict 3-cabinet 4-throne room 5-palace .....

(53) It augurs cheer. 1-increases 2-betokens 3-ends 4-bores 5-controls .....

(54) sporadic attempts 1-vigorous 2-sportive 3-half-hearted 4-continual 5-scattered

(55) He was a charlatan 1-accessary 2-bystander 3-student 4-clerk 5-quack .....

(56) abortive scheme 1-sly 2-tactless 3-successful 4-miscarrying 5-daring .....

(57) vacillating mind 1-wavering 2-thinking 3-stolid 4-scintillating 5-empty .....

(58) a chimerical scheme 1-mathematical 2-dangerous 3-fantastic 4-financial 5-novel..

(59) abysmal terror 1-cervical 2-immeasurable 3-cowardly 4-needless 5-stark.....

(60) suasive command 1-temporary 2-suave 3-fearful 4-responsive 5-persuasive ....

(61) honorable appellation 1-position 2-duty 3-title 4-discharge 5-appeal.....

(62) purloin liquor 1-drink 2-buy 3-sell 4-distill 5-steal .....

(63) equivocal character 1-equal 2-equestrian 3-dubious 4-loud 5-musical .....

(64) cupidity in his nature 1-love 2-flaw 3-beauty 4-covetousness 5-stubbornness .....

(65) prolific seed 1-sprouting 2-tested 3-mixed 4-fertile 5-loose .....

(66) a tacit agreement 1-previous 2-unkept 3-verbal 4-written 5-wordless .....

(67) a pungent taste 1-stinging 2-vapid 3-lasting 4-foul 5-sweetish .....

(68) scurrilous jokes 1-funny 2-practical 3-stale 4-vulgar 5-scornful .....

Go to the next page. Do not wait for any signal.

(69) fructify the earth 1-fertilize 2-water 3-plough 4-pacify 5-populate .....

(70) denizens of the deep 1-pirates 2-fish 3-fishermen 4-inhabitants 5-prowlers .....

(71) a trenchant criticism 1-army 2-unwarranted 3-gentle 4-constructive 5-biting .....

(72) a lethal gas 1-fragrant 2-buoyant 3-non-explosive 4-sleeping 5-deadly ...

(73) therapeutic uses 1-electrical 2-curative 3-photographic 4-natural 5-daily ....

(74) simian traits 1-similar 2-inherited 3-acquired 4-apish 5-vulgar .....

(75) anomalous pronunciation 1-incorrect 2-foreign 3-standard 4-correct 5-irregular .....

(76) connubial tenderness 1-hypocritical 2-matrimonial 3-clumsy 4-rare 5-devout .....

(77) a sinuous course 1-lengthy 2-narrow 3-broad 4-winding 5-sinful .....

(78) his animadversion 1-influence 2-insistence 3-verdict 4-concentration 5-censure .....

(79) Genius is ascetic. 1-eccentric 2-self-restrained 3-astute 4-great 5-cruel .....

(80) abject posture 1-enticing 2-groveling 3-objective 4-offensive 5-tired .....

(81) life of an anchorite 1-sailor 2-fish 3-hermit 4-laborer 5-dendrite .....

(82) a polemical writer 1-political 2-exhaustive 3-popular 4-controversial 5-new ....

(83) argent luxuries 1-passionate 2-silvery 3-golden 4-needless 5-necessary .....

(84) long cicatrix 1-road 2-period 3-aviatrix 4-brochure 5-scar .....

(85) They badgered him. 1-teased 2-strapped 3-shoved 4-argued 5-brought .....

(86) a nugatory edict 1-ineffectual 2-royal 3-unjust 4-expected 5-conciliatory ....

(87) charge of prolixity 1-lengthiness 2-terseness 3-favoritism 4-harshness 5-scorn ...

(88) Epitomes are helpful 1-inventions 2-ladders 3-criticisms 4-abridgments 5-manuals .....

(89) an esoteric system 1-socialistic 2-moral 3-secret 4-vague 5-eclectic .....

(90) egregious mistakes 1-trifling 2-linguistic 3-enormous 4-greedy 5-analogous .....

(91) something of a gourmet 1-scholar 2-inventor 3-hermit 4-sinecure 5-epicure .....

(92) an exotic term 1-exquisite 2-erotic 3-foreign 4-expressive 5-obsolete .....

(93) keep them turgid 1-relaxed 2-muscular 3-clean 4-turbid 5-bloated .....

(94) staunchless avarice 1-villainy 2-hatred 3-bleeding 4-flow 5-cupidity .....

(95) furbish you 1-renovate 2-supply 3-teach 4-whip 5-govern .....

(96) vicarious sacrifice 1-holy 2-unselfish 3-substitutionary 4-vicious 5-true .....

(97) emulate his virtues 1-rival 2-describe 3-reward 4-deplore 5-praise .....

(98) a clever stratagem 1-laborer 2-stratum 3-artifice 4-purpose 5-method .....

(99) by a prolepsis 1-relapse 2-anachronism 3-pretense 4-surprise 5-accident ....

(100) epigrammatic style 1-ungrammatical 2-pointed 3-illustrative 4-bold 5-simple ....

Stop here. Wait for further instructions.

TWO-DIGIT ADDITION

Print your name here _____

Print the name of your school here _____

Look at the following addition problems.

8	9	3	8	5	3	7	14	18
6	7	5	6	2	2	2	4	1
14	16	~~8~~	14	7	5	~~8~~	18	19

Two of the answers are crossed out because they are wrong.

In the following problems cross out every answer that is wrong.

7	5	8	9	12	17	3	8	7	12	8	7	14	5	4	8	7
6	4	3	6	2	2	9	6	5	3	9	12	4	6	9	10	4
13	8	11	15	14	19	13	14	11	14	17	19	17	11	14	18	11
13	17	11	9	14	12	3	5	7	6	18	6	14	16	12	14	4
3	2	8	6	5	3	9	8	5	9	1	12	4	3	6	5	13
16	19	19	16	19	14	12	13	12	15	18	18	18	19	18	19	17
3	6	13	16	8	14	8	9	13	12	11	9	7	8	14	16	4
5	8	6	1	11	2	7	4	3	5	7	4	2	7	4	3	12
8	14	19	17	18	16	15	13	16	15	18	13	9	15	16	19	16
13	16	9	18	13	7	3	16	2	7	4	15	12	10	3	9	4
5	2	7	1	2	7	8	1	9	8	13	4	5	2	8	8	12
18	17	16	19	15	14	12	18	11	15	17	19	17	12	14	17	16
16	14	11	9	15	7	12	14	8	3	5	3	6	14	13	4	9
2	3	5	8	2	4	6	5	10	15	12	11	10	2	5	7	6
18	17	15	17	18	11	18	19	17	18	17	15	16	16	18	11	16

When the signal is given (not yet), turn the page and work more problems of the same kind. Work quickly but try not to make mistakes.

Stop here. Wait for the signal.

Cross out every answer that is wrong.

13	10	8	5	3	14	16	9	7	13	12	14	7	5	3	9	6
5/18	7/17	9/17	4/10	15/18	4/18	2/18	6/15	12/19	4/16	2/14	3/17	11/18	13/17	16/19	4/13	7/12
12	15	7	5	9	16	14	13	9	4	7	16	14	8	4	12	11
6/18	4/19	12/19	9/13	7/15	3/19	1/15	2/14	10/19	13/17	8/15	2/18	5/19	8/16	6/10	5/17	7/17
8	14	7	3	9	16	13	7	2	18	15	13	15	6	9	6	4
11/19	2/16	10/17	4/7	7/15	2/18	3/15	4/11	6/7	1/19	2/17	3/16	1/17	8/14	8/17	5/11	9/13
15	14	10	12	8	16	8	2	13	15	6	8	1	9	13	11	15
2/17	4/18	7/17	2/13	10/18	2/19	8/16	4/6	5/18	2/17	7/13	5/13	16/17	7/17	5/18	6/17	1/16
8	12	16	14	8	14	12	11	10	9	5	4	13	11	14	17	8
5/12	4/16	1/17	4/17	7/15	3/17	6/18	6/17	4/14	8/16	7/12	8/12	4/17	7/19	5/19	1/18	6/14
16	14	12	11	10	17	7	3	12	17	14	8	5	15	14	8	4
3/19	1/15	4/17	5/16	3/13	2/19	11/19	6/9	4/16	1/18	2/16	2/11	4/9	4/17	1/15	9/17	8/12
7	9	5	8	13	8	9	13	7	13	12	15	18	15	8	7	14
12/19	9/18	8/13	7/14	6/16	11/19	7/16	2/14	4/11	3/16	5/16	3/18	1/19	2/17	6/15	5/12	5/19
11	15	13	12	16	7	4	9	14	17	13	12	8	7	5	16	14
6/17	3/18	2/15	1/13	1/16	9/16	7/11	2/12	5/19	2/18	4/18	2/14	11/19	6/13	6/11	2/18	3/16
8	16	14	8	13	9	12	14	9	7	4	12	11	18	16	5	7
11/19	2/18	1/15	10/18	6/19	5/15	3/15	2/16	3/12	4/11	9/13	5/18	6/17	1/19	2/18	7/13	8/15
17	14	11	16	8	6	15	15	13	10	12	9	4	2	17	14	8
2/19	3/17	5/17	2/18	7/15	3/9	1/16	2/17	3/15	8/18	4/16	6/16	2/6	9/11	2/19	4/18	6/14
11	16	12	9	14	7	5	13	12	10	7	8	14	13	8	3	9
6/17	3/19	3/14	7/16	4/18	7/14	8/13	6/18	6/18	8/18	8/15	9/16	3/17	5/18	6/14	9/12	7/15
16	12	15	8	14	9	4	8	16	12	11	10	15	8	16	9	6
2/18	5/17	4/19	5/12	3/16	7/16	9/13	4/12	2/19	6/17	6/17	9/19	3/18	1/9	2/17	8/17	7/13
11	15	14	10	8	5	14	17	13	9	3	8	14	12	1	8	4
6/17	3/18	5/19	7/16	8/16	6/11	4/18	2/18	2/14	7/16	9/12	5/13	4/17	7/19	8/17	4/12	9/13
8	5	16	14	5	3	8	16	12	11	13	8	4	9	7	1	16
11/19	13/18	1/15	2/16	11/16	16/18	7/15	3/18	6/18	5/16	4/17	6/15	9/13	2/11	5/12	15/16	2/17

Stop here.

F L A G S

Print your name here _____

Print the name of your school here _____

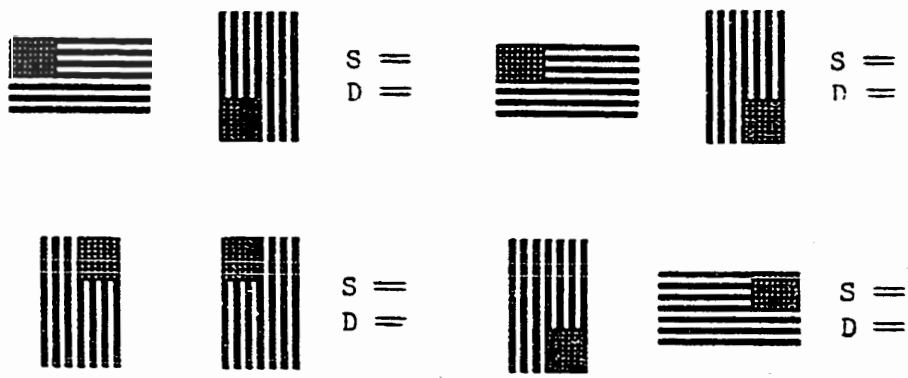
Here are two pictures of a flag. These two pictures of the flag are the same. You can slide one picture around to fit exactly on the other picture.

S is marked to show that the pictures are the SAME.

The next two pictures of the flag are different. You can not slide the pictures around to make them fit exactly.

D is marked to show that the pictures are DIFFERENT.

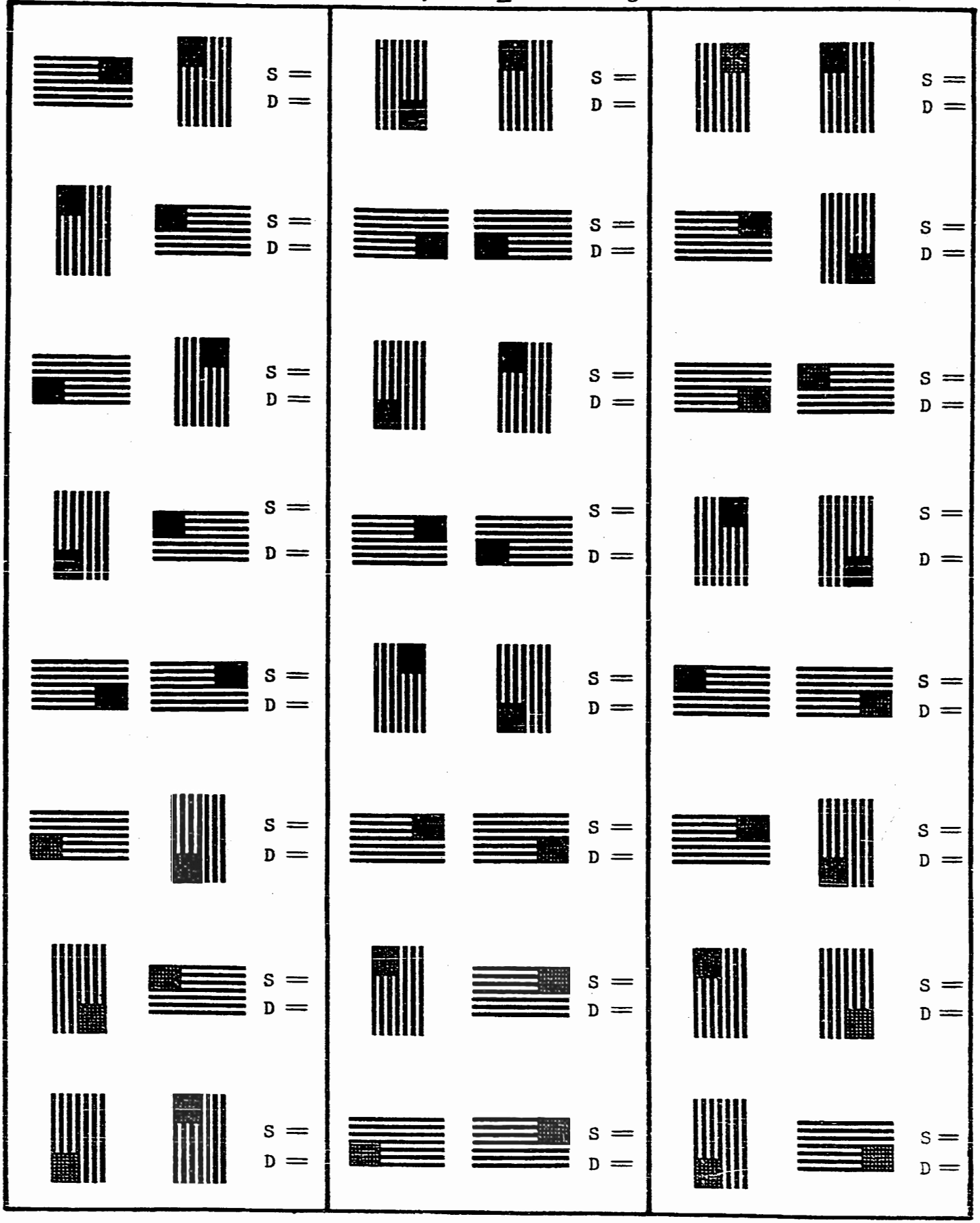
Here are some pictures for you to mark. Try to fit the pictures together by sliding them around flat on the paper. If the two pictures of the flag are the same, mark S. If the two pictures are different, mark D.



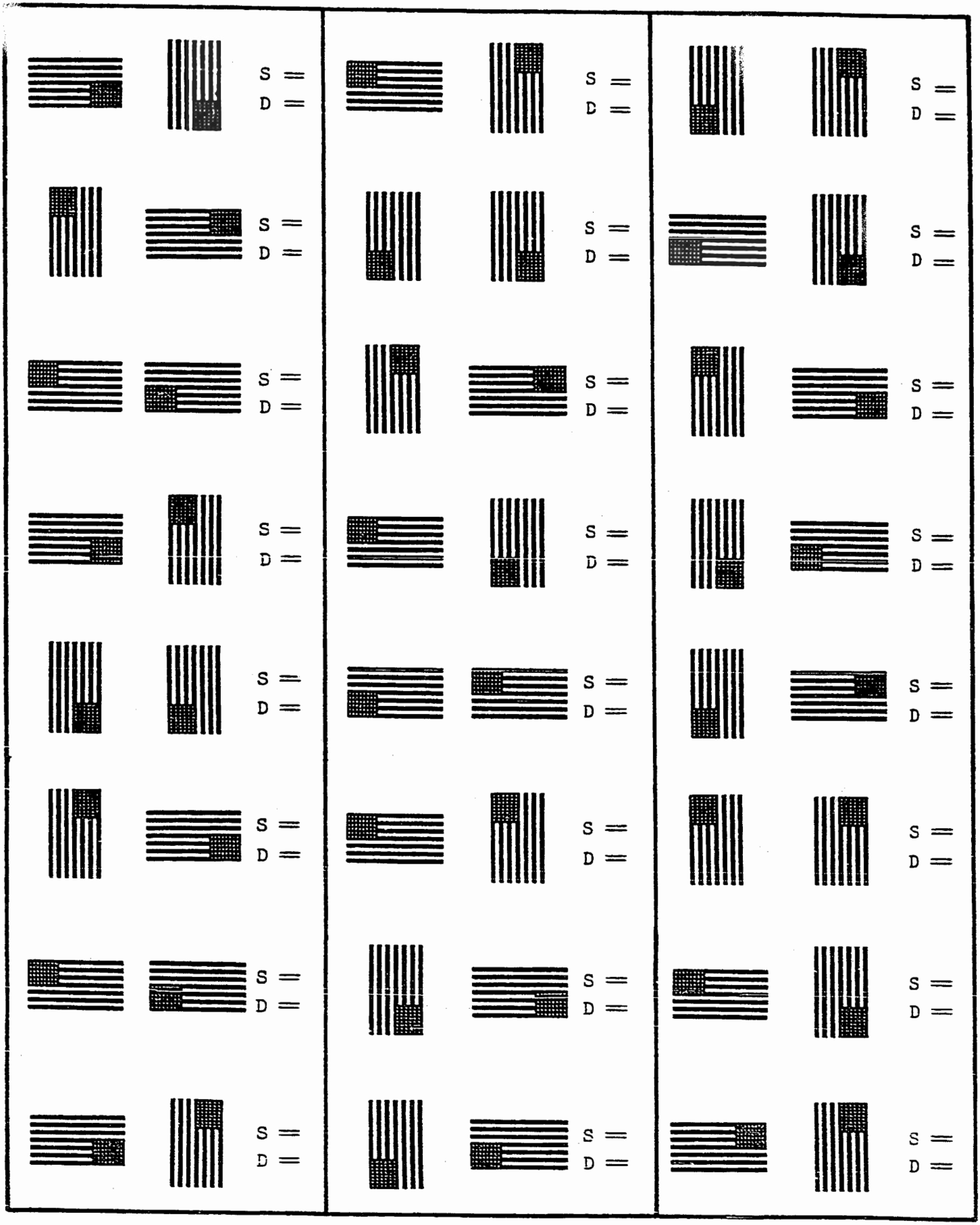
When the signal is given (not yet), turn the page and mark more problems of the same kind. Work quickly but try not to make mistakes.

Stop here. Wait for the signal.

Mark S if a pair of flags are alike; mark D if the flags are different.



Go to the next page. Do not wait for any signal.



Stop here.

F I R S T A N D L A S T L E T T E R S

Print your name here _____

Print the name of your school here _____

Each word in the list below <u>begins</u> with <u>S</u> and <u>ends</u> with <u>K</u>.

soak

stuck

streak

squeak

On the blanks below write several words which <u>begin</u> with <u>M</u> and <u>end</u> with <u>T</u>. The words may be as long or as short as you like; the number of letters does not matter. Go ahead.

_____

_____

_____

_____

_____

_____

_____

_____

When the signal is given (not yet), turn the page. A new beginning letter and a new ending letter are given at the top of the page. Write as many words as you can which begin and end with the given letters. The length of the word does not matter. Work quickly.

<u>Stop here</u>. <u>Wait for the signal</u>.

FIRST AND LAST LETTERS

Write as many words as you can which begin with T and end with E. The length of the words does not matter.

Stop here.

NAME RECOGNITION

Print your name here _____
Last Name First Name

Print the name of your school here _____

The name, Johnson, E. B., is repeated several times in the columns below. Find that name as quickly as possible and draw a line through it. The first two columns have been done correctly. You do the other two columns. Go right ahead. Do not wait for any signal.

Johnson, E. B.

Johan, E. B.	Carter, B. G.	Keeler, A. C.	Emmett, J. C.
Lampe, P. G.	Gilroy, R. B.	Johnson, E. P.	Johnson, D. B.
~~Johnson, E. B.~~	Berry, T. W.	Strobel, B. G.	Holmes, B. B.
Dimock, E. T.	Johnston, P. B.	Marsh, A. R.	Brooks, E. G.
Kraft, J. K.	Parsons, A. L.	Johnson, E. B.	Stevens, T. W.
Marvin, J. G.	Schenley, B. J.	Hanson, W. J.	Johnsen, E. B.
Johnson, E. R.	~~Johnson, E. B.~~	Molden, C. R.	Downes, G. A.
David, E. B.	Underwood, T. W.	Johnson, E. B.	Goodwin, T. W.
Anderson, B. J.	Frances, R. M.	Cowley, F. C.	Johnson, E. B.
Benson, J. P.	Johnsen, E. P.	Runkle, A. K.	Cramer, B. J.

When the signal is given (not yet), turn the page and mark other columns in the same way. Work rapidly and accurately. Mark as many names as possible in the time allowed.

Stop here. Wait for the signal.

Draw a line through each Johnson, E. B.

Rockwood, A. F.	Clayton, H. M.	Johnsen, F. B.	Johanides, C. J.
Jogalsky, B. G.	Johanan, E. R.	Johnholtz, E. P.	Johnsen, J. C.
Johnson, J. R.	Johnson, F. B.	Johnson, E. C.	Johnson, E. B.
Donovan, A. R.	Davidson, J. P.	Whetstone, B. C.	Jacobson, T. P.
Johanek, E. B.	Pearson, C. M.	Jonasson, E. R.	Jonathan, F. T.
Swanson, R. L.	Johnican, E. P.	Johnson, E. B.	Johnmar, E. C.
Johnen, F. P.	Johanesen, F. P.	Johnsen, J. R.	Hampton, C. C.
Larson, R. E.	Johnk, E. B.	Jonassen, F. S.	Johnsen, E. B.
Johnson, E. B.	Johnsen, F. R.	Johndahl, E. B.	Johnson, F. P.
Johnsen, E. P.	Nielsen, T. C.	Johnstone, E. B.	Frazier, A. C.
Blackstone, J. F.	Johnson, E. B.	Johnsen, F. C.	Johnson, E. P.
Jonas, E. B.	Johnson, F. P.	Johnsic, F. Q.	Johansen, E. B.
Johnson, E. B.	Franklin, T. B.	Johnson, E. B.	Johnsen, T. P.
Hudson, J. P.	Johnnie, F. P.	Jefferson, T. S.	Willson, S. C.
Johan, D. Q.	Johann, E. D.	Erlanger, M. R.	Johnson, E. B.
Peterson, C. C.	Johnsen, E. B.	Johndale, F. S.	Lesster, J. P.
Johnsen, R. E.	Johnson, E. R.	Stafford, T. F.	Johnny, F. R.
Johnopolos, E. G.	Stapleton, T. B.	Johnson, E. B.	Harrison, D. E.
Johnson, E. G.	Johansen, E. B.	Johanna, F. G.	Johnsen, C. P.
Johngrass, F. P.	Johannes, F. R.	Johnson, E. B.	Jonen, G. T.
Seavers, F. B.	Johnsen, F. B.	Johnnye, T. C.	Johnson, F. C.
Johnson, E. B.	Johnson, T. Q.	Johnsen, E. B.	Johannesen, F. C.
Johnson, P. T.	Fullerton, D. B.	Griffith, C. J.	Goodwin, C. P.
Marston, S. T.	Leonard, E. D.	Milton, F. P.	Jonson, E. W.
Pearson, B. J.	Johnson, E. B.	Wellman, J. M.	[illegible]wood, H. L.
Jonen, F. G.	Jackson, F. F.	Johnsen, F. S.	Olson, A. T.
Johnson, E. D.	Dennison, J. F.	Lancaster, J. L.	Johnson, E. B.

Go to the next page. Do not wait for any signal.

Draw a line through each Johnson, E. B.

Leighton, J. P.	Jensen, E. C.	Johnsen, E. C.	Johnson, C. R.
Johnson, F. R.	Johns, E. R.	Jorgensen, F. D.	Jolliff, C. P.
Thomson, T. C.	Johnson, B. C.	Houghton, E. J.	Johnson, E. C.
Johnsen, F. P.	Johnsen, F. C.	Johnck, F. P.	Johnsen, E. B.
Johnson, E. B.	Thornton, O. L.	Jepsen, E. B.	Johnson, E. B.
Swenson, W. R.	Johannessen, E. C.	Johnswood, E. C.	Frederick, A. P.
Johnston, T. R.	Johnsen, G. B.	Johnsen, E. P.	Johncours, E. R.
Johannsen, E. B.	Johnson, E. B.	Addison, J. A.	Kelleman, R. K.
Johnson, E. B.	Houser, J. R.	Johnson, E. B.	Johnsen, T. P.
Johnson, E. C.	Jonlick, F. P.	Mendelson, F. R.	Johnson, E. B.
Adamson, P. T.	Johnson, E. B.	Jollands, T. D.	Josen, C. P.
Bookman, B. M.	Cleaver, A. C.	Jillson, E. C.	Stackler, C. D.
Jonscher, E. B.	Jordan, T. R.	Sebert, J. E.	Johnsen, E. B.
Olsen, O. C.	Naughton, A. F.	Johnson, E. G.	Anderson, C. K.
Johnson, F. B.	Johnston, E. B.	Morrissey, W. S.	Jacobsen, R. B.
Johnsen, E. P.	Johnsen, F. R.	Jointer, F. C.	Barton, C. P.
Johanson, F. B.	Prestley, F. G.	Johr, K. B.	Naughton, C. P.
Rathburn, J. R.	Alexander, P. E.	Johnston, E. P.	Odelson, F. R.
Jonsson, L. M.	Johnson, E. B.	Johnson, F. R.	Jonard, E. V.
Wellington, E. P.	Meissner, J. E.	Templar, J. J.	Johnsen, P. B.
Johnstone, E. B.	Jonswold, E. C.	Johnsen, E. P.	Johnson, E. B.
Jonson, F. S.	Johnsen, F. B.	Johnson, E. C.	Jefferson, C. G.
Warwick, T. J.	Steward, H. G.	Underwood, W. R.	Johnson, E. C.
Johnson, E. B.	Johnson, F. C.	Jostsen, H. D.	Jesperson, F. R.
Mohawk, C. D.	Jeherson, E. P.	Tomlison, B. N.	Waterford, E. F.
Clauson, L. R.	Joosten, P. C.	Johnsen, E. B.	Johnson, E. G.

Go to the next page. Do not wait for any signal.

Draw a line through each Johnson, E. B.

Johnson, F. B.	Johnson, E. B.	Johnsen, E. P.	Johler, P. B.
Johnsen, E. P.	Jonasen, E. C.	Jonrose, F. B.	Johnsen, J. E.
Johnican, E. C.	Josephsen, E. G.	Johnson, E. B.	Johnberg, T. W.
Johansen, E. B.	Johnson, G. C.	Johnsen, T. R.	Johnmer, T. P.
Johnson, E. B.	Wilkins, M. P.	Johnsen, L. G.	Eckhart, J. E.
Johnson, F. P.	Jonnsen, E. B.	Blanton, P. C.	Johnen, E. P.
Kimball, T. T.	Reupert, A. M.	Johr, J. O.	Davidson, A. E.
Johnston, E. C.	Johnson, E. B.	Ashton, J. E.	Johnson, E. B.
Lawrence, H. C.	Johnsen, E. P.	Jonquil, G. F.	Jenssen, F. B.
Patton, L. D.	Pickering, E. C.	Johnston, E. B.	Rivett, L. R.
Terrill, C. M.	Johnston, F. P.	Johanson, F. P.	Johnsen, E. C.
Johnson, E. B.	Jonson, F. R.	Johnson, E. B.	Chamberlain, A. P.
Roberts, L. E.	Jamisen, E. G.	Johnican, T. R.	Johnston, E. G.
Jonquil, R. C.	Stanley, C. S.	Byington, T. F.	Walton, A. A.
Silliman, J. H.	Jansen, F. R.	Johnsen, E. C.	Jonalsen, F. P.
Johnsen, E. B.	Ewing, M. T.	Jonrose, F. P.	Johnson, E. B.
Johnson, F. P.	Johnsen, E. C.	Jonscher, J. P.	Jamison, E. P.
Wolford, H. H.	Marshall, C. D.	Johanson, E. P.	Atkinson, M. P.
Joranson, E. C.	Johanson, T. B.	Joransen, F. D.	Jorgansen, E. C.
Smeltzer, A. A.	Johnson, R. C.	Oberman, M. D.	Jefferson, T. G.
Jensen, C. R.	Jackson, H. J.	Jacobson, T. B.	Johnsen, F. C.
Johnson, C. P.	Johnson, E. B.	Jansen, F. G.	Johnson, E. R.
Walder, J. R.	Johnsen, F. D.	Condon, M. P.	Blattner, F. O.
Johnson, E. B.	Johnsen, E. C.	Johnsen, E. B.	Johnson, E. B.
Koestner, Otto	Johnson, E. B.	Jenson, T. F.	Paulson, L. S.
Connolly, R. F.	Johnson, F. P.	Jonaitis, T. J.	Johanns, E. D.
Johnsen, E. B.	Moseley, L. C.	Johnson, F. P.	Johnsen, E. B.

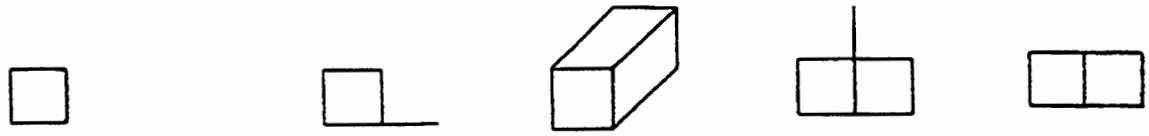
Stop here.

THE GOTTSCHALDT FIGURES

Write your name here _____

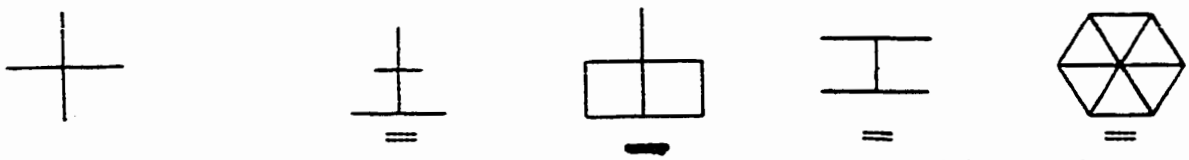
DIRECTIONS

Look at the row of drawings below. The first design is hidden in each of the more complex drawings. Can you find the square in each of the drawings?

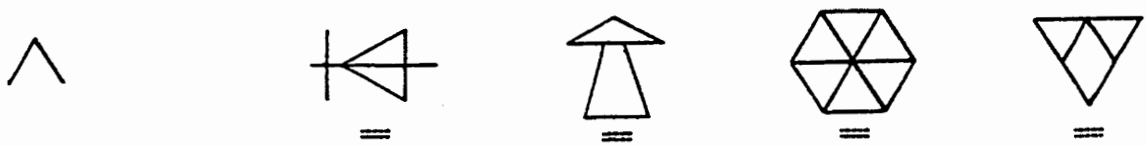


The design must be in the same position in the drawing as shown at the left. In the row of drawings below two contain the design. Those two drawings are marked. The other two drawings are not marked because they do not contain the design in the same position as is shown at the left.

A drawing is to be marked if it contains the exact design in the correct position. Here is another row in which the answers are shown by marking the answer spaces.

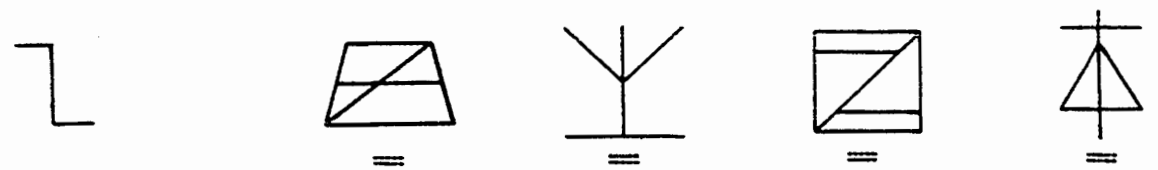


In the next row you are to mark the spaces under the drawings which contain the design.



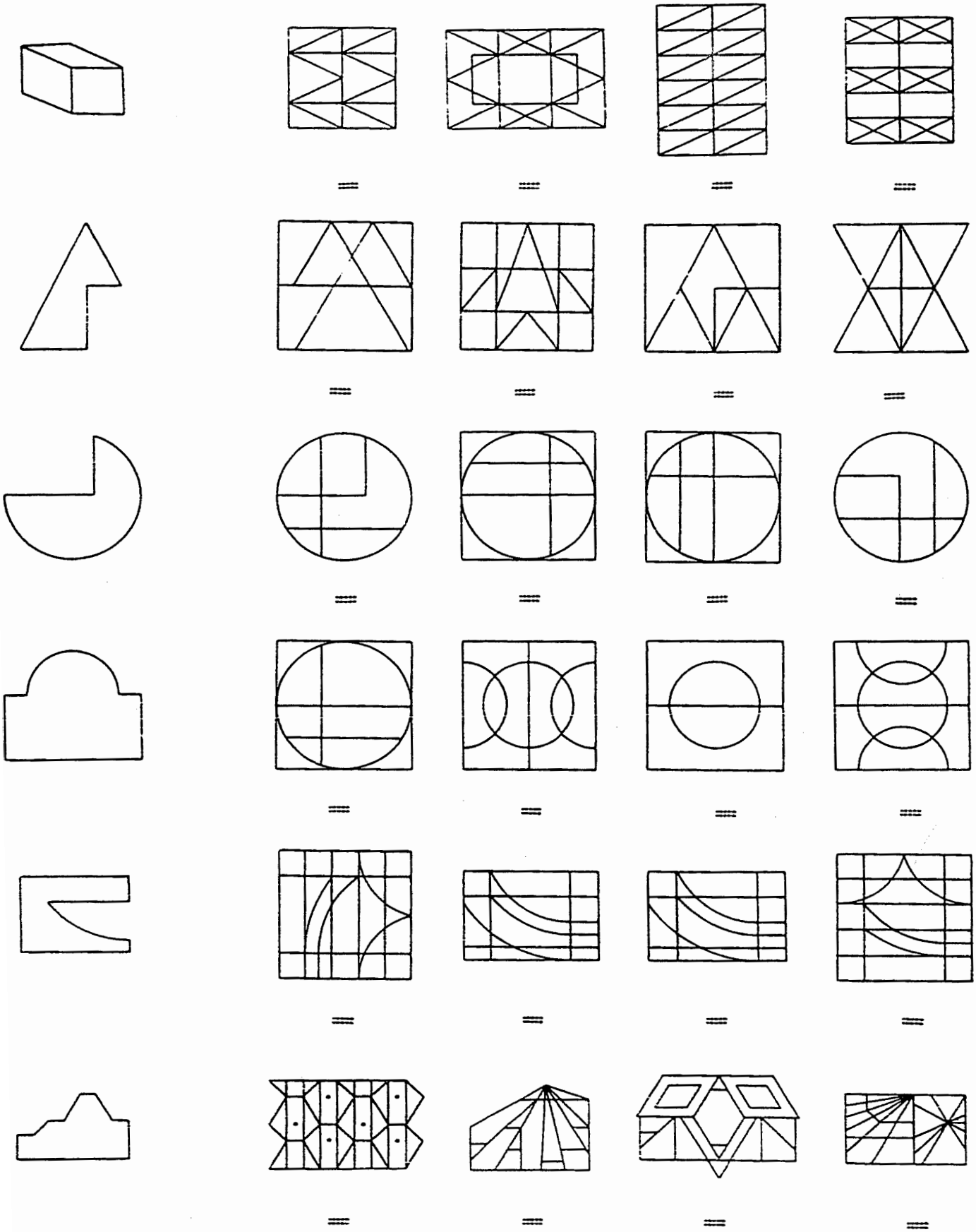
You should have marked the last two drawings.

Here are two more rows for you to practice on.

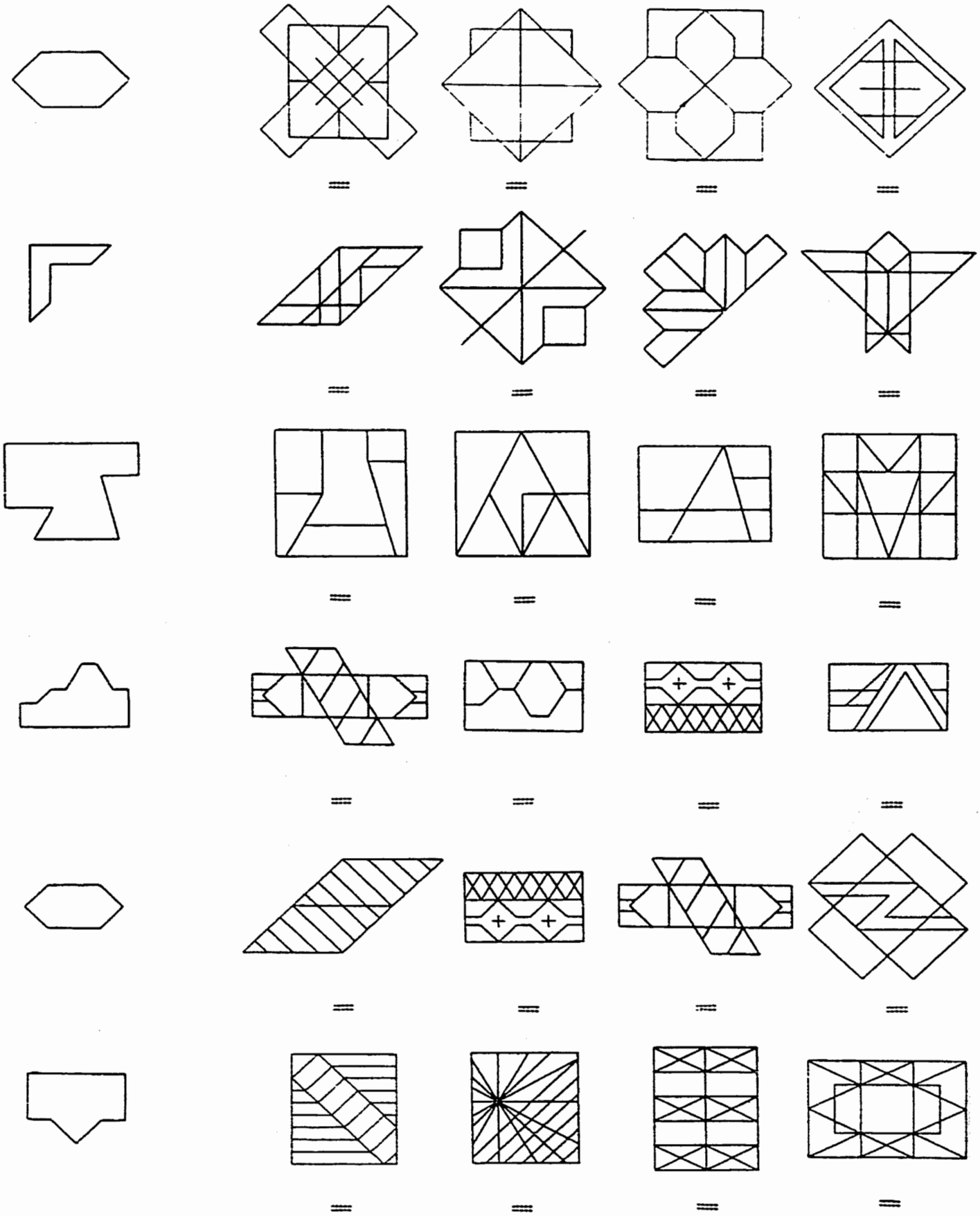


Do not turn the page until the examiner tells you to do so. The following pages contain rows of designs and drawings. If a drawing contains the design, mark it. If it does not contain the design, do not mark it. You will have only a few minutes for this task. WORK JUST AS FAST AS YOU CAN.

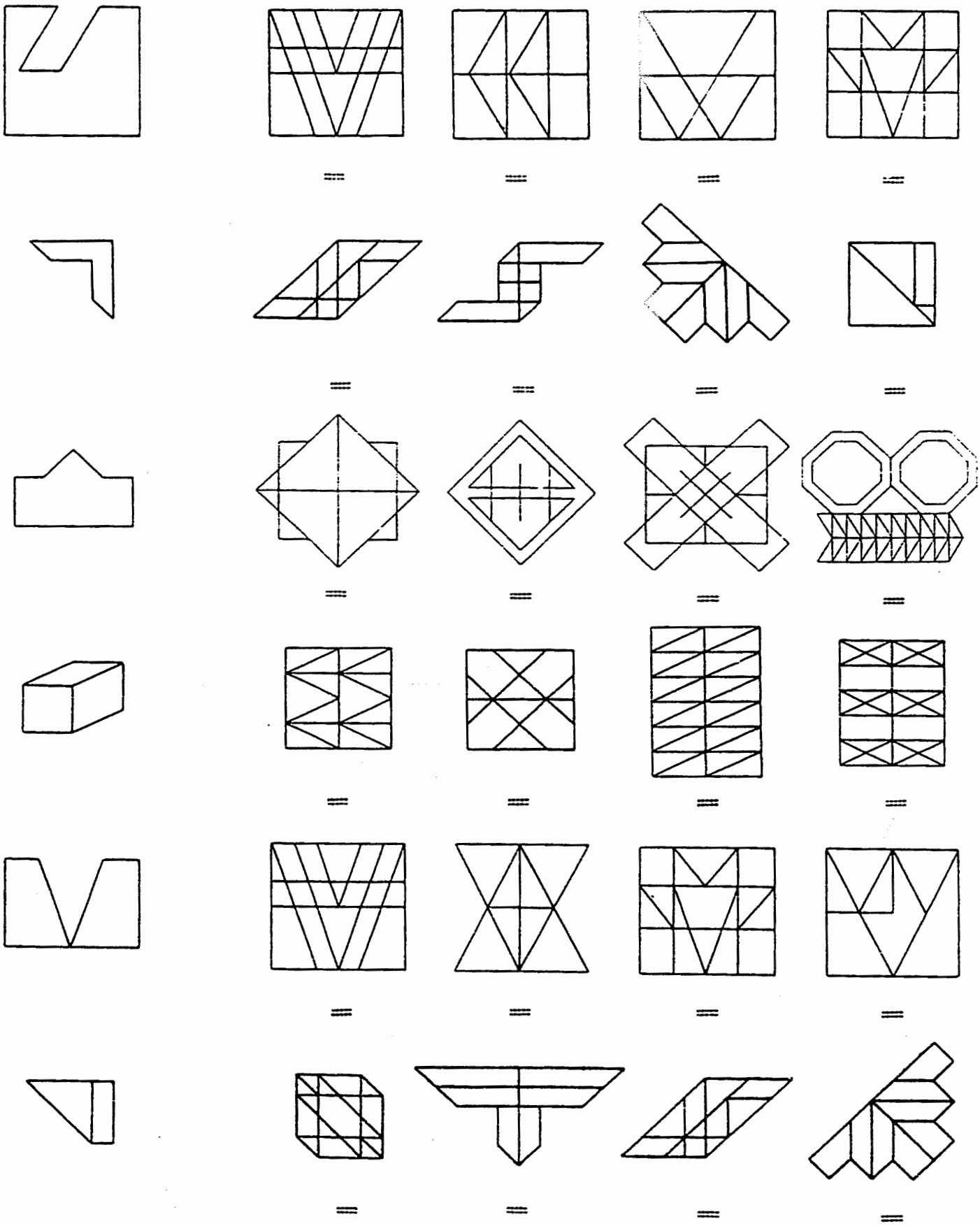
WAIT FOR THE STARTING SIGNAL



GO RIGHT AHEAD TO THE NEXT PAGE



GO RIGHT AHEAD TO THE NEXT PAGE



STOP HERE

SIZE COMPARISON

Print your name here _____
Last Name First Name

Print the name of your school here _____

Look at the following pairs of words. Notice that a line has been drawn through the word in each pair which means the larger of the two things.

~~man~~ - child

puppy - ~~horse~~

grass - ~~tree~~

~~house~~ - door

In the following pairs of words draw a line through the word in each pair which means the larger of the two things. Go right ahead. Do not wait for any signal.

thumb - hand	dollar - penny	ocean - pond
mile - inch	barrel - cup	scooter - tractor
Texas - Rhode Island	foot - yard	kitten - lion
brick - house	cottage - skyscraper	orange - cherry

When the signal is given (not yet), turn the page and draw a line through the word in each pair which means the larger of the two things. Work quickly. Mark as many pairs as you can in the time allowed.

Stop here. Wait for the signal.

Draw a line through the word in each pair which means the larger of the two things.

finger - arm	hoe - plow	church - bell
mouse - elephant	banana - tree	ant - horse
airplane - sparrow	kitchen - kettle	rowboat - steamship
cigar - match	stove - streetcar	razor - axe
mile - inch	napkin - tablecloth	truck - apple
ladder - pencil	ocean - lake	cloud - raindrop
stool - table	car - robin	key - door
Chicago - Texas	lion - kitten	house - brick
canoe - battleship	penny - church	locomotive - buggy
coat - button	harmonica - piano	cherry - grapefruit
goat - mouse	mountain - house	gallon - quart
bird - airplane	scissors - thimble	week - day
forest - tree	rake - comb	basketball - beach
envelope - stamp	stadium - football	minute - hour
door - house	toe - shoe	cow - puppy
carrot - horse	deer - spider	tooth - foot
fly - wagon	peanut - football	skyscraper - cottage
rug - washcloth	man - child	second - minute
stove - spoon	woman - face	nose - face
sofa - stool	ocean - pond	mountain - owl
bicycle - automobile	pencil - basketball	barrel - pint
knife - cannon	army - soldier	raisin - chair
piano - violin	dress - pin	camel - violin

Go to the next page. Do not wait for any signal.

Draw a line through the word in each pair which means the larger of the two things.

leg - finger
inch - yard
cigarette - table
cow - rat
claw - lion
man - pencil
knife-- stove
bathtub - soap
hammer - tack
house - penny
carrot - car
camel - caterpillar
robin - worm
radish - tomato
library - book
wrench - sidewalk
oyster - whale
chair - room
shoe - toe
soldier - army
dress - collar
cigar - factory
cannon - pistol

ball - wagon
ant - dog
blotter - desk
apple - truck
page - book
clock - airplane
creek - river
snowflake - drum
piano - flute
twig - tree
puppy - cow
floor - boot
sky - bird
store - window
butterfly - eagle
needle - clock
ship - stomach
stove - cup
platter - saucer
spider - boy
toothpick - broom
barrel - rose
stock - frog

minnow - shark
towel - sheet
cat - elephant
typewriter - dime
pint - quart
potato - pea
barn - sheep
face - eye
bus - desk
shirt - button
chicken - bug
eraser - table
boat - lake
violin - pin
beet - cabbage
dog - tree
ring - bracelet
house - bed
goat - tree
bottle - castle
grape - fox
ashtray - teapot
garden - axe

Stop here.

TOPICS

Name _____

Often, as in conversations, it is good to have many ideas about a topic. See how many ideas you can think of about the topic you are to be given. Be sure to list all the ideas you can about the topic whether they seem trivial or not. You are not limited to one word. Instead you may use a phrase to express each idea.

Here is a sample problem. Two examples are given below of ideas about the topic, "A train journey." Study these examples. Then go ahead and fill in the blanks with more ideas about the topic, "A train journey."

Number of miles

Catching the train

_____

_____

_____

_____

_____

_____

_____

When the signal is given (not yet), turn the page. Another topic will be given. You are to list as many ideas as you can about the new topic. Work as fast as you can.

Stop here. Wait for the signal.

TOPICS

The new topic is: "A man going up a ladder."

List all the ideas you can about "A man going up a ladder."

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

11. _____

12. _____

13. _____

14. _____

15. _____

16. _____

Turn the page. Go right ahead.

TOPICS

17. _____

18. _____

19. _____

20. _____

21. _____

22. _____

23. _____

24. _____

25. _____

26. _____

27. _____

28. _____

29. _____

30. _____

31. _____

32. _____

33. _____

34. _____

Stop here.

SECOND SESSION

Date _____

Hour _____

MULTIPLICATION

Print your name here _____

Print the name of your school here _____

Below are two multiplication problems. Multiply the numbers for yourself to see if the products are correct.

	64	39
	× 7	× 4
	448	166
R	—	=
W	=	—

The first answer is right so the space in the R row is marked. The second answer is wrong so the space in the W row is marked.

Check the answers in the problems below. If the answer is right, mark the space in the R row. If the answer is wrong, mark the space in the W row.

	57	46	29
	× 6	× 8	× 7
	342	358	193
R	=	=	=
W	=	=	=

Stop here. Wait for further instructions from the examiner.

MULTIPLICATION

If a multiplication is right, mark the first place immediately under the product. If the multiplication is wrong, mark the second place under the product.

53	68	32	82	98	72	94	57	36	65	72	92	58	65	62
6	3	8	3	6	9	7	4	7	9	8	4	7	9	6
318	204	266	236	576	658	656	208	266	585	576	368	406	585	382
R														
W														

28	81	39	47	79	84	56	48	52	66	32	47	56	46	92
4	3	7	8	7	3	4	8	6	3	9	7	6	9	7
112	233	263	376	553	242	244	384	312	194	288	329	396	404	644
R														
W														

57	42	87	78	56	76	35	54	28	63	62	87	75	97	35
4	8	3	4	8	6	7	4	9	6	7	3	4	6	9
238	336	261	312	448	446	245	206	252	368	424	241	302	582	325
R														
W														

66	73	84	92	43	32	74	64	23	58	27	86	39	67	52
7	8	6	3	9	8	4	7	6	7	8	4	9	6	6
462	604	494	276	387	246	276	448	138	406	206	344	351	402	312
R														
W														

59	52	92	38	64	67	34	73	48	89	38	32	97	73	48
3	8	6	4	7	3	9	7	8	6	4	7	4	6	8
157	406	552	142	448	201	296	491	384	524	152	214	388	458	384
R														
W														

24	89	86	69	72	43	75	26	98	26	34	73	59	29	45
7	6	8	4	7	9	3	6	4	8	7	4	6	8	7
158	534	668	286	494	387	225	146	392	198	238	292	374	252	305
R														
W														

36	98	63	36	46	59	85	95	49	37	49	54	43	76	86
8	4	8	6	4	3	7	6	7	9	3	4	6	8	4
312	382	494	236	164	177	595	570	333	353	157	236	228	608	334
R														
W														

68	78	52	56	89	72	69	24	76	42	67	94	54	89	67
8	7	6	9	7	8	7	8	4	6	3	9	4	6	7
544	566	312	504	623	586	483	182	294	272	191	846	216	534	469
R														
W														

23	36	75	82	69	98	53	38	68	36	82	98	72	93	57
6	8	3	7	4	6	8	7	4	9	4	6	8	7	9
148	268	235	574	356	598	404	286	272	304	348	588	556	641	513
R														
W														

62	65	47	79	84	56	48	52	68	34	39	87	64	76	56
7	6	4	8	3	6	4	7	9	8	6	7	8	4	9
434	390	178	632	252	316	182	344	582	292	244	589	532	304	504
R														
W														

Stop here. Wait for further instructions.

COMPLETION

Print your name here _____
Last Name First Name

Print the name of your school here _____

Look at the following definition. You are to think of the word that fits the definition.

1. A contest of speed.

B F M P (R)

The word is race. Notice that the letter R is circled. It is the first letter in the word race.
Draw a circle around the first letter of the word that fits the definitior below.

2. A place or building for athletic exercises.

C D G H T

The word is gymnasium. You should have drawn a circle around the letter G because it is the first letter in the word gymnasium.

Do the following examples in the same way. Do not wait for any signal.

3. The thin cutting part of an instrument, as of a knife or sword.

A B D H W

4. The wife of a king.

F N P Q V

5. A small or portable bed, as of canvas stretched on a frame.

C G N P T

When the starting signal is given (not yet), turn the page and work more problems of the same kind. Work rapidly because your rating will be the total number of correct answers. You may not be able to finish in the time allowed.

Stop here. Wait for the signal.

Think of the word that fits the definition. Then draw a circle around the letter forming the first letter of the word.

COMPLETION

1. The hardened surface part of bread.
   C O R T Z

2. A plant or animal that obtains food at the expense of other living organisms.
   L M N O P

3. An enclosure where grapes are grown.
   G M V W Y

4. Periodical payment for the use of property.
   B C G L R

5. The hand with fingers doubled into the palm.
   C D E F G

6. A formula for making a dish in cookery.
   I M R T U

7. The record of a ship's voyage.
   B D G H L

8. A pack of playing cards.
   B D G H L

9. The power of the chief executive to prevent legislative enactment.
   A E R S V

10. A small flask used by soldiers for carrying liquid.
    A C E M R

11. A very thin gauze-like paper.
    P Q R S T

12. A foreign-born resident of a country of which he is not a citizen.
    A E I O U

13. A long conspicuous or handsome feather.
    G H M P R

14. The tooth of a venomous serpent.
    A F M P U

15. A trench in the earth made by a plow.
    A E F L P

16. A temporary cessation of hostilities.
    A E I O U

17. The fluid part of the blood.
    N O P Q R

18. The complete absence of government.
    A G H K P

19. An allowance of food or clothing.
    B H R T Y

20. The ability to deal with others without giving offense.
    P Q R S T

21. One who explores for gold.
    G H K L P

22. One who wantonly mars a work of art.
    T U V W Y

23. A legally enforceable agreement.
    A B C D E

24. A race in which a disadvantage is imposed upon a superior contestant.
    G H K R V

25. A heavy substance put into the hold of a vessel to give stability.
    A B C D E

26. Flowing back of the tide toward the sea.
    E F G H I

27. A thin cake or biscuit.
    G L P R W

28. Water saturated or strongly impregnated with common salt.
    A B E R V

29. The west wind, or any soft breeze.
    H L Q T Z

30. A self-contradictory statement.
    F H J M P

Stop here.

SUFFIXES

Print your name here _____

Print the name of your school here _____

Look at the words in the following list. Each of them ends with able.

capable

valuable

comfortable

hospitable

Write in the blanks below several words ending with ent. Go ahead.

_____

_____

_____

_____

_____

_____

_____

_____

When the signal is given (not yet), turn the page. You will be given some new letters and asked to write as many words as you can which end with those letters. Work quickly.

Stop here. Wait for the signal.

S U F F I X E S

Write as many words as you can which end with tion.

Stop here.

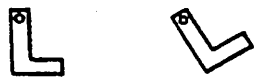
C A R D S

Print your name here _____

Print the name of your school here _____

Here is a picture of a card. It looks like an L, and it has a hole in one end.

The two cards below are alike. You can slide one around on the page to fit the other exactly.



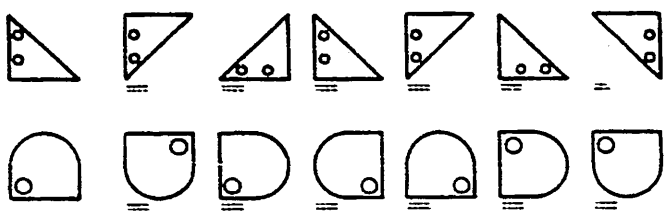
Now look at the next two cards. They are different. You cannot make them fit exactly by sliding them around on the page.

Here are more cards. Some of the cards are marked. The cards which are like the first card in this row are marked.

Below is another row of cards. Mark all the cards which are like the first card in the row.

You should have marked the second and third cards. They are like the first card.

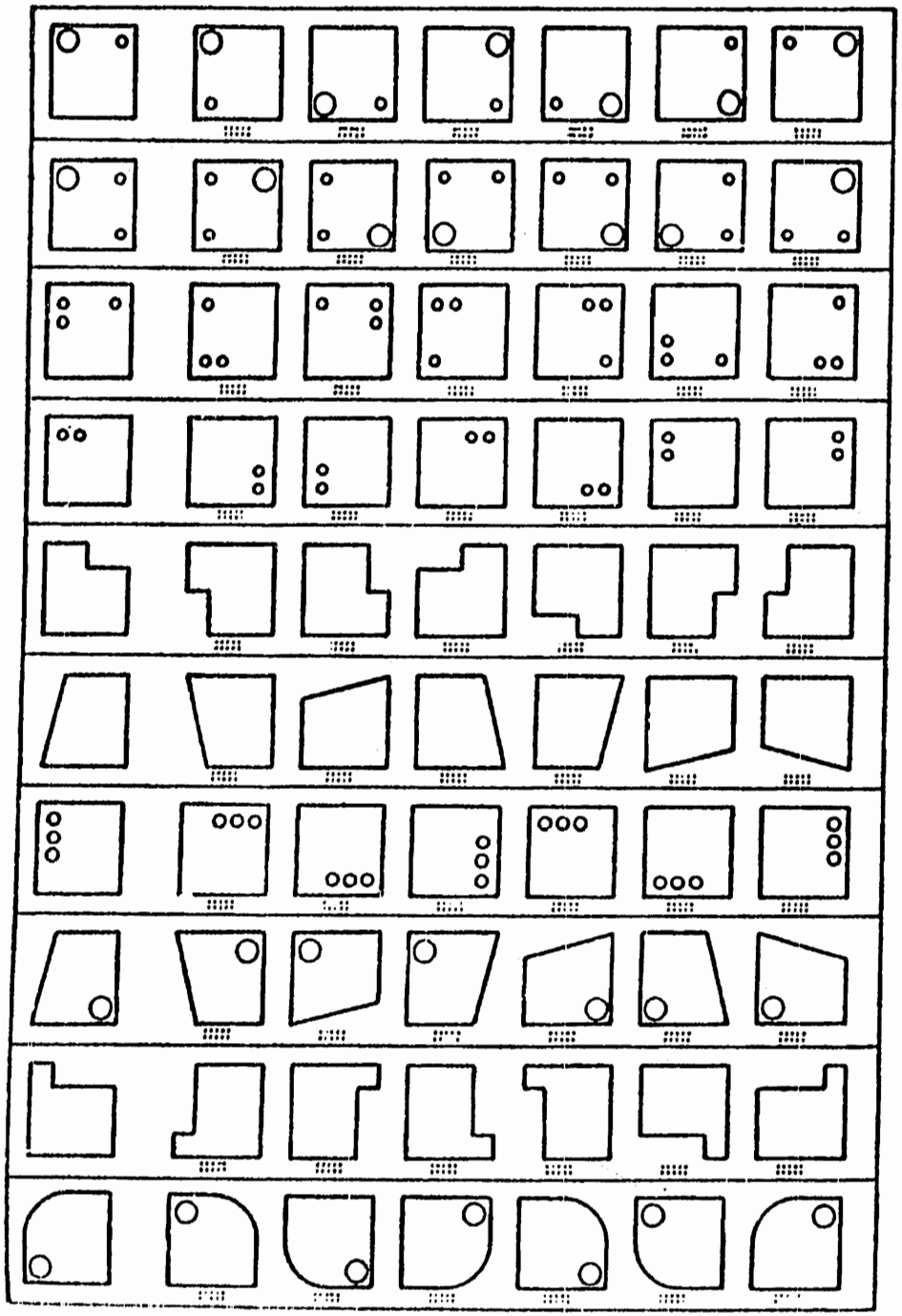
Here are some more cards for you to mark. In each row mark every card that is like the first card in the row.

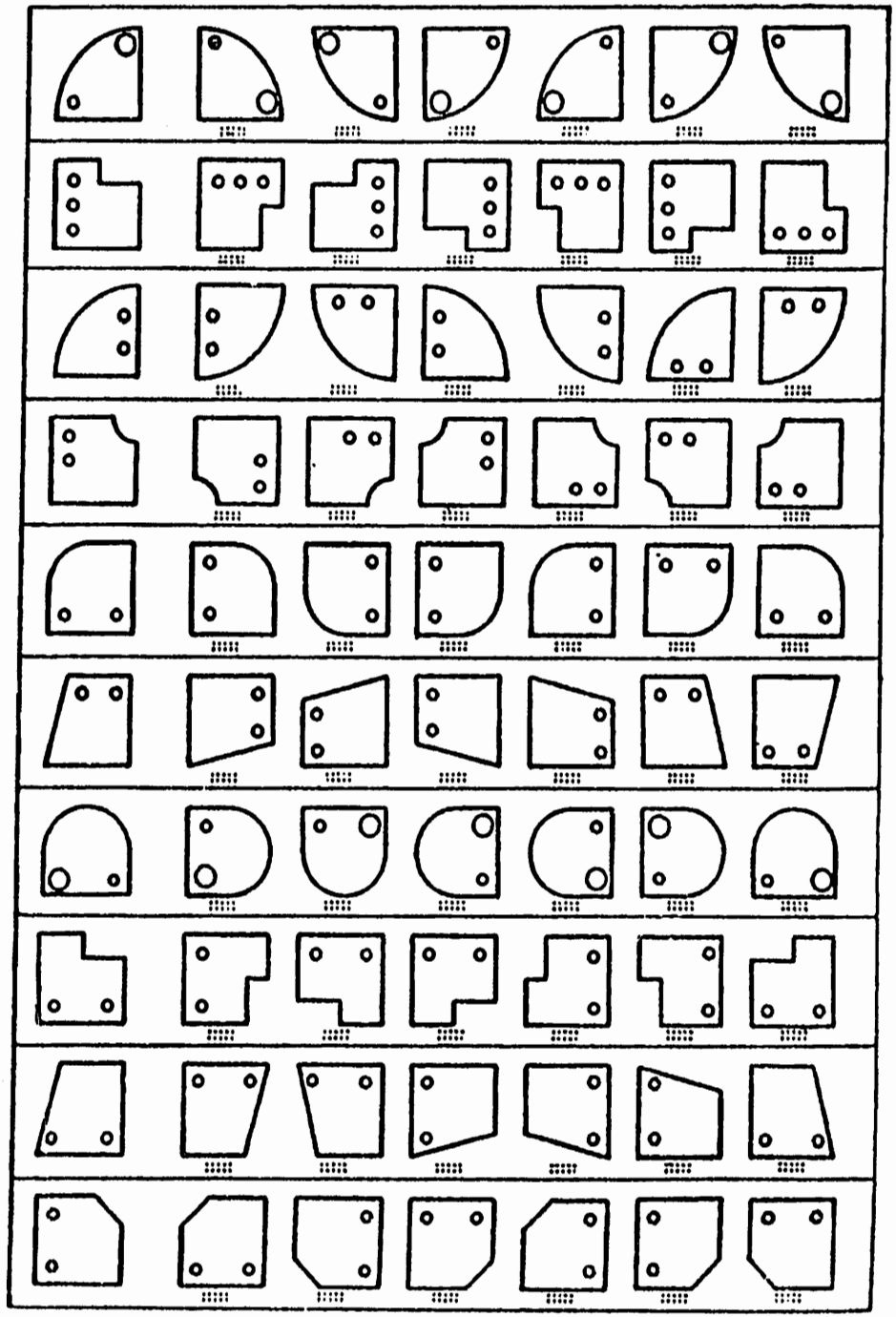


When the signal is given (not yet), turn the page and mark more problems of the same kind. Work quickly but try not to make mistakes.

Stop here. Wait for the signal.

In each row mark every card that is like the first card in the row.





STOP HERE.

HIDDEN PICTURES

Directions:

Look at this picture.

It is a picture of an old man in a buggy.

But hidden in the picture are other people.

One person hidden in this picture has been encircled.

There are two more people hidden in the picture. Find them and mark them in the same way.

You are to find the people hidden in the picture and mark them. In addition, there are other objects, a horse, a pitcher, and a bell, for example. Do not mark them, since you are to look only for people.

The number under each picture will tell you how many people there are. When you find a person's head, or a whole figure, draw a ring around the complete figure. Sometimes there will be only a face, sometimes a whole head, sometimes a whole person. Encircle the whole figure you see.

Go through the entire booklet and find the easy ones on each page first. Then go back and find the hard ones on each page. You may turn the booklet any way you please in order to find the hidden pictures.

Stop here! Wait for signal!

3 people

La petite

5 people

6 people

5 people

4 people

5 people

LETTER "A"

Print your name here _____
Last Name First Name

Print the name of your school here _____

Look at the rows of letters below. Each letter A has been crossed out.

Z B S B H X G

X T J X R F Y

L M V O X E X

X C Q N D X F

Below are longer rows of letters for you to practice on. Cross out each letter A in the rows below. Go right ahead. Do not wait for a signal.

V U T O C M Z C A F M L Z Q K E L A X I E A I B Z W O Z Q N R U T E T A E B

P R T E W C M O Z T E C U D A E F V E H K Z G M S M I C Y F B M N O Q W R D

D C B A L D T Y O N Q O Z J L U V U B R Z M S E Y O D K U Z D E W O L L E M

G J X N U X O O A R R Z C U Y O E L A D A P C X N U P R K K L I T N U W L B

When the signal is given (not yet), turn the page and cross out each letter A as you find it. You may work from left to right or right to left on each row, as you wish. Work fast. Mark as many A's as you can in the time allowed.

Do not turn the page until you are told to do so.

Cross out each A in the rows below.

K D N C Y A N X R E I W O F H G N Z M X D S H J K F V E R A Y U D V C N X

L V M F B X H Z V D T R I W Y D B V G C S A J F G X B A V X C E F H D S E

S K D B C U A O Q N C M S E W T Z C X A S O J G D R E V X M Z N W A N I Q

E O W K A V X H G T R D K G L X A M C V B Z T S H F O G T Q X S R F Y K M

M Z B C R E Y T S F D I Y W G D A V X N Z E W P L A V N W N C T P F A K D

R T S V W B Y X K S G D G C N R K G A M Z W O D K X P A X R W G Z N U R P

L W T X Y Z B S M C R I S H F Q H C P N X H F T Z M U K F C B T U W H B P

Y Q S A P R K G N C R S I W J F H Z V T L V M R F S H D A W H D K G L Y L

B C T D C Z H S K P M N H N C B E R M I W G K E O T P A V N H D L V N B E

T S U W I A G D K E I Q V X A M L P E K S F U J I X P A J D E S Z U C E B

I T H W F S R J X B Z E C O N P Y A M B Y U Q E R V M T X C E I A C X R G

J A H E I Q D O M P X N R Y Z I W F D J S I G Y B Q C N X P E Y Z V R E V

U S D G F E U W I X B E A C H O F P K D G A N X R W P D L H Q G S Y Z B E

H D T R G C M X R E T U T O D G E X V O T A H X V C X A V E U N A H V O T

L M A E S F R Y W U B S J Z M N Y U X V W T H D V H V B A E K H X F A I X

S K H B M X R O P X V I N A E X Z R U R N B I L B C D S H J A E Q L K J H

J T U S K H C M A T U I W X P K B W D J L G M X Q S P B F X C U A Y D V G

T B O U E D J K C L G B W R Z Q I H V A H M C O Y R P H S E W G C K S J M

L H A C N R X I J P Y T J G E N Z J S J T O R K D F E C N A X N U M T G W

B F K E O X P A W S D A V M N K U A J P N L T V E X W Z F Q G W H Y U I D

O K T E W F S A X B Y U J F L M N T E I S F A X G H U C V A W X M K O Y Z

P L M U N Y B R G E X W A Z D V F H Y W I N J L O P B N D X V I E A I K T

D L E N B O H K J Y E O P G D C Z W S V N M K G Y T U J F P L H K L D F B

I H K A T Y E W D G J M B C Z S D E R A H F K P I Y T E F V N A K F S O L

M N B C S A D Z G R I O Y U H G F L B I V O C P M R B Y X R W D F J U P R

Go to the next page. Do not wait for any signal.

DISCUSSION

Name_____

Here you are to write a discussion about a given topic. Be sure to write all that you can about this topic. Use all the ideas you can think of whether they seem trivial or not. Expand on any idea as much as you like. When you have written all you can about one idea start a new paragraph and write on another idea about the topic. Just be sure you write as much as you can about this topic.

When you have finished one page, turn immediately to the next page and go on. Do not wait for any signal. Work as rapidly as you can.

This time there is no practice problem. Read the instructions carefully and then wait for the signal.

When the signal is given (not yet), turn the page. The topic you are to write a discussion on will be given. Write all you can about this topic. Use any idea you can whether it seems trivial or not. When you have finished one page, turn immediately to the next page and go on. Work as rapidly as you can.

Stop here. Wait for the signal.

DISCUSSION

The topic is: "a parcel."

Write all you can about "a parcel."

Turn the page. Go right ahead.

DISCUSSION

Turn the page. Go right ahead.

DISCUSSION

THIRD SESSION

Date_____

Hour_____

WORD CHECKING

Print your name here _____
Last Name First Name

Print the name of your school here _____

In this test you are to mark every word that means something which does not grow and which is smaller than a football. An object is smaller than a football if it would fit inside an inflated football.

Look at the words below.

horse	~~match~~
chair	boat
~~pencil~~	mouse

A line has been drawn through two of the words, pencil and match. A pencil and a match do not grow, and they are smaller than a football. A chair and a boat do not grow, but they are larger than a football. A mouse is smaller than a football, but it grows. A horse grows, and it is larger than a football. Only things which do not grow and which are smaller than a football are marked.

In the list below, draw a line through every word that means something which does not grow and which is smaller than a football.

bird	chimney
cigar	cow
umbrella	watch

You should have marked cigar and watch. They do not grow and are smaller than a football.

Here are some more words for you to practice on. Mark every word that means something which does not grow and is smaller than a football.

bug	saxophone	flea
auto	eagle	door
pen	bed	stamp
typewriter	clam	minnow

When the signal is given (not yet), turn the page and mark more words in the same way. Work quickly, but try not to make mistakes.

Stop here. Wait for the signal.

Draw a line through every word that means something which does not grow and which is smaller than a football.

carrot	fly	ladder	inkwell	table
acorn	rug	fork	davenport	bicycle
attic	onion	violin	bracelet	kite
stove	piano	penny	bench	garage
moon	radiator	buckle	airplane	handkerchief
mountain	bullet	sardine	hoe	lighthouse
pansy	mattress	tennis ball	suitcase	door
cuff	pill	rowboat	pen	faucet
elephant	razor	mosquito	wheelbarrow	rose
key	locomotive	cherry	furnace	tack
gate	stool	bead	turnip	saw
cookie	cannon	necklace	tent	monkey
mouse	eraser	woman	saddle	knife
tree	needle	battleship	yacht	sled
palace	peanut	scooter	nail	man
elevator	postcard	fish	glove	oyster
trunk	river	tractor	potato	icebox
button	canoe	lake	hair	canary
baseball	house	walnut	muffin	cloud
envelope	broom	butterfly	bear	cup
monument	oven	spoon	bath tub	dime
carriage	scissors	crayon	deer	lollipop
trombone	buttercup	pin	whole	stairway
bull	comb	kodak	barn	victrola
earring	rake	wolf	pillow	bench

Go to the next page. Do not wait for any signal.

Draw a line through every word that means something which <u>does not grow</u> and which is <u>smaller than a football</u>.

tulip	thimble	rivet	cigarette	fence
spider	truck	pistol	desk	harmonica
sparrow	slipper	soldier	screw	kitten
pumpkin	hinge	pebble	avocado	zebra
pliers	daisy	teeth	olive	spruce
rug	chalk	bottle cap	vault	ladder
horse	basket ball	salmon	golf ball	marble
hotel	sardine	quarter	camel	quail
shoe lace	stable	spectacle	apple	seal
cattle	pearl	couch	bookcase	trout
diamond	lemon	nickel	organ	boiler
thrush	brick	ape	tiger	eyelid
ruby	match	pretzel	forest	man
sock	germ	crab	billboard	napkin
dagger	wagon	leaf	sheep	anvil
roadster	bubble	cinder	cat	anchor
tumbler	wharf	collar	fingernail	plateau
donkey	radish	cap	washcloth	chimney
skyscraper	nugget	train	rake	maple
cricket	wren	crumb	piccolo	biscuit
tomato	sled	willow	dollar	pool
minnow	match box	airplane	prune	billfold
wall	thread	tuba	toe	rowboat
soap dish	apple	lamp bulb	lion	apartment
bank	pocket	pantry	robin	ring

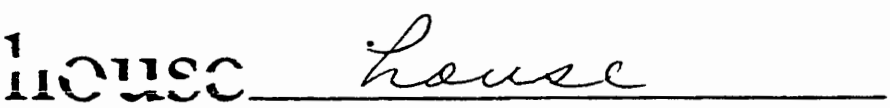
<u>Stop here</u>.

MUTILATED WORDS TEST

Name_____
(Print)

Look at the word house. It has been printed twice, but the second time part of each letter has been erased. Since the word is house, it has been written on the line.

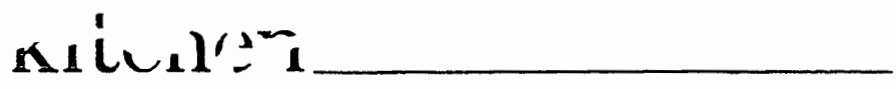
house

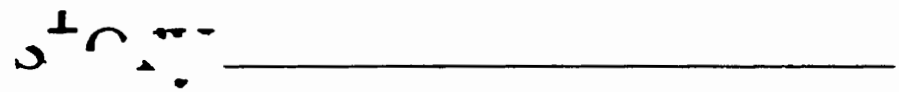


Now look at the word below. Write the word on the line.

You should have written football.

Below are two more words. Write them on the lines.





When the signal is given (not yet), turn to the next page and identify more words. Work as rapidly as you can. If some words are difficult, pass on to the following ones and return later to those omitted.

STOP HERE.

Write the words on the lines. Return later to those you find difficult.

bread ________	[illegible] ________
artist ________	[illegible] ________
pistol ________	sugar ________
pickles ________	[illegible] ________
sweater ________	[illegible] ________
window ________	husband ________
[illegible] ________	[illegible] ________
highway ________	[illegible] ________
college ________	hammer ________
chicken ________	[illegible] ________
[illegible] ________	[illegible] ________
[illegible] ________	turtle ________
[illegible] ________	[illegible] ________

LETTERS c, s, v, z

Print your name here _____
Last Name First Name

Print the name of your school here _____

Look at the row of letters below. Each c, s, v, and z has been crossed out.

r x ✗ a ✗ ✗ w ✗ m ✗ a u ✗ ✗ n a x ✗ e m x

In this test you are to cross out each c, s, v, and z in the rows of letters. The four letters, c s v z, will be repeated before each set of four rows to help you keep them in mind. Go ahead and cross out the four letters, c s v z, in each of the long rows below. Do not wait for any signal.

c s v z

r o a w x z n i x a w s x e o n x c r v a c i n w v m

w n x m z s a e r x u o x v m w a c n v r o i m v u s

x c m r w s a i o u m c v z w n u a o s e v x z e i n

c n o u m z s a r u e c x v i m n a r o x u z e w a m

When the signal is given (not yet), turn the page and cross out each c s v z in the long rows of letters. Work fast. Find and mark as many letters c s v z as you can in the time allowed.

Stop here. Wait for the signal.

Cross out each c, s, v, and z in the rows of letters below.

c s v z

a o s w m x i c z e n v r a i s o e v c m z u s c i n i

s i u v m w v r x z o a s r z c s v o s c z w c n v r m

s e a x z o o m u v n w r s c x z w n i u r w s a z c v

i w u r s m x n v m a w a r o x r u e c v z m s a w r x

c s v z

s e r x c v a i m o n u c v e z r a w v x i n v s r n z

u o r n x v m i w n a z x s e o c u n v a w z x r i m n

n e s r w i z v a c x o m x n s u e w a s n c i v o m o

s x z a o m i u v n m i c r s a x z w r c a e i v c m u

c s v z

v s u c e n r z m a c v r s i m v o m u c r x v z w a c

x a w n e w x o m v c i z s n v a w e o r u m v x z c n

a v x r n v a o n i m u o e c v s a z x e c r x v r s a

u s n x o r v a c w z r x i n r m r s c v w a o i m c u

c s v z

e u a n v c x r x c n v s n m w x o a x a a x a s c v o

m i s n u c u u m o u w m o v a z c s u e s m i v i r n

x n i c r x v w v n x a v u e v r e v w i m v x z n o u

z x u z o x n z s u v z x r c w w s c m n r c r n m m a

c s v z

w o w n a x a c n e r s m o v z c r e s n a i s c v r a

r a x m z m s x m n i x c m e n x a i r m x a x r e i x

c a s z x r m w o w z n x m w r e a s u n a w x s e z e

s v a r w c a z r e z e u e v s m a r n m w e u c s i m

Go to the next page. Do not wait for any signal.

Cross out each c, s, v, and z in the rows of letters below.

c s v z

w e r i o a s m n v x c r z s a x c u n v m r o n a z x m e

o s a r w x v w z i o m v n e r s a z x w m z c s v x n i u

w n x m z s a e r x u o x v m w a c n v r o i o m v u i s a

w a m x n e r u o s i a c v n m r x z a u u e r a s z c n n

c s v z

n i m a x z w c e v r n u o m i r w z s c a r x m n o r u v

a s z x m e c s u o i n m n v m s x z w e r a s a z x x c c

x c m r w s a i o u m c v z w n u a o s e v x z e i n v u x

a c s e r x z m n u o n v x z s a w e i r i v w x w z w u r

c s v z

c v x i e o r n a m s z w s o c u n z m i x a e r w s v m x

n v m x a w e z u x o r a n m i v x c e u r a s z m u n o c

e r n o s m z i x a w r s c v o m v x c a w i u s z v x u n

r a i n u x e c e x s n z o m v e a c z s a s v o m z a w v

c s v z

s w x c n i u s m z a v r c e o u m x n u r e a z o x v m s

m v x a n u e x r v z a c w i m o n u v x v s a e z r u o n

m n c s a x v e z w o u i o n o m v e r s x z x z a c e v m

o w m z a i s c x r a u z a r s w c m v n v u x r s w v a w

c s v z

v n e x w o m u v n i c w a z r s x e u v o c x s a w r z x

z s n r w s a c n v u i x o c i w z e m n i o m n v s e c o

c u x m w v r s i a z n i x o e r c m v z s a i o v c v s a

r o a w x z n i x a w s x e o n x c r v a c i n w v m w u x

Stop here.

BOY'S FIRST NAMES

Print your name here _____
Last Name First Name

Print the name of your school here _____

In this test you are to find the first names often given to boys. The names will be scattered through lists of other words. You are to draw a line through each boy's first name as you find it. The first column of the practice lists below has already been marked. Go ahead and draw a line through each boy's first name in the other columns on this page. Do not wait for any signal.

Aunt	Mary	Subdue	Brass	Dot
Cow	Shadow	Cocoon	Celery	Keel
Chart	Tulip	Ed	Freddie	Yarn
~~Bob~~	Missouri	Elizabeth	Knock	Earth
Groan	Tom	Judge	Plane	Limp
Ball	Kitty	Nell	Dollar	Dallas
~~James~~	Lake	Chess	Grace	Carl
Ann	Boot	Roger	South	Ankle

When the signal is given (not yet), turn the page and draw a line through each boy's first name. Do not mark any other words. Work fast. Mark as many boy's first names as you can in the time allowed.

Do not turn the page until you are told to do so.

Draw a line through each boy's first name.

King	Floor	Africa	Chosen	Interior	Smell
Foot	Owls	Victor	Male	Wool	Chicago
Lemon	Mayor	Caustic	Import	Hand	Cyclone
Steel	Ohio	Famine	Homer	Architect	Andrew
Radish	Rock	Hospital	Physics	Congo	Sash
Glove	Maple	Handle	Depth	Arch	Rain
Edwin	Address	Pawn	Whiskey	Isle	Fred
Arizona	Canada	Cloth	Horse	Money	Newark
Eight	Gladys	Water	Lily	Press	Deaf
Patient	Herring	Pine	Florence	Basin	House
Cabinet	Ruler	Airplane	Alfalfa	Roy	Kennel
Shaft	Panama	Philip	Author	Trout	Socks
Haddock	Esther	Chess	Cocoa	Bernice	Alabama
Richard	Veal	Wheat	Chimney	Drummer	Yellow
Oriental	Poplar	Human	Industry	Gamble	Ball
Union	Waves	Susan	Slope	Arctic	Denmark
Fish	Card	Elmer	Poison	Adela	Storm
Queen	Sinner	Mouth	Leon	Ivory	Harriet
Actor	James	Weight	Cotton	Kettle	Kidney
Month	Panic	Helen	Asiatic	Jockey	Birds
Calories	Vessel	Poppy	Heaven	Detroit	Anthony
Eunice	Ear	Green	Concrete	Axis	Rocket
Vegetable	Jack	Alcohol	Bread	Nose	Auto
Handball	Spruce	Plant	Hazel	Chester	Texas

Go on to the next page. Do not wait for any signal.

Draw a line through each boy's first name.

California	Eileen	Petal	Twins	Likely	Deck
Barley	Clothes	Some	Motor	Professor	Round
Clock	Mail	Measure	Banker	Raymond	Hot
Rye	Snake	Faith	Calvin	Costly	Lumber
Floyd	Yukon	Gems	March	Yard	Hair
Ceiling	Blanche	Speed	Colorado	Georgia	Grace
Draft	Steam	Allen	Possible	Tunnel	Volume
Belgian	Export	British	Electric	Boston	Depth
Nose	Space	Trout	Bookcase	Fields	Wilbur
Eggs	Nail	Lion	Omaha	Ellen	Engine
Elsie	Brian	Gilbert	Leaf	Smith	Song
Law	Blood	Bronx	Crowds	Golf	Law
Sardine	Flock	Fourth	Contract	Stupid	Companion
Pump	Bicycle	Mary	Rocker	Abbot	Volcano
Raise	Male	Decay	Bear	Claribel	Louis
Egypt	Stephen	Violin	Joseph	Orange	Bay
School	Oysters	Bass	Fleet	Glacier	Nickel
Berlin	Spain	Mineral	Gun	Diana	Word
Vote	Delaware	Buffalo	Purple	Navy	Bible
Iowa	Shake	Surplus	Screw	Peter	Friend
Weight	Bourbon	Chain	Alfred	Turkey	Male
Ernest	Fellow	Relief	Tall	Oklahoma	Edith
Water	Defeat	Today	Rose	Virginia	Tom
Blind	Zoo	Dan	Donkey	Rocket	Sole

Go on to the next page. Do not wait for any signal.

Draw a line through each boy's first name.

Baby	Coast	Pacific	Official	Robert	Chew
Disc	Paul	Clod	Speed	Cube	Wharf
Slate	Excess	Ethel	Mast	Balloon	Henry
Type	Iron	Chick	Home	Preach	Fight
Roger	Aroma	Sleep	Tennis	Doctor	Scotch
Marine	Strong	John	Agnes	Chest	Edna
War	Eric	Helm	Jane	Pawn	Pliers
Bishop	Melody	Canvas	Dowry	Tenor	Walter
Square	Eliza	Storm	Clod	Invent	Blonde
Opera	Cruel	History	Compose	Peru	Platform
Cave	Goal	Dunce	Artist	Ann	Taste
Violet	Clear	Edgar	Palace	Embryo	Dive
Mile	Trail	Ashes	Ore	Ralph	Ivy
Quarter	Bulldog	Crush	Train	Ore	Cube
Bulge	Pomp	Fence	Team	Albert	Mossy
Pack	Earl	Maisie	Carl	Gambol	Mine
Well	Castle	Arm	Sordid	Mabel	Lawyer
Radio	Dolores	Rear	Obese	Clinic	Ruth
Jury	Canyon	Shrink	Hike	Conrad	Wood
Pastor	Retreat	Alice	Court	Salt	Skin
Waltz	Wilt	Study	George	Genius	Antique
Meat	Bill	Canary	Polar	Bubble	Wet
Walter	Ruby	Clock	Candy	Charlotte	Norman
Olive	Beggar	Police	Joan	Dawn	Dorothy

Stop here.

DOT PATTERNS

Print your name here _____
Last Name First Name

Print the name of your school here _____

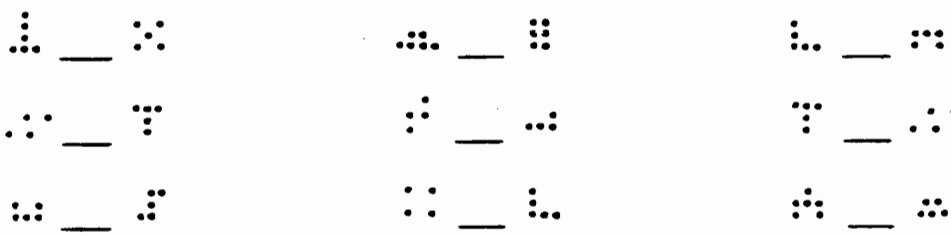
Look at the two pairs of dot patterns in the row below. Notice that a cross (X) has been made on the line joining the two patterns of one pair.

The first pair of dot patterns has the same number of dots in each pattern. The second pair has a different number of dots. That pair is marked.

In the row below, two of the pairs have the same number of dots. Mark the one pair which has a different number of dots in the two patterns.

You should have marked a cross (X) on the line between the second pair of dot patterns. It is the only pair which does not have the same number of dots in the two dot patterns. The first pair has 4 dots in each pattern, while the third pair has 6 dots in each pattern.

In the columns below, mark a cross (X) on the line between the pairs which have a different number of dots in the two dot patterns. Go ahead. Do not wait for any signal.

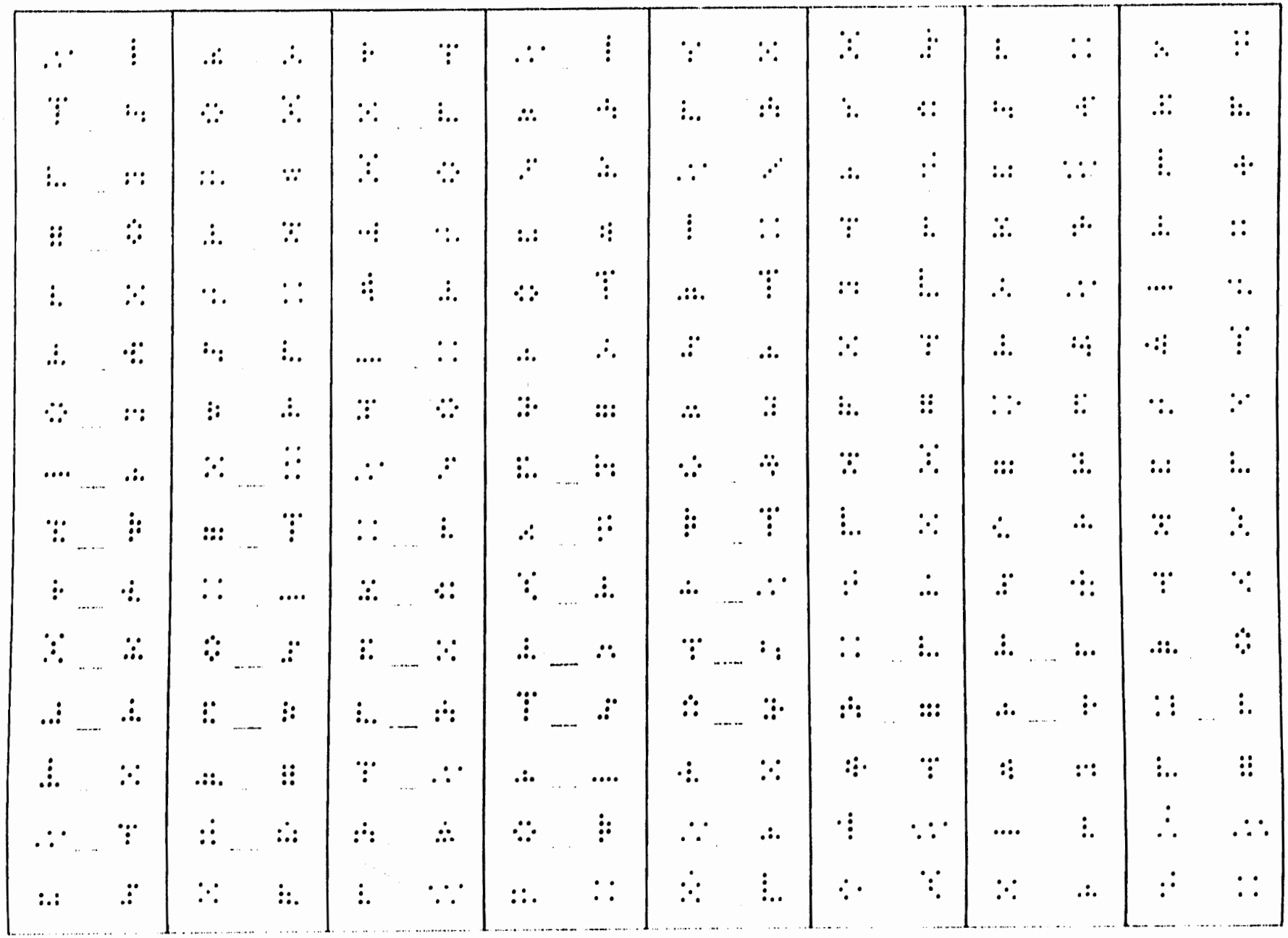


When the signal is given (not yet), turn the page and mark the pairs of dot patterns having a different number of dots in each pattern. Work quickly. Mark as many pairs of different patterns as you can in the time allowed.

Stop here. Wait for the signal.

DOT PATTERNS

Mark (X) the line between each pair which has a <u>different</u> number of dots.



I D E N T I C A L F O R M S

Print your name here _____

Print the name of your school here _____

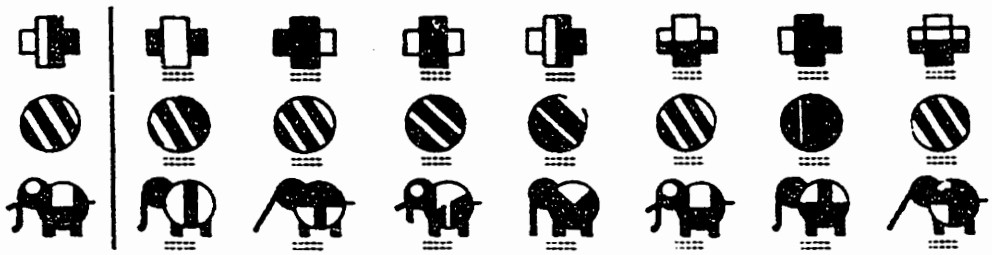
All the pictures in the row below are somewhat alike, but not exactly. Some of the pictures are exactly like the first one in the row. Look at the pictures and find those that are <u>exactly</u> like the first one in the row.

Three pictures are exactly like the first one. They have been marked.

Now you are to mark the pictures in the next row yourself. Look carefully at all the pictures and mark each one that is exactly like the first one in the row.

You should have marked two pictures, the second and the next to the last.

There are three more problems on this page. Go ahead and mark them for practice.



When the signal is given (not yet), turn the page and mark more problems of the same kind. Work quickly but try not to make mistakes.

<u>Stop here</u>. <u>Wait for the signal</u>.

In each row below, put a mark under every picture which is identical with the first.

Turn the page. Do not wait for any signal.

Stop here.

OPPOSITES

Print your name here _____
Last Name First Name

Print the name of your school here _____

Look at the pairs of words below. Notice that a line has been drawn through each pair of words that are opposites in meaning.

~~best — worst~~	winter - fall	~~idle — busy~~
high - tall	~~rich — poor~~	~~little — big~~
~~down — up~~	~~smooth — rough~~	dirty - boy

Draw a line through each pair of words in the rows below that are opposites in meaning. Mark only the pairs that are opposites. Go ahead. Do not wait for any signal.

none - all	death - buried	find - return
late - door	front - back	last - first
cool - warm	deep - shallow	foul - weather
big - man	sell - goods	midnight - noon

When the signal is given (not yet), turn the page and draw a line through each pair of words that are opposite in meaning. Do not mark any other pairs. Work fast. Mark as many pairs of words that are opposite as you can in the time allowed.

Stop here. Wait for the signal.

Mark through each pair of words that are OPPOSITES.

take - all	ceiling - clouds	depart - bright	poor - penny
long - short	high - low	thin - thick	wild - vertical
add - ball	door - open	warm - happy	small - large
soft - easy	dirty - muddy	opposite - far	dusk - fiction
none - wall	shallow - deep	early - always	fast - deer
white - black	cool - wind	light - heavy	moving - day
front - yard	day - night	back - best	well - sick
far - away	stars - night	little - small	shrewd - loosen
behind - subtract	yes - no	down - birth	below - ground
up - down	man - alive	woman - girl	sober - disagree
worst - type	wrong - answer	beginning - returns	bottom - row
smooth - slick	death - town	go - come	expand - fully
all - things	empty - bottle	pull - on	float - old
early - morning	cost - sell	old - new	false - glass
big - dog	top - bottom	off - wrong	pretty - over
dead - man	and - many	winter - spring	south - sun
slow - leak	boy - alive	under - arrive	rough - smooth
hot - cold	find - right	close - open	idle - narrow
yellow - color	true - false	short - tall	in - window
asleep - alive	strong - weak	peace - narrow	pure - timid
white - horse	last - follow	hate - work	shout - fact
lost - stolen	tired - enemy	young - man	night - still
late - tired	soldier - give	back - yard	drunk - build
wet - dry	double - trouble	noon - whisper	girl - boy

Turn to the next page. Do not wait for any signal.

Mark through each pair of words that are OPPOSITES.

busy - war	less - low	noise - loud	lost - found
pretty - below	rich - poor	well - known	natural - rapid
bad - poor	strong - young	rugged - dawn	dry - weather
first - trail	dark - color	heavy - ton	wise - close
before - after	color - fast	young - ugly	low - floor
north - south	front - back	same - way	moldy - floor
push - fresh	thin - man	hard - soft	clean - dirty
sour -lemon	love - hate	thick - rough	distant - begin
midnight - foul	dry - noon	float - enlarge	west - wind
out - in	tall - high	short - heavy	ceiling - dumb
bold - tame	right - length	waste - ready	night - stars
weak - arm	open - empty	slow - pull	easy - idle
tighten - contract	narrow - wide	black - soot	no - some
good - bad	began - brave	sweet - rich	winter - arrive
sink - haste	new - large	near - far	right - wrong
after - noon	bright - polished	sharp - knife	full - empty
equal - degree	come - run	late - early	win - lose
above - below	easy - clean	hot - town	high - dry
orange - second	man - woman	living - dead	give - nothing
sick - fever	fact - true	end - dull	wide - low
hunt - remit	big - little	cold - sick	right - left
slow - fast	loss - time	lean - lanky	safe - sound
reduce - save	lift - level	awake - asleep	loose - fat
large - area	joy - top	no - gain	ball - strike

Stop here.

FIRST DIGIT CANCELLATION

Print your name here _____
Last Name First Name

Print the name of your school here _____

Look at the rows of numbers below. A ring has been put around the first number in each row. The numbers in the row that are like the circled number are crossed out.

(3) 7 2 ~~3~~ 9 0

(7) ~~7~~ 2 8 6 3

(1) 0 8 6 3 ~~1~~

(4) 6 9 ~~4~~ ~~4~~ 1

Cross out the numbers in the following rows that are like the circled numbers at the beginning of each row.

(2) 1 9 5 2 3

(8) 6 7 1 5 8

(5) 9 5 4 8 2

(3) 4 5 3 5 2

Here are more practice rows. Cross out each number in a row that is like the circled number at the beginning of each row.

(8) 7 6 0 3 5 2 1 0 5 8 4 7 9 3 2 6 5 8 5 3 8 0 1 1 8

(2) 5 9 1 0 7 9 4 2 0 0 8 3 4 2 0 8 6 1 6 9 3 5 8 6 1

(5) 5 8 2 5 9 7 3 4 6 8 5 3 2 0 1 9 6 7 4 5 6 7 2 4 3

(5) 3 5 8 0 1 8 1 0 7 4 2 5 7 5 8 7 4 3 2 7 9 0 1 8 7

(4) 5 3 6 9 1 2 2 5 3 7 5 8 0 3 8 6 0 5 3 4 2 1 9 7 5

(3) 8 3 4 7 1 8 2 0 2 7 4 3 6 8 0 1 8 6 3 6 4 7 9 5 5

(7) 4 5 8 5 7 4 5 8 7 3 2 6 8 4 5 9 1 1 0 7 8 4 2 7 6

(9) 6 4 5 4 7 5 8 0 1 8 3 2 5 4 5 7 9 6 8 0 1 7 5 5 9

(1) 0 7 9 5 3 3 4 7 9 1 7 0 4 0 2 3 7 5 8 1 5 3 7 9 0

When the signal is given (not yet), turn the page and cross out each number in a row that is like the circled number. Work fast. Find as many numbers as you can in the time allowed.

Stop here. Wait for the signal.

Cross out each number in a row that is like the circled number.

(4)	1	7	5	9	6	2	0	3	8	5	5	4	1	0	7	8	1	3	9	2	6	8	3	5	1	4	6	7	2
(8)	2	7	1	4	5	7	5	8	3	9	1	8	2	4	6	3	5	2	7	5	2	8	6	4	6	9	3	8	0
(2)	5	4	6	5	0	4	0	7	0	7	2	8	3	9	1	4	6	5	3	5	0	4	6	3	0	3	4	7	2
(7)	1	6	6	7	4	2	0	1	9	1	8	4	3	7	6	5	2	4	8	3	6	5	0	9	1	8	6	7	6
(3)	2	4	8	9	1	7	5	2	6	8	3	9	2	4	0	8	6	7	4	5	4	4	3	1	2	7	0	1	9
(8)	1	2	4	9	6	4	3	4	8	7	6	8	3	5	4	9	1	2	8	2	7	1	6	3	3	5	0	4	5
(7)	6	5	1	4	9	8	2	5	3	4	8	2	1	1	2	1	3	5	4	7	6	4	5	9	3	2	2	5	4
(8)	3	9	0	4	0	7	3	9	4	8	5	4	6	7	2	8	1	3	5	7	4	2	8	8	2	5	0	4	9
(1)	3	1	5	1	2	4	2	7	6	3	0	5	0	4	8	5	2	7	8	9	3	5	4	2	6	4	3	8	3
(2)	6	7	3	4	6	8	1	5	0	4	3	7	2	5	4	3	9	0	6	2	8	4	6	5	5	4	3	3	8
(0)	8	7	0	2	9	3	6	4	6	8	2	5	0	7	0	4	6	5	3	2	9	3	8	7	6	2	6	9	0
(3)	4	3	2	8	3	2	9	3	7	4	4	8	6	4	5	7	2	2	9	3	8	7	0	8	2	4	0	2	8
(9)	2	2	6	7	3	2	8	6	2	3	8	4	9	6	0	5	3	3	2	7	1	2	5	8	6	3	8	2	5
(6)	6	1	2	2	5	8	3	4	9	7	5	5	2	4	2	8	6	2	8	7	2	8	0	8	3	9	1	4	5
(2)	5	8	3	9	0	4	6	3	5	8	2	7	1	4	2	9	0	8	6	7	1	4	2	9	5	8	3	6	2
(1)	0	1	4	2	6	8	0	3	8	2	7	4	6	9	1	8	2	7	6	4	4	3	5	4	6	5	0	7	5
(3)	5	4	6	7	5	8	3	9	4	5	0	7	2	4	6	3	8	1	2	5	3	4	1	1	7	1	8	1	0
(0)	8	2	4	7	6	4	3	8	2	3	3	7	4	9	1	1	5	1	8	4	1	8	2	7	6	6	3	2	6
(6)	0	7	4	8	2	1	2	3	0	9	4	0	6	7	2	1	2	1	6	1	5	5	5	8	3	9	2	1	4
(7)	6	3	1	1	8	4	3	9	6	2	8	7	0	8	6	2	5	4	3	1	2	1	5	8	0	8	6	1	5
(3)	7	5	4	4	6	2	9	8	1	7	5	4	5	8	2	0	8	3	1	7	3	2	9	0	9	1	0	2	3
(5)	4	2	6	2	9	4	3	3	5	2	7	6	3	5	4	1	7	6	2	5	3	5	2	8	7	1	1	6	
(9)	3	3	5	2	7	9	4	7	6	2	5	3	2	1	9	6	6	1	4	2	8	4	6	3	2	6	8	6	9
(1)	7	4	2	3	8	2	9	1	9	4	5	5	3	2	7	3	8	1	9	0	9	8	2	7	1	3	6	4	8
(6)	5	7	6	2	1	1	9	1	8	2	3	7	8	0	8	0	7	6	4	3	2	1	8	7	5	4	4	5	

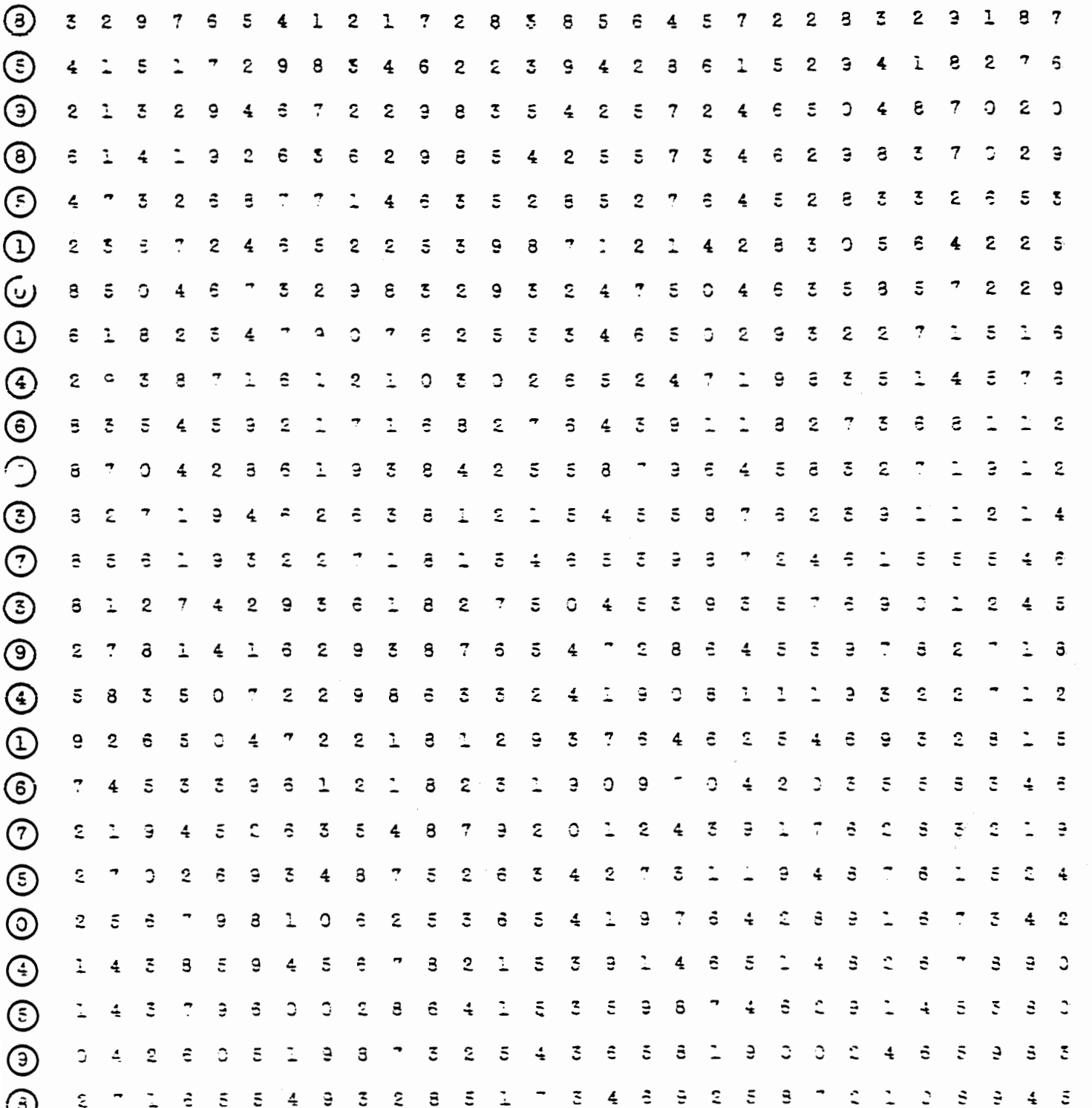
Go to the next page. Do not wait for any signal.

Cross out each number in a row that is like the circled number.

(0)	2	8	5	4	7	2	6	9	3	8	2	7	4	4	5	3	2	8	5	4	6	7	5	2	9	8	1	1	5
(9)	6	4	2	7	6	2	5	8	3	9	1	4	2	2	6	8	5	4	3	7	4	2	6	9	5	1	0	2	8
(8)	5	3	3	2	7	4	6	2	9	1	3	0	6	2	8	0	4	7	0	2	5	8	6	3	3	2	5	1	2
(1)	0	2	6	4	3	9	2	8	6	1	2	0	5	1	7	9	3	2	8	1	3	2	6	4	5	2	2	9	7
(6)	4	5	8	7	4	2	6	5	3	9	2	3	6	1	2	1	8	7	1	2	8	1	5	3	2	6	6	1	9
(7)	3	2	4	5	0	4	2	2	9	7	3	8	5	4	6	3	0	1	2	7	2	4	8	1	3	5	2	1	8
(5)	2	4	6	7	1	8	9	3	2	4	6	9	1	8	2	5	4	7	6	8	9	1	5	4	2	3	6	7	5
(1)	4	7	5	2	8	3	6	2	9	4	2	8	2	6	8	1	9	2	5	4	3	4	6	5	0	8	2	2	6
(4)	6	7	2	3	9	8	8	7	6	1	5	4	5	2	6	7	3	1	9	5	8	7	1	4	6	2	5	3	8
(5)	2	8	3	2	4	9	0	8	2	5	0	3	6	5	5	9	1	8	0	2	0	3	6	7	2	4	6	9	1
(9)	5	3	1	7	6	2	8	3	3	4	8	7	2	9	1	1	2	8	3	7	5	4	0	1	5	8	2	5	5
(2)	6	8	3	4	2	7	1	9	0	8	2	1	6	1	:	1	3	1	9	2	8	7	3	8	4	5	0	4	5
(7)	6	7	2	9	3	8	6	7	2	1	7	4	3	8	1	9	8	7	6	1	5	8	0	1	6	1	4	5	2
(0)	5	4	0	7	6	8	1	2	8	7	9	3	1	2	5	8	3	2	1	9	6	2	2	8	3	7	-	1	8
(2)	6	8	5	1	7	9	2	5	0	4	6	1	2	8	3	5	4	7	6	5	0	1	8	7	6	1	2	3	6
(5)	2	7	6	2	8	3	5	4	1	2	8	9	3	2	2	2	8	8	5	4	6	3	1	2	0		0	8	5
(2)	7	5	0	4	3	2	9	8	6	5	3	2	8	1	2	1	9	4	3	7	2	8	3	4	6	9	1	5	0
(3)	5	4	2	9	1	7	0	2	5	8	6	5	2	4	7	1	2	3	8	2	5	1	9	7	6	5	3	4	2
(7)	1	3	8	5	5	4	6	5	1	7	0	8	2	2	9	3	5	4	2	7	1	8	0	1	2	2	6	1	9
(4)	5	5	3	7	2	9	6	1	9	2	8	7	8	3	6	8	2	4	5	3	9	2	7	1	6	5	2	1	2
(3)	6	7	2	4	1	2	8	5		2	1	7	0	3	5	5	2	4	6	7	3	8	0	2	5	4	0	3	1
(2)	9	8	2	5	0	4	0	7	0	6	3	2	9	8	0	7	1	3	5	4	2	5	-	7	8	3	8	5	0
(6)	1	7	9	8	3	6	5	4	2	0	9	5	8	7	4	5	2	1	9	6	8	5	4	1	3	2	7	6	5
(4)	3	5	1	4	7	9	6	8	2	0	8	7	4	2	5	8	6	7	5	4	1	-	0	2	3	6	4	5	1
(8)	1	7	9	2	6	8	3	5	1	4	5	2	5	6	3	8	1	9	4	5	3	4	2	7	6	5	0	8	1

Go to the next page. Do not wait for any signal.

Cross out each number in a row that is like the circled number.



Stop here.

FIVE-LETTER WORDS CONTAINING S

Print your name here _____
Last Name First Name

Print the name of your school here _____

This is a test to see how rapidly you can find all the five-letter words containing s in a story. Look at the sentences below. Notice that all words of five letters containing at least one s have been marked.

"As the ~~first~~ rays of the sun lighted the steeple, Dick and his best friend, Tom, sneaked down the hall and out of the house, ~~shoes~~ in one hand and fishing rods in the other. The bass were biting at ~~South~~ Lake, and they were not going to lose this last chance for a mess of fish. They had already decided that the inevitable switching would be worth the fun."

Here are some practice sentences. Go ahead and draw a line through all the five-letter words containing an s. Do not wait for any signal.

"Why, at least, was not her husband one of these men of taciturn passion, who work at their books all night, and at last, when about sixty, as old age sets in, wear a string of orders on their ill-fitting black coat? Mary was so distraught with such dreams of grandeur that she had no time for her house or her clothes; she had time only for her misery. Whenever James kissed her, she felt a wild desire to strike him; she clenched her hands, but so far, had not given way to this mad urge."

When you are told to so (not yet), turn the page and mark all the five-letter words containing an s. Work fast, but find as many five-letter words containing an s as you can in the time allowed.

Stop here. Wait for the signal.

Draw a line through each five-letter word containing an s.

It was Karl's afternoon to appear before the faculty of the Paris City High School to account for his various misdemeanors. Since he had been suspended a week ago, his father had called at the Principal's office and had confessed his perplexity about his son. Because the Principal knew this was not the first time Karl had caused trouble, a stand was being taken on the issue. Karl entered the faculty room suave and smiling.

When asked by the Principal as to why he was there, Karl stated, politely enough, that he wanted to come back to school. This was a lie, but Karl was quite accustomed to lying; found it, indeed, indispensable for overcoming friction. His teachers were asked to state their respective charges against him, which they did with such emphasis as evinced that this was not a usual case. Disorder and impertinence were among the offenses named; yet each of his instructors felt that it was scarcely possible to put into words the real cause of the trouble, which lay in a sort of hysterically defiant manner of the boy's; in the contempt which they all knew he felt for them, and which he seemingly made not the least effort to conceal. Once, when he had been making a synopsis of a story at the blackboard, his English teacher had stepped to his side and attempted to guide his hand. Karl had started back with a shudder and thrust his hands violently behind him. The astonished woman could scarcely have been more hurt and embarrassed had he struck at her. The insult was so involuntary and definitely personal as to be unforgettable. In some small way or another, he had made all his teachers, men and women alike, conscious of the same feeling of physical aversion. In one class he habitually sat with his hand shading his eyes; in another he always stood looking out of the window during his recitation; in another he made a running commentary on the lecture, with humorous intent.

Go on to the next page. Do not wait for any signal.

Draw a line through each five-letter word containing an s.

His teachers felt this afternoon that his whole attitude, still unchanged, was symbolized by his shrug and his flippantly red carnation, and they fell upon him without mercy, his English teacher leading the pack. He stood through it smiling, his pale lips parted over his white teeth. (His lips were continually twitching, and he had a habit of raising his eyebrows the least bit that was contemptuous and irritating to the last degree.) Older boys than Karl had broken down and shed tears under that ordeal, but his set smile did not once desert him, and the only signs of his discomfort were the slight trembling of the fingers that toyed with the buttons of his overcoat and an occasional jerking of the other hand that held his hat. Karl was always smiling, always glancing about him, seeming to sense that people might be watching him and trying to detect something. This conscious expression, since it was as far as possible from boyish mirthfulness, was usually attributed to insolence or "smartness."

As the inquisition proceeded, one of his instructors repeated an impertinent remark of Karl's, and the Principal asked him whether he thought that a courteous speech to make to a woman. Karl shrugged his shoulders slightly, and his eyebrows twitched.

"I don't know," he replied. "I didn't mean to be polite or impolite, either. I guess it's a sort of way I have of saying things regardless."

The Principal asked him whether he didn't think those ways should be changed. Karl grinned and said he guessed so. When he was told that he could go, he bowed gracefully and went out. His bow was like a repetition of the scandalous red carnation; he was still the same Karl.

His teachers were in despair, and his drawing master voiced the feeling of them all when he declared there was something about the boy which none of them understood. He added: "I don't believe that smile of his comes altogether from insolence; there's a shade of something haunted about it. The boy is not strong, for one thing. There is something that is not sound about the fellow."

STOP HERE.

FOURTH SESSION

Date _____

Hour _____

2, 6, AND 9

Print your name here _____
Last Name First Name

Print the name of your school here _____

Look at the rows of numbers below. Each group of numbers which contains a 2, 6, and 9 has been crossed out. Notice that all three of the numbers 2, 6, and 9 appear in each of the groups crossed out, although these numbers may be present in any order. If a group contains any number other than 2, 6, and 9, it is not crossed out.

952 924 ~~952~~ 829 627 ~~296~~ 562 639 ~~926~~

297 ~~962~~ 496 ~~269~~ 936 469 ~~629~~ 792 259

Below are several more rows of numbers. Go ahead and cross out each group containing all three numbers 2, 6, and 9. Be sure that only a 2, 6, and 9 are used in the groups you cross out. Do not wait for any signal.

629 695 239 269 927 462 625 698 329 972 694

259 976 956 632 963 829 869 569 769 926 967

264 896 263 697 396 962 526 924 629 952 946

682 629 726 562 692 659 297 526 246 628 269

When the signal is given (not yet), turn the page and cross out each group of numbers containing only the three numbers 2, 6, and 9. Work fast. Cross out as many groups containing 2, 6, and 9 as you can in the time allowed.

Stop here. Wait for the signal.

Cross out each group containing a 2, 6, and 9.

632	279	625	926	246	265	649	236	762	982	297	263	629	694	932
369	692	639	296	965	562	239	246	526	697	259	289	627	294	964
923	392	956	625	976	962	246	396	956	924	956	679	286	426	239
962	862	698	972	628	659	976	276	946	729	698	623	796	968	596
263	928	246	326	632	369	964	462	492	652	928	826	697	264	269
276	923	642	963	726	426	964	925	792	936	293	295	932	927	695
529	276	968	826	693	692	369	396	298	632	952	963	239	627	592
627	268	976	624	986	869	965	276	695	829	269	923	924	256	249
932	942	698	236	792	942	924	869	927	698	965	629	268	829	496
976	297	692	362	682	569	462	496	769	256	649	592	624	629	936
967	529	829	769	625	926	592	268	326	298	976	469	982	529	362
627	926	698	289	689	923	526	659	892	623	268	296	492	526	967
529	965	269	946	265	624	326	298	695	267	289	762	264	972	625
297	892	682	936	392	296	249	726	492	659	896	694	693	729	642
726	962	986	972	627	632	694	289	924	276	369	963	276	627	924
965	769	592	689	269	297	729	279	932	627	956	946	964	726	968
592	256	629	256	268	923	946	892	642	625	692	294	679	729	729
462	426	826	268	249	268	649	326	526	265	682	726	926	369	964
286	689	492	964	693	976	932	829	592	298	659	624	936	962	246
639	923	426	623	652	925	692	624	942	496	624	976	892	326	392
986	265	296	392	239	796	928	792	369	986	698	976	629	469	623
298	296	972	649	965	956	962	968	826	936	396	869	236	297	956
982	268	695	249	627	236	562	625	862	596	697	293	298	965	792
692	967	529	297	267	726	762	239	976	698	263	264	295	632	276
942	362	529	362	492	289	492	982	246	962	972	928	269	932	695

Go to the next page. Do not wait for any signal.

Cross out each group containing a 2, 6, and 9.

952 924 682 829 627 526 762 659 297 526 246 628 246 276 927

963 829 689 569 769 926 967 264 896 263 697 396 659 526 923

695 236 269 927 462 625 698 329 972 694 629 259 956 976 632

632 279 625 926 246 265 649 256 762 982 297 263 629 694 952

932 694 629 263 297 982 762 236 649 265 246 926 625 279 632

964 294 627 289 259 697 526 246 239 562 965 296 639 692 369

239 426 286 679 956 924 956 396 246 962 976 625 956 392 923

269 264 679 862 928 652 492 462 964 369 632 326 246 928 263

695 927 932 295 293 956 792 925 964 426 726 963 642 923 276

592 627 239 963 952 632 298 396 369 692 693 826 968 276 529

249 256 924 923 269 829 695 276 965 869 986 624 976 268 627

496 829 268 629 965 698 927 869 924 942 792 236 698 942 932

976 297 692 362 682 569 462 496 769 256 649 592 624 629 936

967 529 829 769 625 926 592 268 326 298 976 469 982 529 362

967 526 492 296 268 623 892 659 526 923 689 289 698 926 627

625 972 264 762 289 267 695 298 326 624 265 946 269 965 329

642 729 693 694 896 659 492 726 249 296 392 936 682 892 297

924 627 276 963 369 276 924 289 694 632 627 972 986 962 726

968 965 769 592 689 269 297 729 279 932 627 956 946 964 726

729 729 679 294 692 625 642 892 946 923 268 256 629 256 592

964 369 926 726 682 265 526 326 649 268 249 268 826 426 462

246 962 936 624 659 298 592 829 932 976 693 964 492 689 286

392 326 892 976 624 496 942 624 692 925 652 623 426 923 639

623 469 629 976 693 986 369 792 928 796 239 392 296 265 986

936 297 236 869 396 936 826 968 962 956 965 649 972 296 298

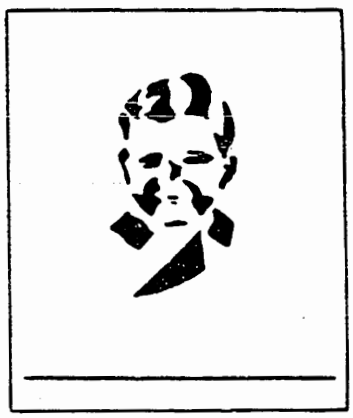
Stop here.

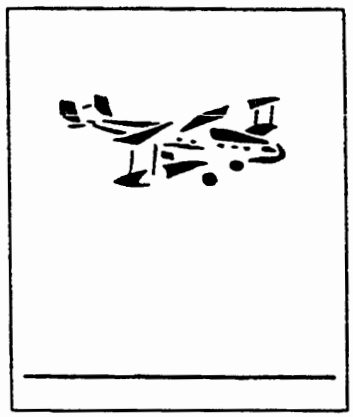
STREET GESTALT COMPLETION TEST

Name_____
(Print)

Look at the figure below. It is a picture of a sailboat, so the word sailboat has been written under it.

Below are some more pictures for you to identify. Write your answer on the lines.



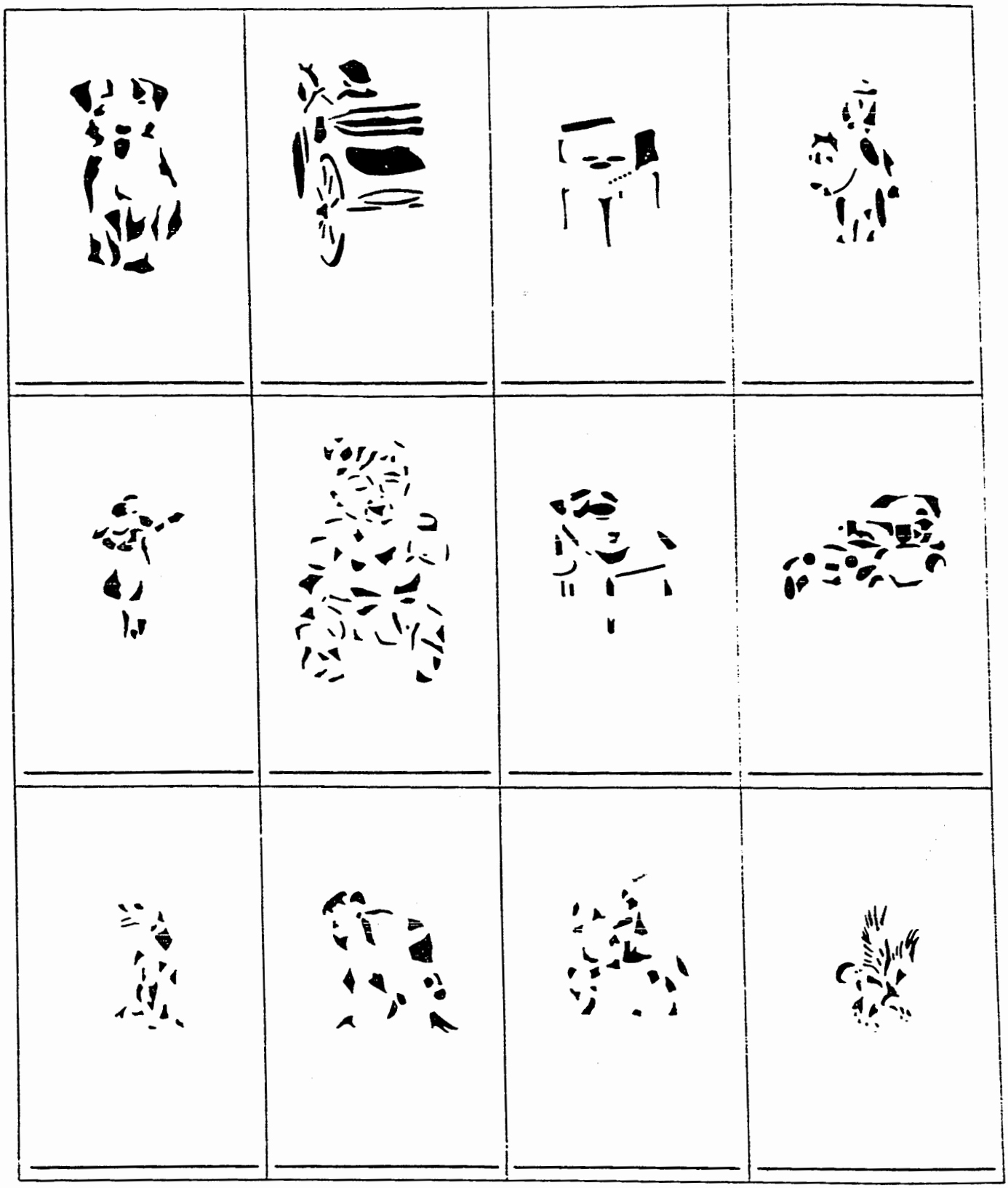


The answer to the first item is boy, or its equivalent.

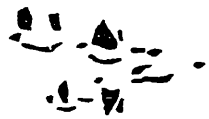
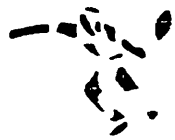
When the signal is given (not yet), turn the page and identify more pictures of the same kind. Work as rapidly as you can. If some pictures are too difficult, pass on to the following ones and return later to those omitted.

STOP HERE.

Identify the pictures. Return later to those you find difficult.



Turn to the next page. Go right ahead.

STOP HERE.

VERBAL ENUMERATION

Print your name here _____

Print the name of your school here _____

The heading of the first column of words below is "Color." Look at the words in this column. Some of the words are names of colors. Notice that a mark has been made under each color. No other words in the column are marked.

The heading of the second column of words is "Fruit." Look at the words in this column. Some of the words are names of fruits. A mark has been made under each of them.

The heading of the third column is "Food." Some of the words are names of foods. Find those words as quickly as possible and put a mark under each of them.

Look at the other column headings and then mark the words in the same way. Go right ahead.

Color	Fruit	Food	Metal	Bird
motor	coast	tower	greet	sled
paper	pear	bread	place	cedar
green	column	cover	allow	robin
class	apple	thread	tender	pedal
poetry	planet	search	answer	gear
dwell	author	near	copper	wren
purple	noise	potato	family	misty
second	banana	crutch	jingle	thrush
liquid	quarter	motor	silver	branch
yellow	apricot	hose	foreign	ridge
switch	quality	meat	part	oriole
deal	minute	claim	brake	blouse
brown	freeze	cart	swim	driver

When the signal is given (not yet), turn the page and mark other words in the same way. Work quickly but try not to make mistakes.

Stop here. Wait for the signal.

VERBAL ENUMERATION

Look at the heading of each column and then mark the words which belong in it.

Flower	Fish	Furniture	Tree	Clothes	Dessert	Bird	Vegetable	Grain	Vehicle	Home	Disease	Insect	Number	Coin
great	meek	wager	lawyer	brain	queen	haste	sweet	relax	delay	grind	style	build	yeast	poppy
above	carp	zebra	poplar	camel	eager	core	groan	tenth	wagon	honor	force	novel	label	usual
split	taper	feast	whirl	honey	cave	wren	humor	lease	short	cheap	crack	beetle	soften	lodge
again	rivet	rural	violin	light	tulip	whirl	glove	stock	gable	sight	store	daily	eraser	talent
engine	dusk	table	crack	debate	vision	fiber	radish	cause	prune	toast	mumps	singe	twelve	chase
store	hinge	daily	quart	banner	emblem	bazaar	force	lemon	stock	avenue	tailor	absorb	blend	bloom
vault	bronze	lease	spruce	aisle	palace	insect	colony	wheat	marsh	queer	degree	origin	insist	penny
daisy	climate	vision	faint	glaze	hinge	might	drill	arrow	kernel	delay	last	frame	jingle	tunnel
roast	eraser	active	lying	shoes	steady	motive	chorus	vocal	plump	wigwam	ninety	handle	fruit	flower
swear	salmon	review	fancy	vapor	moving	broad	next	enact	lunch	choice	teapot	cart	marble	yacht
double	basket	compel	pine	trail	rival	eyelid	bonnet	oats	anvil	orange	pastry	seldom	fifty	split
follow	frost	queen	funny	scale	artist	booth	soft	cart	price	tomato	rhythm	guest	flow	floral
granter	irony	graze	butter	rugged	pudding	loud	carrot	seam	truck	lame	typhoid	debate	night	center
flavor	perch	pause	second	smoke	severe	boiler	wonder	endow	case	joint	candle	energy	stone	dollar
count	drink	grain	sneeze	quail	crash	canary	crash	tenor	pecan	tenth	bubble	locust	seven	listen
theme	geese	trust	cedar	height	hoop	chance	patrol	melted	mutter	knock	lamp	margin	fancy	boat
poppy	breath	blank	method	hotel	cake	giant	voice	junior	match	igloo	recall	joyful	crater	gravel
voice	watch	yeast	grace	engine	sixth	mask	candy	power	crutch	fickle	touch	third	vain	dishes
direct	trout	bridle	nation	stable	eddy	charge	turnip	whence	brass	menace	faucet	magnet	fasten	accent
modern	sultry	insist	maple	couch	pillow	rural	policy	barley	cart	cattle	malaria	winter	eleven	sweep
lilies	budge	signal	bakery	lusty	state	organ	celery	peace	steak	first	polite	hornet	green	canoe
cloudy	bleach	pastry	favor	dress	pie	oriole	seal	civil	attic	plain	measles	twelve	hockey	dime
open	sardine	fourth	encore	advice	bowl	shrewd	touch	have	rule	quiver	monkey	crow	eighty	lark
salute	ladder	dazzle	black	event	grind	queer	valiant	soon	past	summit	trunk	harbor	locket	chain
tulip	smear	shock	limit	apple	excite	inform	barren	rye	auto	mansion	crumb	order	crawl	river
divide	cloth	grape	birch	horse	regret	fence	swing	cup	floor	roar	skate	cricket	magnet	winter
ascent	glass	chair	mine	coat	gasp	thrush	beet	joy	ballot	steep	truth	absurd	high	nickel
column	ample	pecan	absurd	affect	turtle	believe	accent	care	vanish	matter	east	very	wound	famous
origin	cotton	union	hockey	pulley	wrong	wager	denial	glee	buggy	bakery	chess	candle	sober	writer

Turn the page. Go right ahead.

Weight	Body of Water	Car	Farm Animal	Dish	Tool	Liquid	Weapon	Metal	Kind of Wood	Game	Wild Animal	Story	Fruit	Relative
grand	state	gold	aunt	reach	olive	frame	want	mercy	insist	renew	loop	cellar	lemon	vain
clear	glaze	future	cow	daisy	enter	water	ask	far	walnut	stand	style	muffin	frown	erect
trial	bulge	wharf	back	recent	sham	winter	time	west	review	tag	bear	police	north	fierce
degree	trend	paint	far	agree	race	knife	gun	merit	pretty	crust	minor	charm	starch	sister
basket	lake	seldom	edge	dollar	spark	circle	cow	coat	legend	spring	pearl	bather	oyster	poem
guest	twins	drink	harp	runner	cream	empty	most	cinder	anchor	much	flour	plunge	germ	enroll
unity	entire	bubble	chart	start	peak	glass	exit	iron	earth	plant	tiger	paint	plum	subdue
dome	write	sedan	food	pool	echo	couch	bench	haste	retire	juice	color	degree	brisk	timid
cart	hyena	aunt	clay	swerve	call	garret	dagger	weaver	island	cavity	tower	shelf	ball	wolf
ounce	aloft	weak	cover	reason	man	suffer	robin	slope	eager	floor	crumb	foreign	minute	cocoon
vein	pull	around	teeth	saucer	hoe	juice	pane	treaty	worth	tennis	zebra	parent	catch	drift
trust	noon	harbor	speak	four	above	brush	patent	plunge	feast	gleam	candy	voter	health	choose
copy	anger	auto	town	button	wall	stamp	ending	minnow	maple	sweep	image	detour	speed	week
hour	lease	secure	lamb	iron	truth	month	meat	ranch	comb	advice	carve	truth	answer	create
inning	coffee	world	plaid	tape	rake	clerk	easy	lead	gurgle	wealth	limp	noise	second	trust
heart	marble	spare	groan	plate	lunge	pink	chimes	shadow	rinse	scarf	race	glove	tail	music
summer	river	liquid	know	camel	baker	milk	blank	rocky	fully	polo	lion	novel	emblem	aunt
brick	steel	horde	line	meek	sweet	arch	float	every	keeper	sharp	broom	first	brisk	age
acting	glare	coupe	sound	bright	gloom	trout	hose	adjust	cedar	wail	cross	supper	inform	celery
tinkle	them	season	moral	diet	reward	hobble	build	nutmeg	base	blind	record	flood	oblige	sermon
spoon	handle	swamp	plank	boy	ounce	where	cannon	gold	past	frank	wolf	napkin	editor	cipher
expand	order	sweet	voting	very	radio	lamp	pine	sneeze	begin	faucet	first	legend	bench	nephew
ton	ocean	drowsy	horse	cup	metal	ink	radio	dull	pine	chess	flavor	judge	kidnap	mother
printer	silver	shelf	bloom	cast	point	ease	space	pencil	active	part	cloth	lowest	cattle	loan
climb	pond	pair	steady	paste	fire	fool	sword	drain	iron	south	number	fable	orange	swarm
pound	both	canvas	sheep	knot	hammer	opera	four	cattle	soon	golf	leopard	honey	awning	awaken
foot	halt	crowd	glee	train	place	behind	dew	tin	air	bulb	equal	avenue	notion	cousin
grate	windy	dome	remain	yawn	thing	soup	show	shark	oak	span	fiddle	skate	choir	summer
year	creek	reckon	escape	beam	spade	forest	post	danger	bulk	earth	spark	cord	zebra	indoor

Stop here.

LETTER GROUPS

Print your name here _____
Last Name First Name

Print the name of your school here _____

Look at the pairs of letter groups below. A mark (X) has been placed on the line between the groups that are different.

cdef - cdef	zwek X zvek	klzh X klzk
alxr X ahxr	spuk - spuk	bycq - bycq
mfpq X mfqp	dfre - dfre	fqyf X fqqf

Mark each pair of letter groups below that is different. Place the checkmark on the line between the groups that are different. Go ahead. Do not wait for any signal.

wgdj - vgdj	gxeah - gxeah	kfeckb - kfeckb
xief - xief	vrtyn - uytyn	lkgewr - lkgevr
dhjt - dkjt	jluiq - jluiq	jcnbzb - jcnbzd
guhb - gubh	dzyng - dyzng	kfwjub - kfwjub

When the signal is given (not yet), turn the page and place a checkmark (X) on the line between the groups that are different. Mark only the groups that are different. Work fast. Mark as many pairs as you can in the time allowed.

Stop here. Wait for the signal.

Mark (X) each pair of letter groups that is different.

kcef - kcef	cskef - cskef	fwzeg - fwzep
jxat - jxat	vuihb - uvihb	wkign - wkigm
vnij - vnij	cjgah - cjgah	fvuzm - fuvzm
bnej - dnej	luxeq - luxeq	hvgog - hugog
wqih - wqik	vrpyd - vrpyb	cqxiw - cqxiw
vyod - vyob	czqov - czqoy	wdiwj - wdiwj
bwuf - bwuf	vwyuc - vwyvc	ckqey - ckqey
vtgz - vtgz	qnkeh - qnkeh	vgync - vygnc
bvcm - bvcm	vgvic - ugvic	xnzex - xnzex
hvxh - huxh	qmgax - qmgax	dzguq - dzgvq
bhbe - bbhe	cxihb - cxihd	vxuct - vxuct
xtqs - xtps	cqcjl - cqejl	qpfep - qfpep
bgys - bgys	juqam - jvqam	wjqid - wjqid
vduk - vbuk	yvyuz - yvyuz	snqyj - snqyj
ddxb - ddxb	chhjm - chhjm	qzifd - qzifb
rehb - rehb	cjgxn - cjqxm	fkybm - fkybm
lhip - lhip	vqcyj - vpcyj	wajmb - wajmb
mpnb - mqnb	pvqum - pvqum	gyqpw - gyqpw
brkl - brkl	cwkvy - cwkvy	wfojk - wfojk
fehm - fekm	cqvun - cquvn	dhxuh - dhxvh
vwbj - vwbj	dkgim - dkgim	nvqoh - nvqoh
vpqb - vqpb	chdja - chbja	dsijq - dsijq
cbyf - cbyf	xwqep - xwqep	dtleb - dlteb
tvpy - tvpy	cfqyf - cfpyf	nvwef - nvwef
bziq - bzip	jxukn - jxukn	fztov - fztcv

Go to the next page. Do not wait for any signal.

Mark (X) each pair of letter groups that is different.

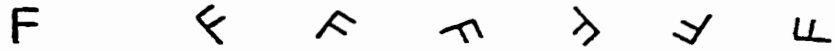
gwzofp - gwzofp	hbzosq - hdzosq	kwwzigh - kwvzigh
hqvuhp - hpvuhp	jkvybr - jkvybr	ndqlepq - ndqlepq
hxfyvp - hxfyup	hzgecs - hzgecs	bnjedhc - bnjedhc
rzgukz - rzgukz	gxzuhq - gxzvbq	zdpjicn - zbpjicn
hjwosr - kjwosr	gjzuvf - gjzuvf	psxfyhn - psxfyhm
wzhyqw - wzkyqw	jbzybr - jbzydr	jdhxump - jdhxump
qtjiqz - qtjipz	kgjuhr - kghuhr	mfcvapn - mfvcapn
zmfycj - zmfycj	shvuxh - shuvxh	cwzfivw - cwzfivw
qbgaqz - qdgaqz	khvyxs - khvyxs	tfpjidq - tfpijdq
jsqufj - jsqufj	kgwogs - kgwogs	ffjxurn - ffjxurn
jzgykm - jzgykm	jxzupc - jxzuqc	cbdliwp - cbdliwq
kcwujt - kcwujt	khzuyn - hkzuyn	hqxvech - hqxvech
cyjehn - cyjehn	hwxazq - hwxazp	dfjzcjp - dfjzcjp
dhgebd - dnqedb	djzaxp - djzaxp	nxmluyf - nxmluyf
pmbyvk - pmbyvk	fygicq - fygicq	pqwjyos - qpwjyos
gjmyzv - gjmyzu	gcyabl - gcyabl	hfkxvwq - hfkxvwq
hscuxr - hscuxr	kmdyqu - kmbyqu	xfkqinp - xfkqinp
ljgicb - lgjicb	mftyzh - mftyzh	gdyoukx - gbyoukx
jynubx - jynubx	qbcehz - qdcehz	rgkzukp - rgkzukp
kvxulz - hvxulz	jfpiws - jfpiws	cfxwutw - cfxwvtw
djyoxm - djyoxm	pqbyjw - pqdyjw	hkyjvcp - hkyjvcp
gpmivb - gpmivb	dbyohp - bdyohp	dfxgedp - dfxgedq
nsdywx - nsdywx	mxgowk - mxgowk	chzxvub - chzxvub
fyxezq - fyxezp	gjmuxq - gjmuxq	ngjzumq - ngjzumq
chkojf - chkojf	mvfogh - mvfogk	qmvixup - qnvixup

Stop here.

FIGURES

Print your name here _____

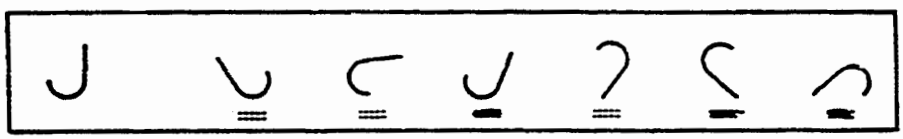
Look at the row of figures below. The first figure is like the letter F which is right side up. All the other figures are like the first but they have been turned in different directions.



Satisfy yourself that all of these figures look like the first one if they are turned right side up.

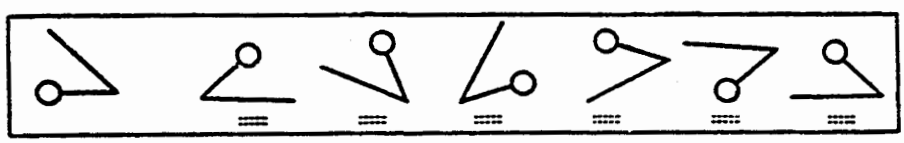
Now look at the next row of figures. The first one looks like an F. But none of the other figures would look like an F even if they were turned right side up. They are all made backward.

Some of the figures in the next row are like the first figure. Some are made backward. The figures like the first figure are marked.



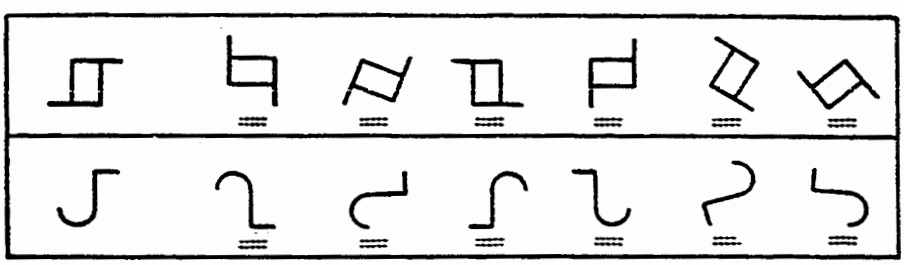
Notice that all the figures like the first figure are marked.

In the row of figures below, mark every figure which is like the first figure in the row. Do not mark the figures which are made backward.



You should have marked the first and fifth figures.

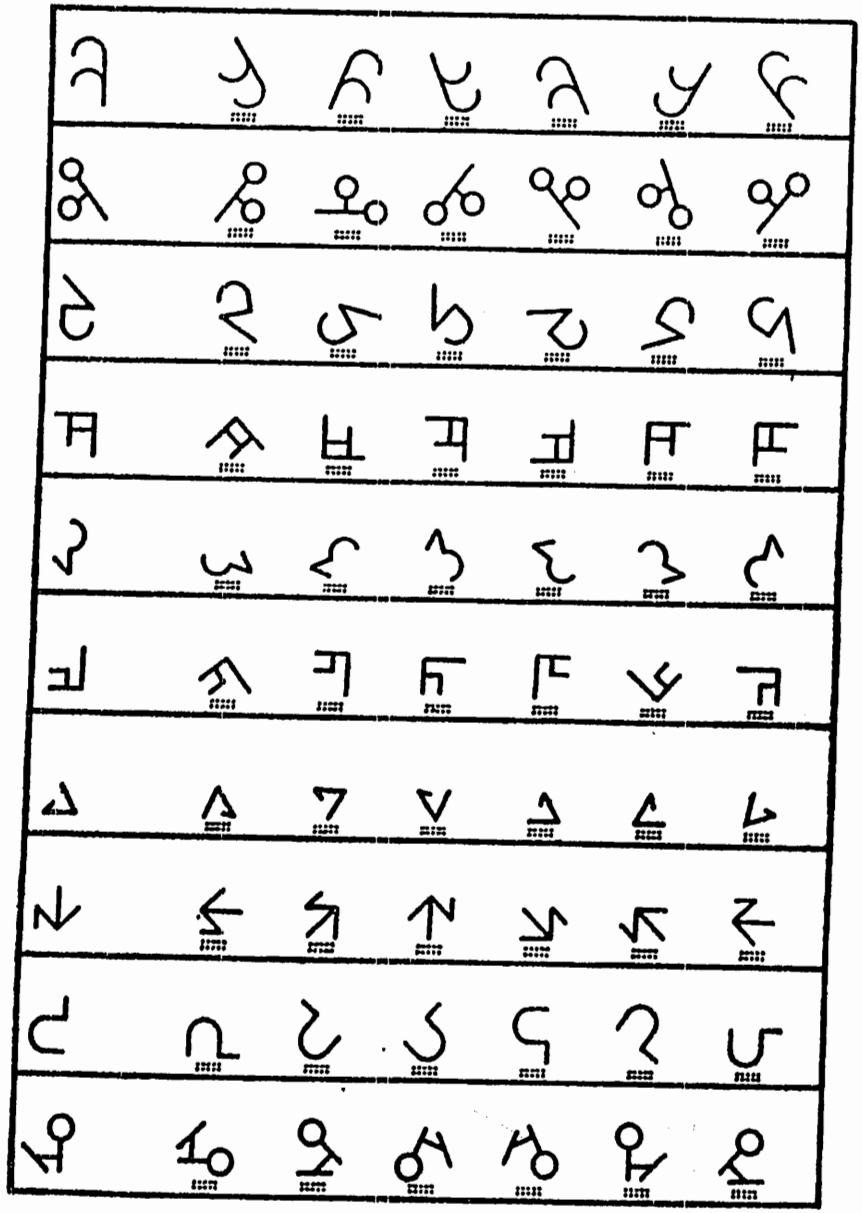
In each row below mark every figure which is like the first figure in the row.

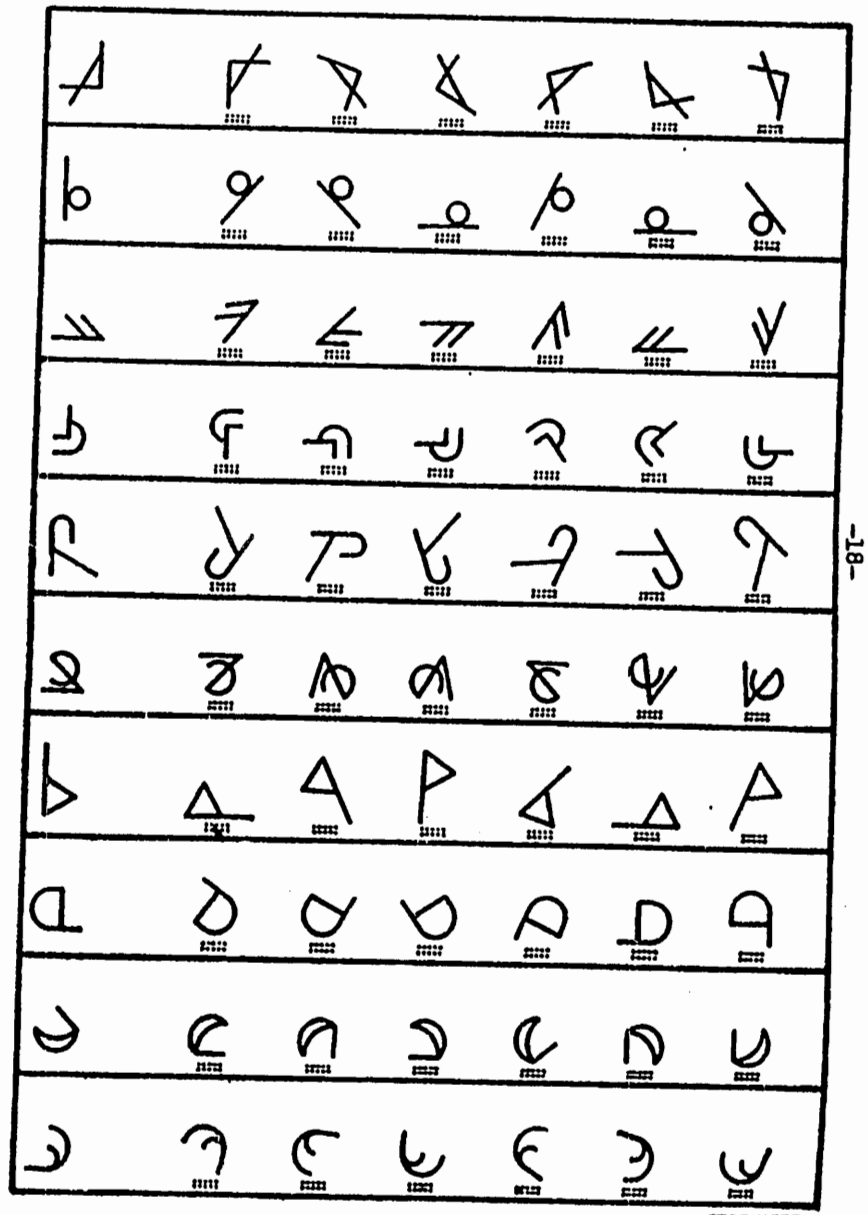


Stop here. Wait for further instructions from the examiner.

FIGURES

In each row put a mark under every figure which is like the first figure in the row.





STOP HERE

FOUR-LETTER WORDS

Print your name here _____
Last Name First Name

Print the name of your school here _____

Look at the row of letters below. Notice that a circle has been drawn around groups of four consecutive letters that spell out a common English word. Only four-letter words are marked. The same letters are used in only one word at a time.

A M G E (W I N D) T E Y K Q C I (R O C K) W Z E (H O W L)

(B E L T) O F (H U L L) V A Y F S M I (P L A N) (F O U R) Y

Below are more rows of letters on which to practice. Draw a circle around each set of four adjacent letters which spell out a common English word. Go ahead. Do not wait for any signal. Read along the rows from the left side of the page to the right side.

K I Y O U R G A C S P I H A N D V Q Z J U X D I E D

V O R S P R E A D U O F T E B E E N A Q F A U N T A

X J A K C O W B N O S E M I Q U E S T F A S T W D M

E L B I A B E S T Y R E K D O W N G U T N E L A S T

When the signal is given (not yet), turn the page and draw a circle around each set of four adjacent letters in a row that spells out a common English word. Go from left to right in each row. Work fast. Find as many four-letter words as you can in the time allowed.

Stop here. Wait for the signal.

Draw a circle around each four-letter word in the rows below.

O F A C E D A F H I B A N K O U L L W E Y J A L P L A Y C I S K E L G Q U T U Y E F O S P E F K I W H A T X A

J A T X G I R L E C V I O Q U P G H I F A L L P O Y W D G S H I P Q V I G T N E X T I N D H E T A L S O S T V

G H S E N D R E H Q B V T Y S H K L O Y M I Z O N E K X C A L L B C I T L X O Y S A K E V E R W H A J C B I N

Q B E S T V Z E T R O I N G L P A Z X E A H O L P E R T P I A W A Y S M Y I N Q Y O T I H D A R K B T U S J C

B E P A R T U R G I X B F A S T H I B L U E R T Y W B I Z G S O F T T F H E G T C C A M E L I C B R A Z I N K

Y O D H A L F Z A D D M L J L U I Q E B I R D P W B A L O V E Y U T O P R J H U D O W N D E X I N T S M E B Y

U T P R H I G H K E O H F S G E I Q R E S T O L I N C O R N T R E S L H U I O J H E D A X C J E K O S F A L L

I M E B U R N L E N M W K C I S H O W V I U J U S T B W E M T C I T Y U W Q U Z R Z X Y P H R I C H W J A Q U

T O N L Y A C Q U R S T U A H I T R I W L I R A I N U G B L U K G E W O L F E S A Z T M G R I C W M E J U Y P

Q D O H T O L P F I V E O S T U R N D I D R U Y T D O D W I T H G E B G V X E W O Q H T W O E S A R M Y E S K

U O L K F U L M L U C O A L P E F S X I T U A B R O T U L B R I N E C K T O X S G R E X S E D G E R W I K A C

W I K W E A K S A Z E A S T S J C I M L U W H A J C R A C E D G C H N O N E T O W P L A H G H A E Y E H F J K

E V Q I T A Z H U R T T Y A L Q I S U W P U E R B C I S A V E O K C A K E V E L N E J O H R A S K E F L X I N

Y A R D L L X R H T O U W A V D Y U J K O M R T R I P L A K G E H O M R I J A T X C A S F L O W Y O R X Y M

P H L I K E B U L W P P E O R I H T M S P Q I W O H E K I C B T I Y N U S E M M C F L A G C U I R Z E V O H

J C I M R U S H D U I D N L A K E O O R K S K I C O S T L Q U W O P I T Y D I W E R N A H N A D T W A S H I A

E R T S A F E U A L I H A V U B A R K U C E E S Y N K I P A I R K O M L A R O S K E V I L N R Y O M P E V R O

Y P V O B I R D O P R O Q U J D E Y T T O L G S T I R N W I F E O K A R X A F O S H O E I O K R I S R Y O R

Stop here.

LETTER SQUARES

Print your name here _____

Print the name of your school here _____

This square has 16 letters in it.
They are arranged in 4 rows and 4 columns.
In only one row or column has a letter been repeated.
In this square the letter v was used twice in the third column.
The column has been marked to show where the repeated letter is.

u	s	v	m
v	r	m	s
s	m	r	u
m	u	v	r

In this square find the row or column which has a repeated letter in it. When you find it, put a line through the whole row or column.

k	b	t	d
d	t	h	b
t	d	b	k
b	h	d	h

In the last square, you should have marked the bottom row.

Here are some more squares for you to practice on. In each square, mark the row or column in which a repeated letter occurs. Diagonals do not count. You will be able to go more rapidly if you scan the whole square instead of checking row by row or column by column.

w	h	s	r
r	u	w	n
u	w	n	s
n	s	u	r

z	u	s	x
u	w	z	u
s	z	x	w
w	x	u	s

k	b	h	d
h	f	k	b
d	h	k	f
f	d	b	h

r	s	m	u
e	u	r	m
m	e	u	r
s	m	e	s

e	m	s	e
r	u	e	s
u	s	m	r
s	e	r	m

m	v	e	s
e	x	s	m
x	m	x	v
s	e	v	x

x	w	r	s
r	x	u	w
u	w	s	x
s	u	x	r

h	d	p	b
b	p	q	h
p	q	b	d
h	b	d	q

There are three more pages of letter squares. You will have 5 minutes to go as far as you can, so do not spend too much time on any one square. Wait for signal.

In each square, mark the row or column in which a repeated letter occurs.

h g y p g d p h d y h g y h d p	c m e r m s c m s r m e e c r s	f h k h h b f d b f d k k d h b	f d t k k h d t h t k f d f t h	x u r s u x s w r s w x w u x r
y b p q b h y p p y q b h p h y	w x z x x u w s u w s z z s x u	t f q d p d f t q p t f t q d p	h b f d d h t b f t h f t d b h	u r s e e m u r r s m u m r e s
m x v s s v e x e m s v x v m e	k t d b t f k f d b f t f k b d	n r s u w n u s s u r w r w u n	s m x e e x m v x v e m v e s s	d p b q h q d b p b h q q d p h
b h p q d b q h q p h d p d b b	f b k t t h f b h f b k b k h t	r s v u m u m r u r s v v m u s	t f b h h b k f f k f t k t h b	k f d b d b t f t k f d d t b k
d h d p y p g d p g h y g d y h	t r w m w m c r c a r a m w a c	y g d h p h y y h d p g d y g p	d p q b h d p q p q b h b p h d	m c e s s m c e r e m r e r x c
w x u s s w x z u z s w z u w s	f t k b b h t f k b f h h k h t	d b d q q h b p p q h d h p q b	m c r e r e m s e s c m c r s e	b h k d d k h t k t d h t d b b

Turn the page. Do not wait for any signal.

In each square, mark the <u>row or column</u> in which a repeated letter occurs.

k d t f f h k d k t f h h k d t	w r u n u n w s n s r u r n s w	q b p y h p b q p y h b y q p h	x s v e e v m s v e s x s m e m	e r s u u m m r r s u e m u e s
r n u a a u n e e r a n e a r u	t b h f k h k b b t f h f k b t	r e a n a n e u e u a r u r n e	d t k b f b d k b d t f t f k d	w s r n u r w n r u s w n w u s
a m w c r c m w c w a r m a r w	f t d t d f b h t b h f h d t b	r w n u u n s w w s w r s r u n	h q p y q h b p b p h q p y y b	k d f d t k h f d t k h f h t k
h k t b h b d k d h b t k t h d	u e m r m s e u u r s e s u r m	f t h b h b f d b k t h t b k f	r n u w s u s n n r w u w s n r	s e r c e r c m s c m r c m s e
w r x r s w u x r s w u x u s w	q f q p p t d f t d p q f q t d	e s r m m c e s s r m c c e c r	w x u s u r x w r w s u x s r x	f q d p q t f d t p d f p f q t
a u e n u r a e e n r u r u n a	f d h t h t d b d b h f b f t d	w n u r s r n w n s w r u w s n	q t d p t q f d p d q f d p t f	m u r s s r m v r s v m v m u u

<u>Turn the page</u>. <u>Do not wait for any signal</u>.

In each square, mark the row or column in which a repeated letter occurs.

r m v s u s m r r v s u v u r m	f k d b k d h f d h b k f b k h	a u r e e a n u r n a r n e u a	f h b d d f h k b k d f k b f d	b p y h h q b q q y h p p b q y
w m c a a r m w m a r c c w m r	k b d h b f k b d k h f f h b d	z u x s x w z u s x z w w s u z	w s r w s w n u u r w n n u s r	b d f k d t b f t b k b k f d t
y d g h p h y d d h p q g y d p	h t d b d k b h k h k t b d t k	q b y h b p q y h y b p b h p q	n u s w s w n r u s r s r n w u	w z s u z s x w s x u z w u z x
f t b h h b t d d f h t d h f b	s x v e x m e v v e s m m s x e	m a w c w r m a a w c r c r a m	x r s w w u r s u s w x r x s u	d f b k f t d t k b f d t d k b
d y g p p d h g h g p y y p g h	b k t d k h d t t d b h h b k d	f h d t h f t k d t k f k h r d	c a r c r m a w a w m r m c w a	k f h t h d f k d k t h f t d f
r n e n e r u a n u a r a e n u	r u s m u m v r s v r s m s u v	t p f d q d p t d p t f f t d q	h b d t b f h d d t f b f b t h	w r s m m u r w s m w u u s u r

Stop here.

WORDS ASSOCIATED WITH AN UNFURNISHED HOUSE

Print your name here _____
Last Name First Name

Print the name of your school here _____

Look at the columns of words below. Some of the words are closely associated with a house, such as types of house, the parts of a house, the construction of a house, or items provided with an unfurnished house ready for sale.

In the first two columns the words which are closely associated with a house have been marked. Go ahead and mark the last two columns. Draw a line through each word which is closely associated with a house. Do not wait for any signal.

line	dress	grape	Thanksgiving
~~basement~~	doughnut	apron	hen
table	~~brick~~	lettuce	key
suit	~~title~~	wall	slipper
picture	mirror	tack	lumber
~~closet~~	~~pipe~~	shelf	accident
~~cottage~~	fish	hunting	sofa
lake	reader	cement	architect
~~screen~~	sleeping	hidden	drain
avenue	~~window~~	brave	rug
lamp	chair	curtain	shade

There are more columns of words on the next three pages. When the signal is given (not yet), turn the page and draw a line through every word which is closely associated with an unfurnished house. Work fast; mark as many words as you can in the time allowed.

Stop here. Wait for the signal.

Draw a line through the words associated with an unfurnished house.

kitchen	race	radio	movie	disturb	breakfast	diet
begin	march	boat	tile	stir	reply	hunger
shade	nail	raw	car	narrow	desk	swim
carpet	napkin	piano	express	crust	flag	score
snabby	bathtub	blister	loud	lock	flashlight	barber
flavor	cousin	news	gravy	pint	pistol	gulp
shower	screw	dust	stocking	smart	lantern	perfume
pan	waiter	long	comb	reckless	lavatory	lame
reason	bald	shingle	flour	sweater	first	mop
night	playmate	knob	copy	fresh	beam	lard
feeble	bent	stale	soda	faucet	crumb	scribble
dresser	wrong	return	wire	spice	soup	bluing
mile	shoe	angry	platter	slight	pretend	singer
rest	ironing	loose	rapid	chirp	nibble	insure
April	wish	willing	actor	scold	learn	striped
clutch	soon	picture	sing	glass	woven	cement
hammer	water	window	cabinet	cruel	paint	wringer
button	lamp	soldier	answer	hoarse	broom	glue
print	flyer	pipe	second	knitted	salad	furnace
loaf	erase	plum	appetite	varnish	fireplace	bushel
garter	laugh	nap	dawn	amuse	dotted	sore
promise	worn	shadow	try	porch	blanket	fry
pine	tough	wall	ceiling	drain	distant	sorrow
group	daisy	hide	doll	crutch	pencil	noise

Go on to the next page. Do not wait for any signal.

Draw a line through the words associated with an unfurnished house.

forget	swift	taken	picnic	senseless	floor	grape
severe	steaming	coat	correct	telegram	climb	bread
lamp	breeze	plum	twenty	term	entire	action
blame	discover	pot	mean	uncle	supplies	pantry
postage	itch	tame	deep	fastened	shield	city
rafter	trusting	wallpaper	tender	wavy	remind	lathe
absent	door	market	corner	graceful	cough	spoon
mouth	speech	delicious	comic	roast	thrown	permit
plaster	fence	serious	arrive	plumbing	brief	drill
deal	faith	youthful	endless	watchman	shrill	memory
foundation	scare	hall	slide	asbestos	slight	roof
dumb	harvest	violin	derby	bed	print	prune
fireman	quiet	outer	sewer	powerful	electricity	blame
complete	brow	memory	mended	scout	rocker	fringe
steel	noodle	actress	toasted	bump	twice	track
certain	stairs	promise	bite	shrink	recent	commit
trust	sewing	protest	pane	voice	tremble	sauce
heater	invest	key	cake	loving	smile	hidden
curtains	clock	stubborn	berry	wrist	copper	party
fisherman	bottle	cracker	parting	contractor	verse	eaves
policeman	radiator	sudden	sleeping	sill	mustard	trouser
remember	marker	sure	respect	tray	gloom	tomb
Indian	stucco	shallow	masonry	beginning	ounce	gown

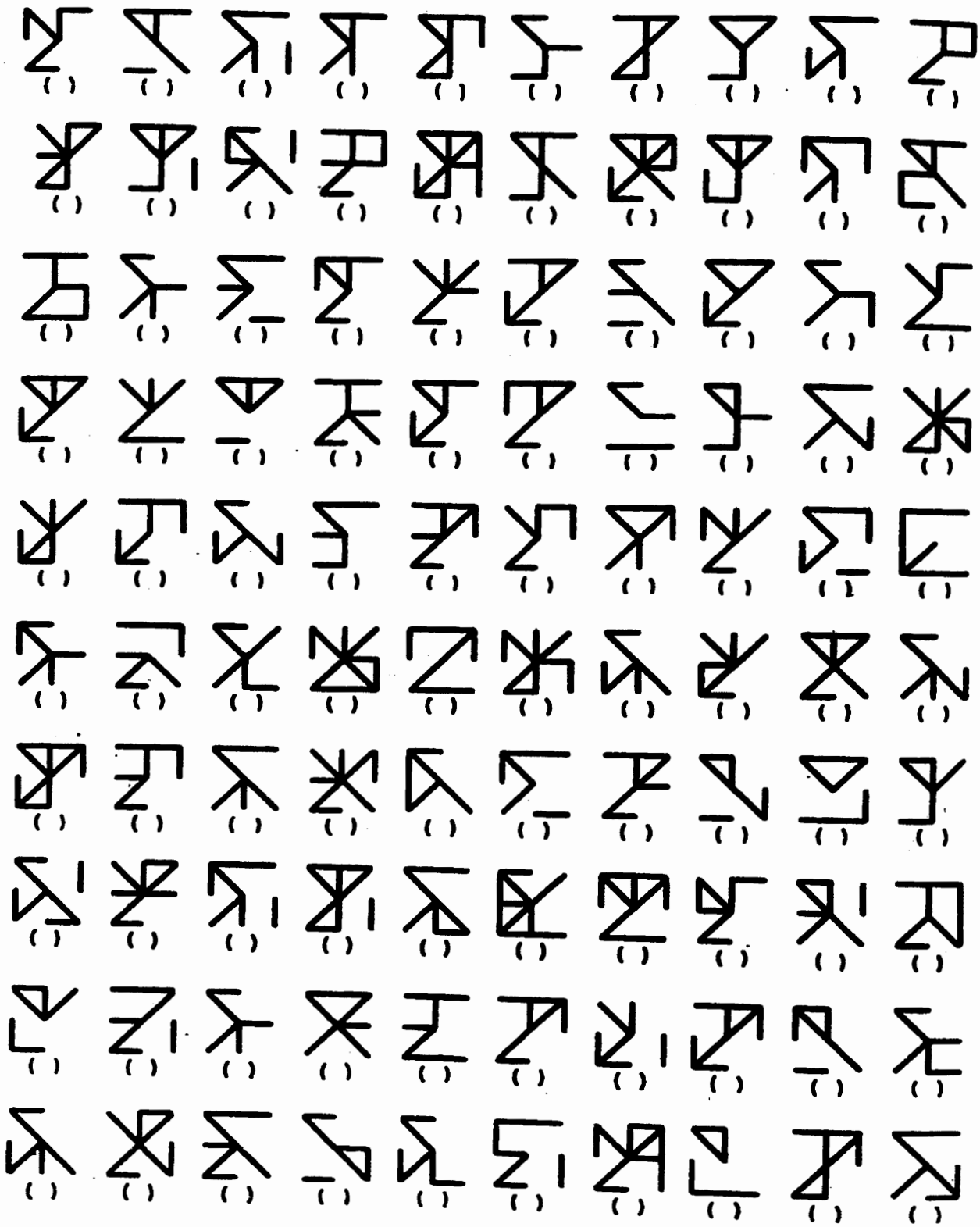
Go on to the next page. Do not wait for any signal.

Draw a line through the words associated with an unfurnished house.

coast	branch	lyrical	eve	sink	barn	society
print	ridge	slender	wagon	novel	part	column
pillar	blouse	budget	anvil	daily	fifth	peach
apple	driver	eyelid	lunch	frame	among	clapboard
planet	speed	lease	sedan	singe	closet	talent
putty	threshold	doorbell	baker	absorb	virtue	chase
quarter	poetry	lemon	share	poorer	chimney	penny
quality	sash	wheat	prefer	seldom	fence	yacht
freeze	second	vocal	casual	verify	boycott	split
minute	liquid	dove	mutter	locust	request	turkey
cherry	switch	junior	dazzle	ranger	rent	listen
single	decade	castle	steak	winter	astronomy	stone
place	thing	concern	attic	hornet	endurance	tidings
allow	meek	remodel	cart	change	posture	mink
answer	taper	founder	past	rotund	cartoon	vein
iron	sultry	severe	ballot	volcano	tremble	smoke
brake	eraser	hoop	beauty	majesty	cruiser	broken
swim	salmon	bedroom	energy	mansion	leave	wood
cord	fusion	eddy	balcony	force	nutmeg	voting
sled	perch	moving	pledge	store	plywood	corn
cedar	hinge	rival	chorus	mumps	damage	harp
robin	drink	tart	pebble	fishing	florist	plank
pedal	breath	bowl	bushel	pattern	tunnel	rake
misty	visitor	excite	bungalow	skating	banker	fire

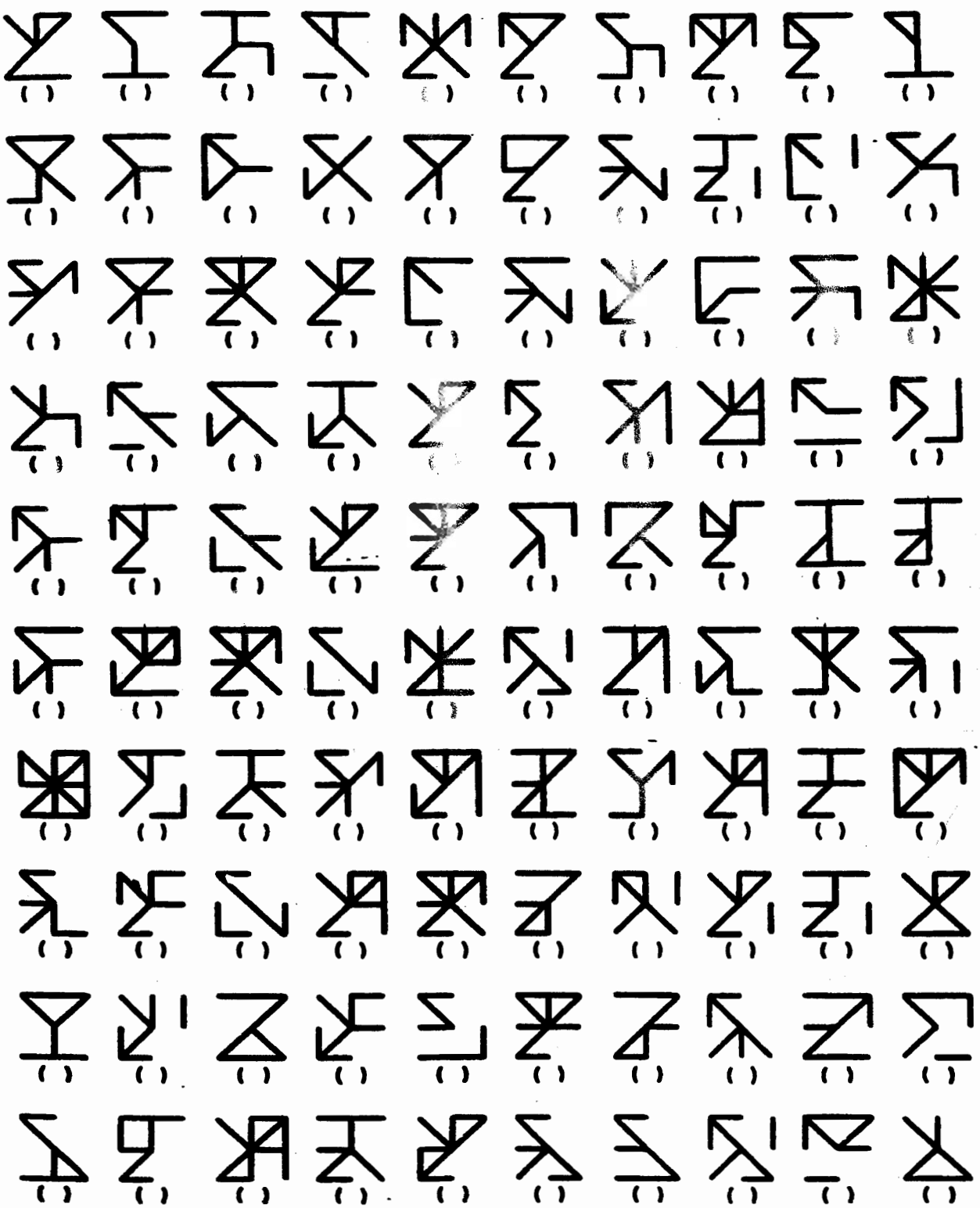
Stop here.

Mark (x) each design containing the 



Turn the page. Do not wait for any signal.

Mark (x) each design containing the Σ



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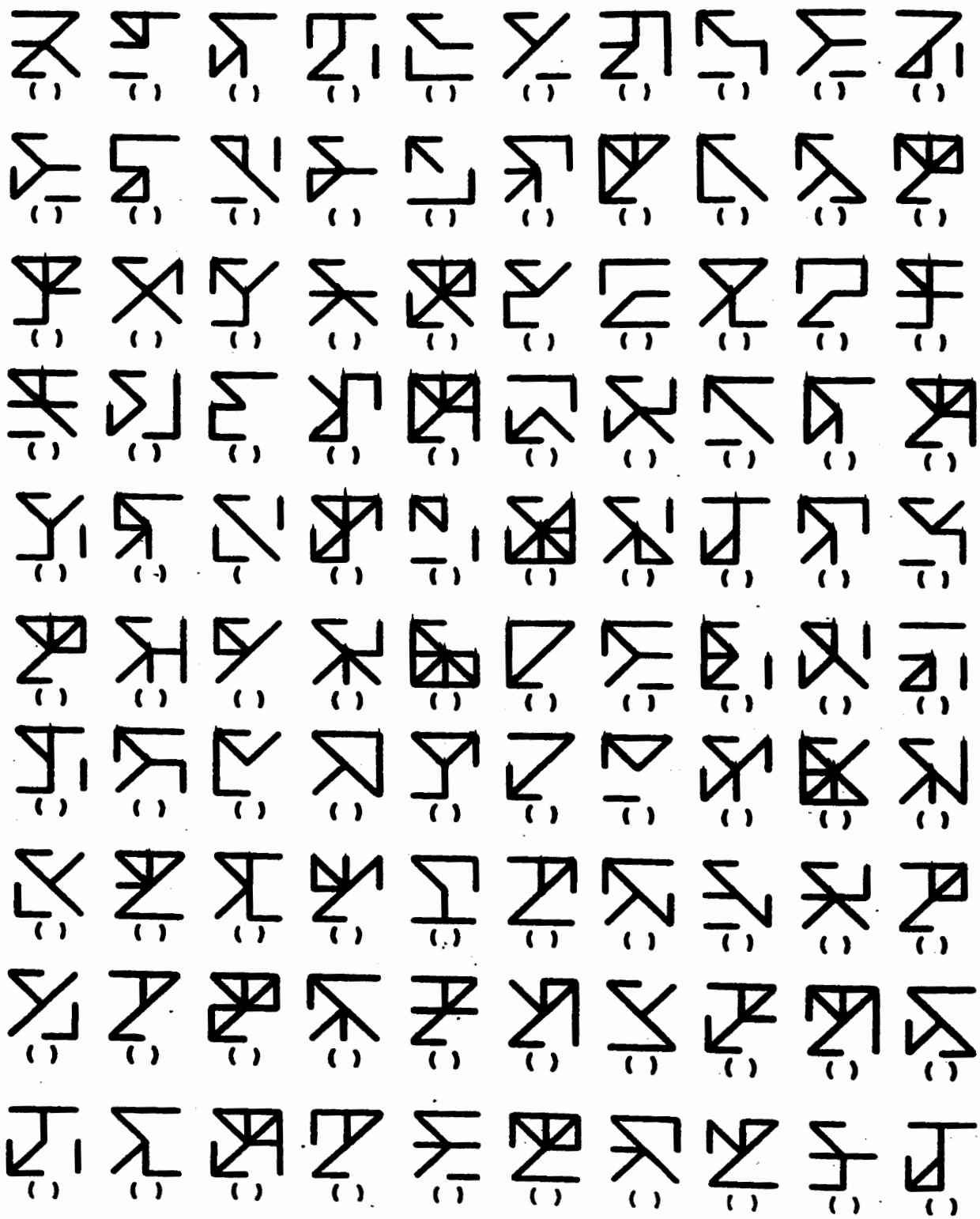


Stop here.

PICTURE SQUARES

Name _____
Last First Middle Initial

Address _____ Phone _____

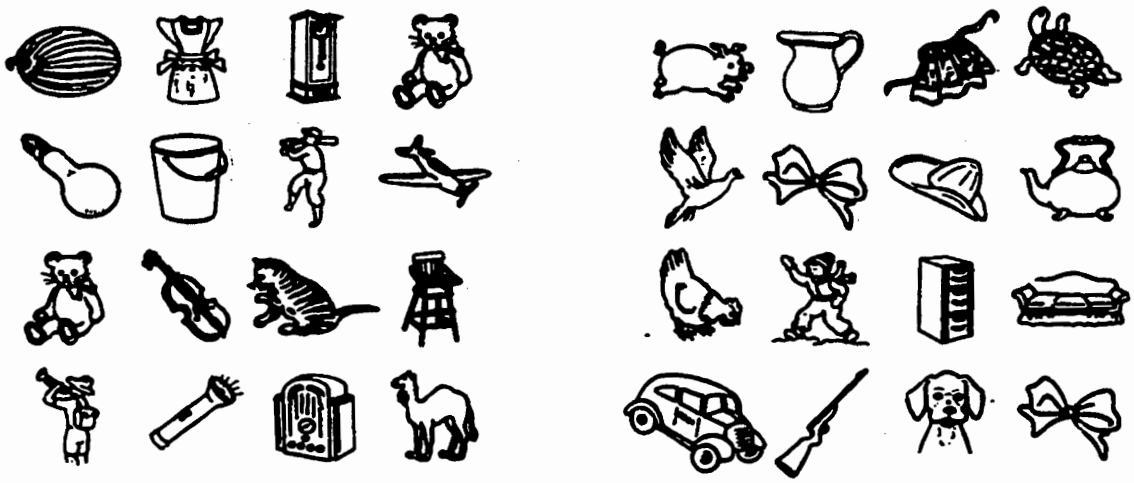
The square shown below has 16 pictures in it. The pictures are arranged in 4 rows and 4 columns. In this square the picture of a house is used twice. Each house has been crossed out to show that it has been used twice in this square.

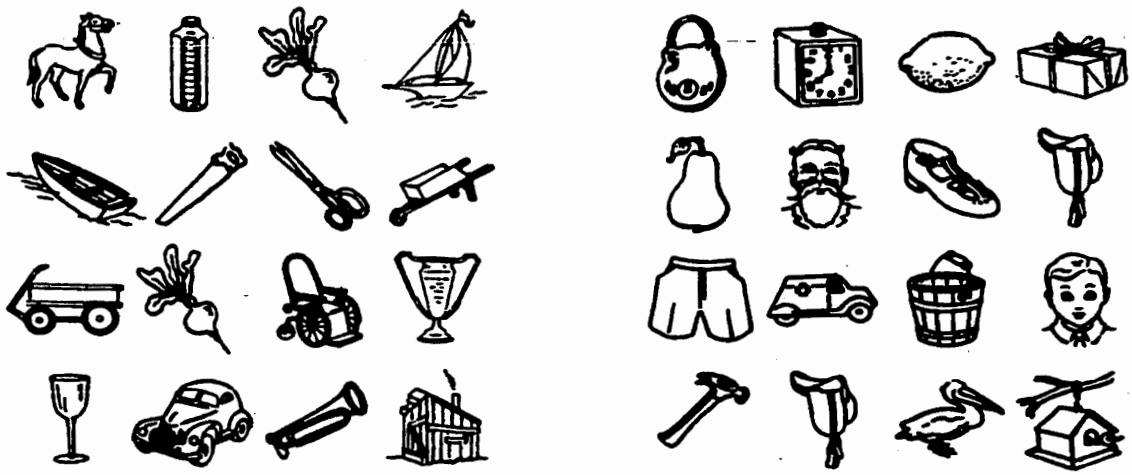
Below are two squares for you to practice on. In each square cross out the two pictures that have been used twice. There will be only one pair of repeated pictures in each square. You will be able to find the repeated pictures more rapidly if you can scan the whole square instead of checking row by row or column by column.

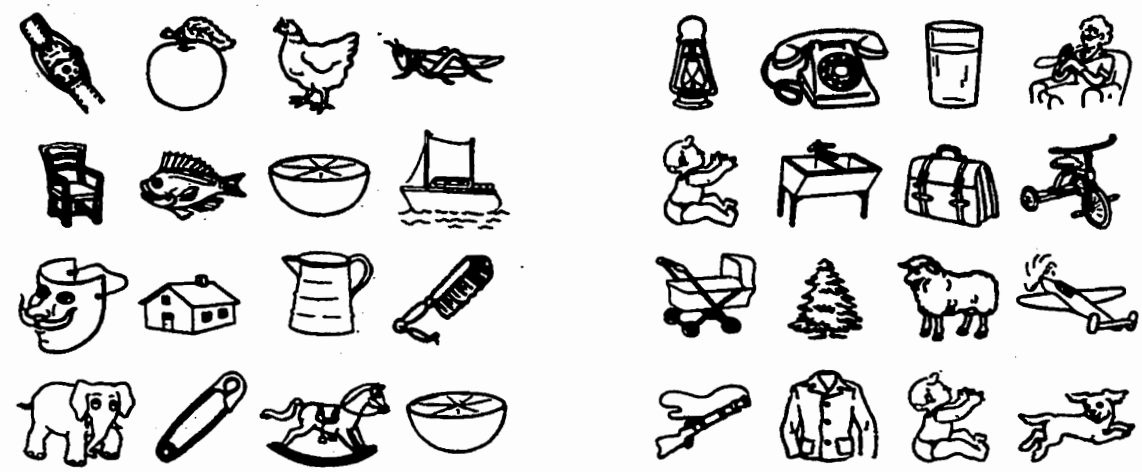
When the signal is given (not yet), turn the page and cross out as many pairs of repeated pictures as you can in the time allowed. Work fast, but do not spend too much time on any one square. If you do not see the repeated pictures quickly, go on to the next square and come back to the hard items if you have time.

Stop here. Wait for the signal.

In each square, cross out the pictures that are used twice.

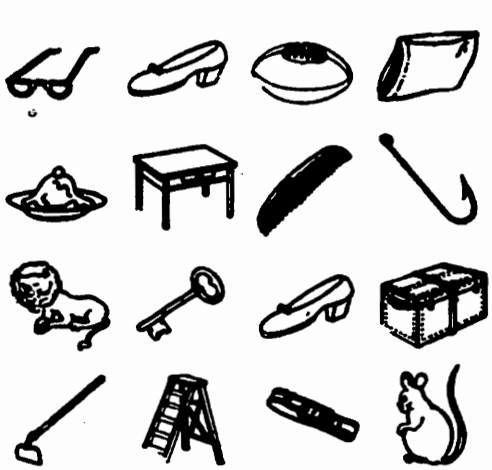


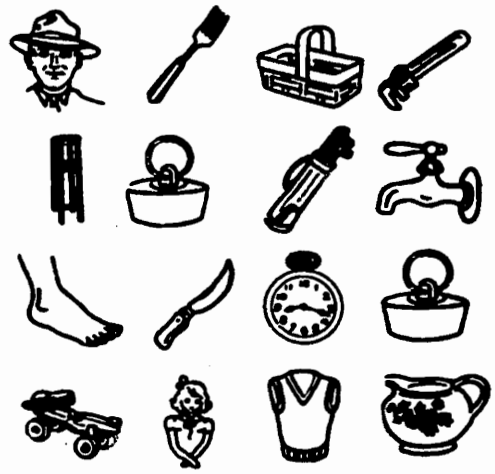




Go to the next page. Do not wait for any signal.

In each square, cross out the pictures that are used twice.





Go to the next page. Do not wait for any signal.

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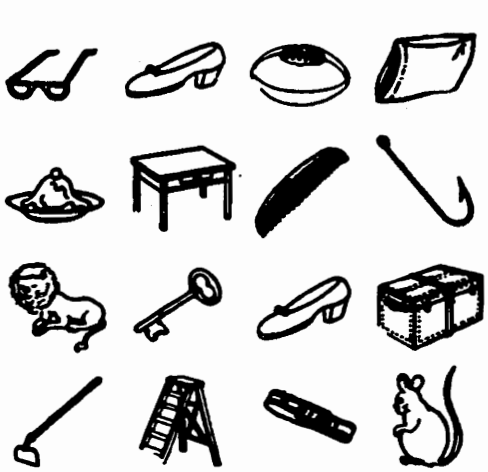
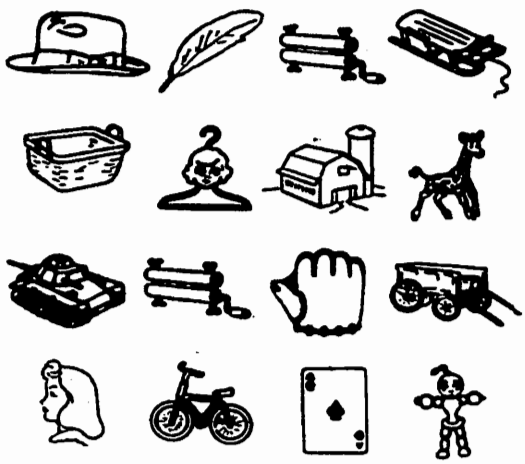
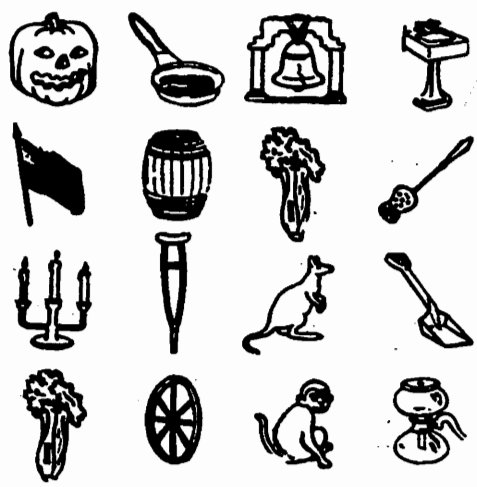


Go to the next page. Do not wait for any signal.

In each square, cross out the pictures that are used twice.





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