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ITEM VERSUS CONFIGURAL ANALYSIS OF ACADEMIC ACTIVITY PREFERENCES IN RELATION TO VERBAL AND QUANTITATIVE ABILITIES

Thesis for the Degree of M. A.

MICHIGAN STATE UNIVERSITY

Muhammad S. Sajid

1959

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By

Muhammad S. Sajid

A THESIS

Submitted to the College of Communication Arts of
Michigan State University of Agriculture and
Applied Science in partial fulfillment of
the requirements for the degree of

MASTER OF ARTS

1959

ACKNOWLEDGMENT

The writer feels indebted to Dr. Louis L. McQuitty without whose help and guidance it would not have been possible for him to undertake the study.

He also wishes to express his gratitude to Dr. H. Kumata for his encouragement and valuable suggestions throughout the study.

The researcher is grateful to Mr. James C. Lingoes for his help regarding the programs for the Mistic, without which it was not possible to complete the study within the available time.

The author wishes to thank Dr. Albert E. Levak, Training Advisor, Ford Foundation Pakistan Project, for all mechanical facilities; and to Miss Wilma J. Woodford for her most sincere and continuous help and cooperation in preparing long, tiring tables and in proofreading.

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AN ABSTRACT

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Approved by _____

ABSTRACT

Problem

The purpose of this study is to examine differences in patterns of responses to the items of the Academic Activity Preference Inventory by the freshmen who scored high on verbal but low on numerical items of the College Qualification Tests versus those who scored high on numerical but low on verbal items of the same tests at the time of admission to Michigan State University, September, 1958.

The study also undertakes the comparison of the configural and the item analytic results.

Review of Literature

Clinical psychology had two dissimilar heritages--dynamic psychology and psychometric methods. In harmony with the latter it has stressed objectivity; in sympathy with the former it has focused on patterns of behaviour.

Clinicians faced serious problem when patterns of responses were neglected in favour of linear models by the psychometrists. Hence the former turned to projective techniques in assessing configurations. This move made the psychometrists aware of the seriousness of the situation and consequently they broadened the capabilities of their tradition by showing that configurations could be objectively assessed. Zubin, Mechl, Gaier, Lee, McQuitty, etc., are some of the pioneers in this field,

who claim that the configural approach has unique predictive value which item analytic approach lacks. Both these methods have been applied and compared in this study.

Procedure

A group of 824 freshmen of Michigan State University who had taken both the College Qualification Tests and the Academic Activity Preference Inventory in September, 1958, constituted the 'population' of this study. The subjects were classified into two groups, A and B, on the basis of their verbal and numerical scores. Group A consisted of 164 students who had high verbal but low numerical scores; and group B had 176 students with numerical but low verbal scores. Each group was further subdivided into A_1, A_2, and B_1, B_2, respectively. The subgroups A_1 and B_1 were used as experimental sample and A_2, B_2 were treated as cross-validation sample. The data were exposed to both the item analytic and the configural methods.

Conclusions and Recommendations

The configural results were better than the item analytic results, but not at any significant level of confidence.

The study was restricted to the first forty items of the Academic Activity Preference Inventory which has 275 items. The prospective researcher is advised to select sets of analytically suited and configurally suited items out of these 275 items. This would put him in a better position to see the correct picture of the relative merits of the two methods.

An experimental design of this kind stresses the necessity of a theoretical approach toward the preparation of the configurally suited items. This would be a great help to the researcher who spends a great amount of time in selecting such items.

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I. INTRODUCTION

The present study investigated a problem which has received scant attention: the differences in patterns of responses between students who score highly on verbal items but do poorly on numerical items versus those who score highly on numerical items but do poorly on verbal items.

From the very beginning of man's serious intellectual efforts, to understand human behaviour, both philosophically and scientifically, there has been at least some concern with the significance of patterns of responses, and one of the persistent theories has been that of typology. By studying the works of the psychologists in any period from the pre-Socratic to the present, it is quite common to run upon phrases which deny the possibility of explaining wholes by a study of their constituent parts. Mach (13) supports this theory by an example that the arrangement of lines in geometrical figures causes the emergence of different totals which are reported as squares, rectangles, diamonds and so on. This led him to resort to the doctrine of "sensations of space," sensations which, while not pointing directly to the elements of the original experience, must be taken jointly with them if the 'structured total' is to be explained. Etkin (11) reports that the animal and plant kingdoms are classified in a manner which reflects that characteristics have different predictive indicants depending on the combinations in which they occur.

"Clinical psychologists have been surprisingly ahistorical" (15). Little has been written about the development of clinical psychology. In part, this neglect is due to the clinical psychologists being very busy during and following the World War II. Young (15) remarked, "Making history on every hand as we are, we have a notion that we somehow have escaped history." However, by tracing the history of clinical psychology and by going back to the turn of the last century, it becomes evident that its origins are to be found in the dynamic and psychometric traditions in psychology. The latter, one of the headwaters from which clinical psychology sprang, was a part of the scientific tradition of the nineteenth century and stressed objectivity. Whenever a clinical psychologist insists upon objectivity and the need for further research, he is, intentionally or otherwise, showing the influence of this tradition. Going from Galton through Binet and Terman, it is evident that they always had a respect for quantitative measurement. Similarly Cattell along with Thorndike and Woodworth stressed dealing with individual differences by means of statistical analysis.

The other major source of influence (dynamic psychology) contributing to the growth and development of clinical psychology was the thinking and writing of James, Hall and their associates, also known as the "Boston group." Although they could in no way be labelled clinical psychologists, their thinking was much closer to clinical psychology and to progressive psychiatry than was Titchener's structural point of view. Their main interest was to understand human personality through the

patterns of his behaviour. The emphasis of modern clinical psychologist on patterns of subject's responses, in understanding his behaviour, is an evidence of the influence of dynamic psychology (15).

Louttit (5) states that the interest of the clinical psychologist is in the subject considered as a physical, social and psychological being in the matrix of his environment; and the understanding of the individual depends upon the knowledge of the clinical psychologist of the physical, emotional, educational, social and psychological factors, related to the individual, as a whole.

Allport (1) quotes that the clinical approach is absolutely necessary for the investigation of personality as a whole, for a true picture of personality cannot be pieced together. It is an organismic, and not an additive, total.

To summarize, in the language of McQuitty (7), "clinical psychology has two dissimilar heritages—dynamic psychology and psychometric methods. In harmony with the latter it has stressed objectivity; in sympathy with the former, it has focused on patterns of behaviour."

Clinical psychology encountered a serious problem, however, because psychometrics tended to neglect patterns of responses in favour of linear models. The clinicians realized that too much emphasis on psychometrics restricted their discipline and that each individual clinical psychologist should demonstrate to the bordering professional disciplines and to the lay public that clinical psychology had a useful contribution far more valuable than psychometrics alone. Hence, the

clinicians accordingly turned to instruments such as projective tests, that assisted in assessing configurations. The period in which projective methods were developed was pervaded by revolt against atomistic tradition of the early experimental psychology. Atomistic research began with the attempt to analyze psychological phenomena into elements. Opposed to this viewpoint is one which has various names--global, holistic, organismic or field theoretical. Lewin's typological concepts, Allport's personalistic psychology, Murray's organismic theory and the dynamic approach of Maslow, differ somewhat in conceptualization, but unite in emphasizing the importance of totality and wholeness of personality and of patterns in understanding human behaviour (5,14). Here clinical psychology has shown a willingness to sacrifice its birthright of objectivity to its interest in patterns.

However, as psychometrics was about to lose one of its most thriving, valuable and renowned offspring, it has broadened its perspective and capabilities by demonstrating that configurations can be objectively assessed. Gaier and Lee (4) point out that one of the more promising trends in present day psychometric research is an increasing interest in methods of evaluating patterns of test scores and test responses. In clinical, vocational, social and educational psychology, there is a growing agreement of opinion that taking account of interrelationships among test items will improve the efficiency of prediction. Zubin asserts that total score may conceal as much as they reveal. A total score may carry considerably less diagnostic significance than a direct

and detailed analysis of the responses per se. The authors (Gaier and Lee) provide arguments that consideration of response configurations will yield more fruitful results with higher degree of predictive utility than obtainable by the traditional additive methods. At least one important research conducted by McQuitty (6) on psychological well-being has concluded that mental hospital patients differ from community persons primarily in terms of their patterns of responses. He points out that since the appearance of the Woodworth Inventory during World War I, the psychologists have been trying to investigate a definite problem: whether or not, on the basis of carefully constructed inventories, they can classify accurately even such widely different subjects as the mentally ill and the mentally healthy persons. The investigators did not meet such success because of two uncontrolled problem areas: (a) what inventory test items to be tried out, (b) what method to be used in assigning 'weights' to item responses for the assessment of psychological well-being. The test constructor in this field has greater difficulties than the experimentalist who has two uncontrolled variables and does not know which one is responsible for his results; whereas the former, instead of merely having two uncontrolled variables, has two uncontrolled classes of variables, and does not know to which to attribute whatever success he has achieved. McQuitty, since 1935, and more recently his students, have carried a series of systematic studies of personality inventory items and methods of weighting responses on them in the assessment of psychological

well-being.[1] One of the conclusions that McQuitty reached is that the mentally ill differ from mentally healthy in response patterns (6). This is an evidence in favour of the claim that configurations can be objectively assessed, and this is the meeting ground of clinical psychology's two dissimilar heritages—dynamic psychology and psychometric methods.

Cattell (2) insists that psychologists should study the meaning and effects of the total personality configuration rather than of more levels in specific variables; and the importance of the one and indivisible total configuration cannot be overestimated. He criticizes those techniques which specifically deal with effects of configurations but relegate the pattern to intuitive assessment rather than to explicit mathematical treatment. He proceeded further and developed r_p and other coefficients of pattern similarity. Cronbach and Gleser (3) also developed methods of profile similarity. McQuitty (7) criticizes all these highly developed pattern analytic methods such as those mentioned above, for assessing profile configurations rather than patterns of responses to individual items. "In the profile approaches responses to individual items are used to yield total scores on several variables; and the configurations are isolated in terms merely of patterns of standings on scales, i.e., on linear continua. Thus, they are methods

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[1]For other methods of personality assessments (e. g., T Method, H Method, WH Method, MH Method, etc.) developed by McQuitty during his long continuous research, see (6).

for studying data ordered to linear continua; and data that do not fit are discarded."

Zubin (16) has pointed out that such information may be lost in thus allocating data to linear continua. Meehl (12) has shown that it is theoretically possible for responses treated configurally to have predictive efficiency which they lack when treated individually. For instance, an objective history of vigorous athletic participation at high school level, would argue in favour of masculinity in the male. But such a history in a male of 35, without heterosexual experience, living with his mother and 'sponsoring' boys' clubs, would give an indication of the latent homoerotic component. Hence, patterns of responses have unique predictive value. Meehl's paradox, as he calls it, is recognized by mathematicians. They take account of it in their definitions of independence by stating that 'the property B_0 is said to be completely independent of properties B_1, B_2,....B_n if two conditions (necessary and sufficient) are satisfied: (i) B_0 is independent of every property B_1, B_2,...B_n taken separately, and (ii) B_0 is independent of the logical product of every group of properties selected out of B_1, B_2,..B_n (7).

In short, in the field of personality measurements, recent research indicates the possibility of getting higher validity by using patterns of responses rather than total scores for prediction. In this area, the "differential method" has been used often. It takes into account summative individual differences. (Differential weights are assigned to individual test items and a summation of scores on various

items is used as a predictor of personality). But Zubin (16) feels that this had not led to fruitful results. He advocates the "integral method" which focuses its attention on similarity between individuals. He is against the traditional assessment technique of personality inventories, because he maintains that the pattern which produces the score is itself more important than the summative score on the inventory. An average does not serve the purpose in judging the individual because it is not possible to know how it is composed. Two subjects may get the same average score by receiving different scores on individual items. Though both of them may have the same average score, they are not "equivalent in their structure." Zubin says that some personality specialists are interested in the totality of personality irrespective of the complex interrelationships of the variables which make up the personality. Other specialists, like clinicians, social workers, etc., are interested in the individual variables comprising personality. A golden mean would be to group individuals into families or types. The method used is to find out individuals possessing "similarly integrated characteristics in a given set of variables and, after the subgroups of similarly structured individuals are discovered, the patterns of characteristics that make them similar can be isolated and further studies can be undertaken in other variables of the individuals in each sub-group . . . . The primary tool in this procedure is a technique for discovering similarities between individuals." This type of classification is a kind of typology where the individuals are classified, on

the basis of similarity, into different types. The general criticism of typological methods that they put individuals into pigeon holes that do not fit them cannot be raised against the method of Zubin where individuals are permitted to group themselves into whatever constellations they may exhibit in common. "It is an operationally determined personality pattern."

Thus, Zubin (16) in his agreement score (number of test items on which two subjects agree in their responses) has laid a foundation upon which it is possible to formulate a pattern analytic method for classifying subjects in terms of major pattern of responses to individual items of a test. However, he did not develop the method in any general sense. McQuitty (7) developed a comprehensive procedure for classifying persons in terms of their major patterns of responses.

"In agreement analysis, the responses may concatenate in any fashion whatsoever: they are not restricted to linear continua; the method does not order the data according to any preconceived model. Rather, it classifies the subjects in terms of those patterns which include the greatest possible number of responses for each. These are called predominant patterns; and the data are ordered in terms of them. Responses that do not fit these patterns can be used later to reclassify the subjects in terms of less predominant patterns if it seems worthwhile" (9).

The present study is planned to investigate some differences in the type of thinking between those students who score highly on verbal items

but poorly on numerical items (i.e., having high verbal ability but low numerical ability) versus those who score highly on numerical items but poorly on verbal items (i.e., having high numerical ability but low verbal ability). The responses of the students are scored configurally and McQuitty's agreement analysis is applied in the form of a computed version developed by Lingoes.[1] Also a comparison has been made between the results obtained by agreement analysis and those by item analysis.

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[1]James C. Lingoes is a graduate assistant in Psychology at Michigan State University. His version has not been published. It gives results similar to McQuitty's original analysis.

II. PROBLEM

The purpose of this study is to examine differences in patterns of responses on selected items of Juola's[1] Academic Activity Preferences Inventory (AAPI) in two groups of freshmen (1958) who were selected on the basis of their performance on the College Qualification Tests (CQT). One group scored high on verbal items and low on numerical items, while the other group scored high on numerical items and low on verbal items of the CQT. Two approaches will be used to study the above differences: (a) an item analysis, and (b) a configural analysis of the data.

---

[1]Dr. A. E. Juola, Evaluation Services, Michigan State University.

III. ASSUMPTION AND SCOPE OF STUDY

The rationale for selecting the two groups of subjects is based on the assumption that those who have high verbal ability but low numerical ability think differently from those who have low verbal ability but high numerical ability.

The present thesis investigates two hypotheses:

a. Students who have high verbal but low numerical ability have response patterns different from those who have high numerical but low verbal ability.

b. The configural approach has unique predictive value which an item analytic approach lacks.

IV. BRIEF DESCRIPTION OF THE METHOD

Before we outline the research design it would be helpful to describe McQuitty-Lingoes machine agreement analysis briefly. This method takes into account the pattern of responses of one individual and looks for that individual whose pattern of responses is most like that of the first individual. After classifying and combining these two individuals, it brings in that individual whose pattern of responses is most like what the first two individuals had in common, and classifies and combines this third individual with the first two individuals. In this study this process was repeated to the tenth level, i.e., those ten individuals were classified and thereby combined together whose patterns of responses had most in common. This procedure is carried out for each individual in turn. Overlaps in patterns, i.e., the presence of the same individuals in the patterns, are later eliminated.

V. DESCRIPTION OF THE TESTS

A. College Qualification Tests[1]

The College Qualification Tests (CQT) Form B are designed to serve colleges in their admission, placement and guidance procedures. There are three tests in this series:

Verbal Test (CQT-V): This is a fifteen minute test of vocabulary, containing 75 items. It is an efficient measure of the verbal ability.

Numerical Test (CQT-N): This is a thirty-five minute test containing 50 items on arithmetic, algebra and geometry. It measures skill in handling numerical concepts.

Information Test (CQT-I): This is a thirty minute test composed of 75 items from the fields of science and social studies. It measures the student's background.

Scores on the Verbal, Numerical and Information tests are summed to yield the CQT Total scores.

The CQT are administered to freshmen seeking admission to Michigan State University as a measure of their general academic aptitude. The present study takes into account the first two scores only, i.e., verbal scores and numerical scores.

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[1]The Psychological Corporation, 522 Fifth Avenue, New York 36, New York.

B. Academic Activity Preference Inventory

This inventory was constructed by Dr. A. E. Juola, Evaluation Services, Michigan State University. The assumption is that the following item classification areas are in one way or the other related to academic success:

1. Study Orientation.

   Haphazard versus systematized, planned, efficient use of time in school. Mechanics of study, (e.g. reading the introduction and summary of each chapter first and then reading the chapter, or reading in the order given in the book--introduction, main chapter, summary) is not covered.

2. Adjustment.

   Self-confidence, morale in academic setting, feeling secure in school.

3. Ultra-academic Ideal.

   Dedication to ultra-academic ideal and high scholastic motivation--real bookworm, puritan scholastic motivation.

4. Academic Ideal.

   High scholastic motives and values. Academic activities are most important but not all important.

5. Socio-Economic Class.

   Items portraying values which differentiate the lower classes from higher classes in areas somewhat removed from school (e.g. semi-academic recreational areas).

6. Achievement Motivation.

   An obsessive desire to go ahead, to get good grades, apparently due to some internal or external very strong urge.

There are 275 items in all which are liberally scattered over these six (somewhat overlapping) areas. Each item has four possible and equally correct answers. For instance, item 4 is "Discussing books with friends." On the scoring sheet, space 1 is to be marked if the individual very definitely likes the activity; space 2 is to be marked if the individual feels a mild positive reaction to it; space 3 is to be marked if the individual feels a mild negative reaction to it; and space 4 is to be marked if the individual very definitely dislikes the activity.

VI. STUDY

Subjects

A group of 842 freshmen of the Basic College of Michigan State University (1958), who had taken both the CQT and AAPI constitute the 'population' of this study. Out of these 824 freshmen a random sample of 127 males and 96 females were selected to determine the distribution of scores on verbal and numerical items of the CQT. Scattergrams were plotted between verbal and numerical scores on the CQT separately for each sex. Median scores for verbal and numerical items were 47 and 34, respectively for males, while 46 and 22 for females. These criterion scores were used as a basis for classifying subjects as high or low in verbal and numerical ability. Out of the 127 males there were 24 (about 20%) who were high on verbal and low on numerical items according to the above criterion, i.e., they had scores equal or greater than 47 on the verbal items and scores equal or less than 34 on the numerical items. Based on the results of the selected sample, the following groups were selected from the population:

A. High verbal ability, low numerical ability.

> Males: 47+ (on verbal items), 34- (on numerical items). There were 70 males in the population who satisfied this condition.
>
> Females: 46+ (on verbal items), 22- (on numerical items). There were 94 females in the population who satisfied this condition.

B. High numerical ability, low verbal ability.

Males: 34+ (on numerical items), 46- (on verbal items). There were 86 males in the population who satisfied this condition.

Females: 23+ (on numerical items), 46- (on verbal items). There were 90 females in the population who satisfied this condition.

The above two major groups (A and B) were randomly divided within each sex into two equal sub-groups, the first of which was designated the experimental sample, and the second of which was called the cross-validation sample. These groups are detailed below:

Experimental Sample

1. A_1 = High verbal ability, low numerical ability, 35 males, 47 females = 82

2. B_1 = High numerical ability, low verbal ability, 43 males, 45 females = 88

Cross-validation Sample

1. A_2 = High verbal ability, low numerical ability, 35 males, 47 females = 82

2. B_2 = High numerical ability, low verbal ability, 43 males, 45 females = 88.

Items

Although there are 275 items in the AAPI, not all of them could be analyzed because of machine and time limitations incident to the use of even high speed electronic computers. The present program for correlational matrices are restricted to 38 variables on the computer used (i.e. Mistic). Since the various items of this inventory have not been grouped according to the rational categories described (under "Description of Tests") any selection of 38 items was assumed to be as good as any

other for the purposes of this study. A frequency count was made of all the 275 items of the AAPI for the experimental sample. The first 38 of these which met the criterion of being answered in the same way by less than 80 per cent of the subjects (N = 170), were selected.

The Meehl paradox (12) shows that the items which yield the best configural differences are those which intercorrelate differently in the two groups of subjects, such that if we subtract, the difference would be relatively large. Therefore, the intercorrelation of every item with every other item was calculated for A_1 and B_1 separately. This process yielded two matrices of intercorrelation, one for A_1 and the other for B_1 (see Tables I and II, Appendix). The matrix of B_1 was then algebraically subtracted from the matrix of A_1. The new matrix was called matrix of differences (see Table III, Appendix). In order to classify the items into a number of types or clusters of differences, McQuitty's elementary linkage analysis (8) was applied to the matrix of differences. This analysis is a method of clustering. It can be used to cluster any objects which have distinctive cluster-characteristics. Linkage is defined as the largest index of association which a variable has with a composite of all the characteristics of the members of a cluster (consequently as shown in Table IV, Appendix, every variable is assigned to a cluster in terms of its highest index of association). Cattell (8) recognizes the importance of cluster method by stating that it reduces an almost endless variety of variables to a comparatively small number of representative variables.

In this study, the application of elementary linkage analysis to the matrix of differences yielded eight types (Table IV, Appendix). Some of the types did not yield highly interrelated clusters and involved very few items. Hence, in order to select the items which may yield the best configural differences further investigation was made by applying the following methods:

1. Sum and average of each column in Table III (Table of Differences) was calculated. Matrix of the first sixteen[1] items having the largest column-sum of Table of Differences was prepared. Sum and average of each column of this matrix was calculated and ranked.

   General Mean (of all the sixteen columns) = .1518

   Mean of the first thirteen largest columns = .1595

   (See Table VII, Appendix).

2. The highest entry in each column of the matrix of differences was marked. The first highest entry was examined. It obviously yielded two interrelated items. Every time the list of the items was checked and the duplicates were eliminated. This process of examining the entries and pooling the non-duplicate items was continued till such time that there were sixteen selected items on the list. Matrix of these sixteen items was

---

[1]The figure of "sixteen" was maintained throughout these four methods, because there were eight types and therefore eight reciprocal pairs (highly interrelated items). In order to have a fair comparison between the items obtained through the types and the items obtained by other methods, the number of the items was to be kept constant, in relation to their suitability to the configural approach.

prepared. Sum and average of each column of this matrix was calculated and ranked.

General Mean of all the sixteen columns = .1513

Mean of the first thirteen largest columns = .1593

(See Table IX, Appendix).

3. Matrix of the eight reciprocal pairs[1] (appearing in eight types--See Table IV, Appendix) was prepared. Sum and average of each column was calculated and ranked.

General Mean of all the sixteen columns = .1309

Mean of the first thirteen largest columns = .1364.

4. Matrices were prepared for the sets of the items appearing in eight types. Sums and averages of all the columns were calculated.

General Mean = .1588

(See Table VIII, Appendix).

It was clear from the results of the above methods that: (a) the averages went down if more than thirteen items were considered, and (b) method 1 gave the best items. Hence, the items which were used in this study were numbers 6, 11, 15, 16, 19, 22, 23, 24, 31, 32, 35, 39 and 40, as obtained from method 1.

Item Analysis

At this stage it was considered advisable to expose the data to

---

[1]A and B are said to be reciprocal pairs if A has its highest correlation with B, and B has its highest correlation with A.

item analysis for the purpose of testing hypothesis 2 (comparing the item analytic and configural results). It has been mentioned that each item on AAPI has four scoring categories. Therefore, for the Mistic facility, each item was divided as nearly as possible to the median in relation to the number of responses to each category. For instance, on item number 6, number of responses to category 1 was 13; to category 2, 70; to category 3, 61; to category 4, 26. Hence, the line was drawn between the first two and the last two categories, and the responses to categories 1 and 2 were called 1, and those to categories 3 and 4 were called 0. Chi-square was calculated for all the thirty-eight items. The results are given in Tables X and XI (Appendix). Those thirteen items which were to be used in agreement analysis (i.e., 6, 11, 15, 16, 19, 22, 23, 24, 31, 32, 35, 39 and 40) were ranked according to Table VII in one column, and were ranked according to their corresponding values of Chi-square in another column. Then Rho was calculated to see whether or not the two sets of items for item analysis and for agreement analysis were selected independently.

Item	Ranked According to Table VII	Ranked According to the Corresponding Value, Table XI
19	13	1
11	10	2
6	11	3
40	8	4
15	5	5
24	2	6
23	7	7
22	4	8
35	9	9
39	6	10
32	3	11
31	1	12
16	12	13

Rho = -.43 ($P > .10$)

That is, the two sets of thirteen items were selected independently for the agreement analysis and for the item analysis. Or, in other words, those items which were likely to yield pattern differences were not necessarily those likely to yield item analytic differences. In addition, r was calculated on all the thirty-eight items based on the rankings from item analysis (See Table XI) and from method 1 described above (See Table VII) and was found to be zero. This is further evidence that the two methods for selecting items were satisfactorily independent.

Item	Ranked According to Table VII	Ranked According to Table XI
4	31	1
29	21	2
27	15	3
19	12	4
11	4	5
25	23	6
9	17	7
6	8	8
40	9	9
15	11	10
12	19	11
21	38	12
30	33	13
10	30	14
36	29	15
2	27	16
24	2	17
5	26	18
13	37	19
23	3	20
38	22	21
22	7	22
33	10	23
28	32	24
35	6	25
3	24	26
8	20	27
20	18	28
37	34	29
14	35	30
18	36	31
17	28	32
39	13	33
34	25	34
26	16	35
32	5	36
31	1	37
16	14	38

$r = -.000$

This further confirmed the results obtained previously.

The first thirteen items giving the highest values of Chi-square (Table XI, Appendix) were selected for the item analytic approach.

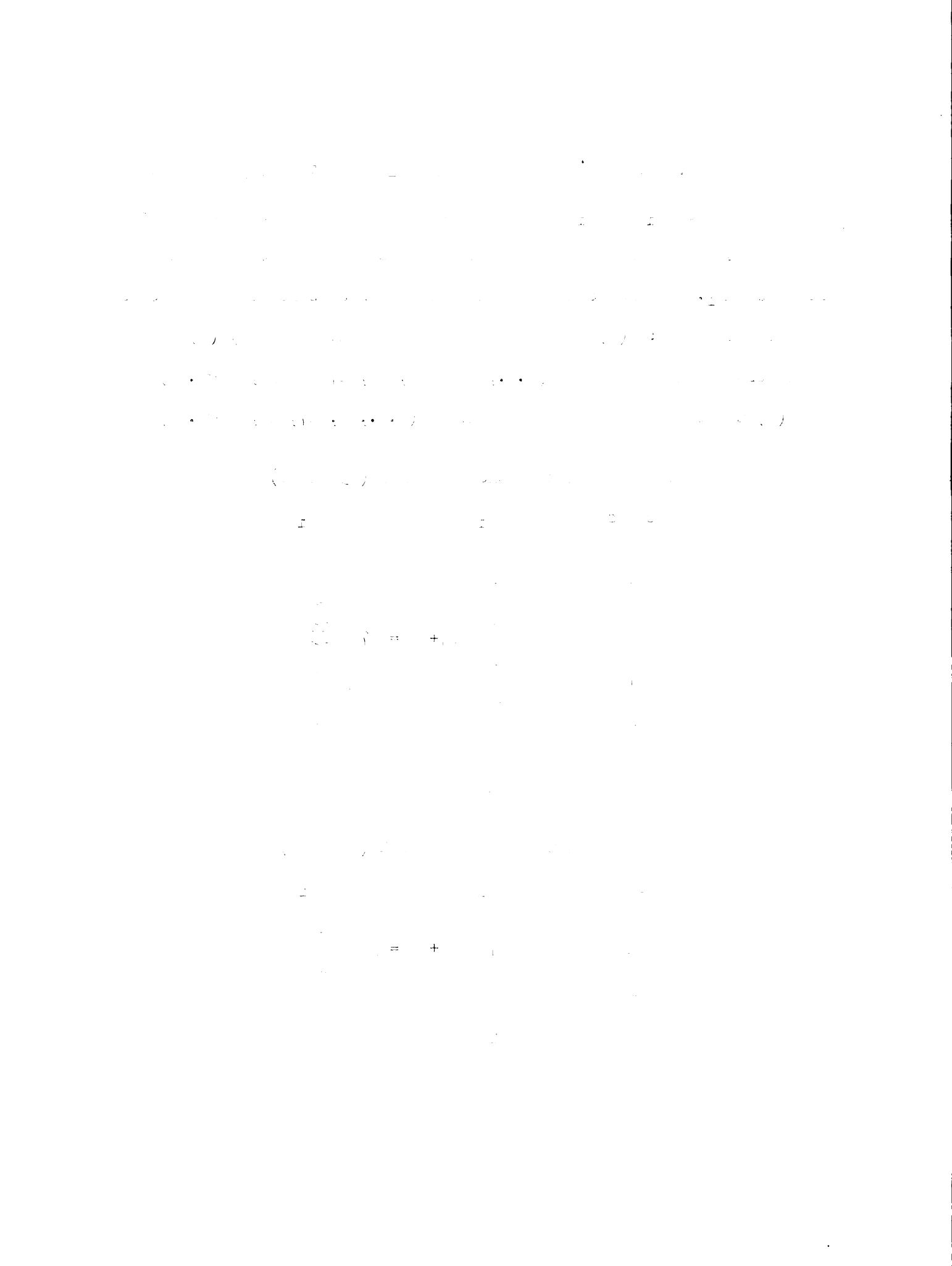
They are items: 4, 6, 8, 11, 12, 15, 19, 21, 25, 27, 29, 30 and 40. The subjects of A_1 and B_1 were scored on these items in such a way as to maximize the difference between the groups in favour of high scores for group A_1. The following distributions of scores for the two groups were obtained for: (a) the thirteen most significant items, (b) the four most significant items (i.e., items 4, 29, 27 and 19; $p < .05$) and (c) the three most significant items (i.e., 4, 27, 29; $p < .01$)

Frequency Distribution Number 1 (13 items)

Scores	A_1		B_1
1	0		2
2	1		8
3	2		13
4	3		13
5	11	17+30 = 47	22
6	13		10
7	14		12
8	20		4
9	12		3
10	6		0
11	0		1
	82		88

Frequency Distribution Number 2 (4 items)

Scores	A_1		B_1
0	4		16
1	17	21+31 = 52	41
2	22		21
3	18		5
4	21		5
	82		88



Frequency Distribution Number 3 (3 items)

Scores	A_1		B_1
0	12		34
1	25	37+13 = 50	41
2	21		8
3	24		5
	82		88

For each frequency distribution the cut-off point was selected which allowed for the maximum difference in scores for the two groups. These empirically determined cut-off scores were 5, 1 and 1 for the three frequency distributions.

Using the same scoring system each subject in the cross-validation sample (A_2 and B_2) was scored and corresponding frequency distributions were made. These were:

Frequency Distribution Number 4 (same 13 items as in FD 1)

Scores	A_2		B_2
2	0		3
3	6		6
4	8		7
5	20	34+56 = 90	16
6	15		20
7	17		22
8	9		12
9	6		1
10	0		1
11	1		0
	82		88

Frequency Distribution Number 5 (same 4 items as in FD 2)

Scores	A_2		B_2
0	2		2
1	28	30+69 = 99	17
2	37		42
3	15		22
4	0		5
	82		88

Frequency Distribution Number 6 (same 3 items as in FD 3)

Scores	A_2		B_2
0	12		6
1	50	62+43 = 105	39
2	19		36
3	1		7
	82		88

Applying the cut-off points determined from the experimental sample fourfold tables were constructed. Below are presented these tables as well as the corresponding tables on the experimental sample.

Results on item analysis on first 13, first 4 and first 3 items *vide* Table XI, presented in fourfold tables.

Experimental Sample

(13 items)

		A_1	B_1	Sum
A	High verbal Low numerical	65	30	95
B	High numerical Low verbal	17	58	75
		82	88	170

Correctly assigned = 65+58=123=72%
CR[1] = .63 (not significant)

(4 items)

		A_1	B_1	Sum
A	High verbal Low numerical	61	31	92
B	High numerical Low verbal	21	57	78
		82	88	170

Correctly assigned = 61+57=118=69%
CR = .37 (not significant)

(3 items)

		A_1	B_1	Sum
A	High verbal Low numerical	45	13	58
B	High numerical Low verbal	37	75	112
		82	88	170

Correctly assigned = 45+75=120=71%
CR = 2.74[1]

Cross-validation Sample

(13 items)

		A_2	B_2	Sum
A	High verbal Low numerical	48	56	104
B	High numerical Low verbal	34	32	66
		82	88	170

Correctly assigned = 48+32=80=47%
CR = 1.79 (not significant)

(4 items)

		A_2	B_2	Sum
A	High verbal Low numerical	52	69	121
B	High numerical Low verbal	30	19	49
		82	88	170

Correctly assigned = 52+19=71=42%
CR = 3.92**

(3 items)

		A_2	B_2	Sum
A	High verbal Low numerical	20	43	63
B	High numerical Low verbal	62	45	107
		82	88	170

Correctly assigned = 20+45=65=38%
CR = 3.10**

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[1]The results are compared by McNemar's Critical Ratio Formula (19a) McNemar, Q. Psychological Statistics. New York: J. Wiley & Sons, 1955.

The above 2 x 2 tables show that the most significant items did not hold up on cross-validation. In fact it is to be noted that there was a tendency for the items to discriminate between the groups in the reverse direction. In the cases of 3 and 4 most significant items we obtained significantly poorer classification than can be expected by chance ($P < .001$).

Agreement Analysis

Agreement analysis was applied to the scores of the subjects of A_1 and B_1 on 13 items (discussed above i.e., 6, 11, 15, 16, 19, 22, 23, 24, 31, 32, 35, 39 and 40). First their patterns were prepared on Mistic (one pattern as a specimen is given in the Appendix). All the patterns within each group, A_1 and B_1, and then between both the groups, A_1 and B_1, were compared. There were some duplicates within each group but there was none between the two groups, However, all the duplicates were dropped. This left 44 patterns of responses in A_1 and 42 patterns of responses in B_1. Subjects of A_1 and B_1 (experimental sample) and those of A_2 and B_2 (cross-validation sample) were scored on the patterns of A_1 and B_1 on the Mistic. Each subject of A_1 and B_1 was then classified in terms of the patterns. This process discriminated between the good and bad patterns. (Good patterns were those where most of the subjects were correctly classified and bad patterns were those where most of the subjects could not be correctly classified). All those patterns where the ratio of wrong classifications to total classifications was equal to or more than 1:4 were dropped. This eliminated 44 patterns

of the 86. The subjects of A_2 and B_2 (cross-validation sample) were scored on the basis of the remaining 42 patterns of A_1 and B_1 (experimental sample; 23 patterns in A_1 and 19 in B_1). Each individual was assigned to A_1 or B_1 depending upon whether or not he made the highest score with A_1 or B_1. If an individual of A_2 could be assigned to A_1, he was labelled as "correctly classified," if he was assigned to B_1, he was labelled as "incorrectly classified." Similarly an individual of B_2 was "correctly classified" if he could be assigned to B_1, otherwise "incorrectly classified." This yielded 47 correct classifications and 35 incorrect classifications in A_2; 46 correct classifications and 42 incorrect classifications in B_2. The configural approach yielded results which, although were not reliably different from chance when applied to the cross-validation sample, were, nevertheless, in the expected direction.

The following fourfold tables were made to compare the results obtained by the agreement analysis and the item analysis:

Cross-Validational Subjects

Configural

		A	B	Sum
Item Analytic 3 Items	B	60	47	107
	A	29	34	63
				170

$CR^1 = 2.68^{**}$

		A	B
Item Analytic 4 Items	B	17	32
	A	72	49

$CR = 3.94^{**}$

		A	B
Item Analytic 13 Items	B	27	39
	A	62	42

CR = 1.81 (not significant)

		A	B	
Actual	B_2	42	46	88
	A_2	47	35	82

CR = .80 (not significant)

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[1]The results are compared by McNemar's Critical Ratio formula (19a) McNemar, Q. Psychological Statistics. New York: J. Wiley & Sons, 1955.

It may be noted that the critical-ratio in the case of the 13 items is not significant, but in the other two cases it is significant at 1% level of confidence. In general, the results obtained by the configural approach are better than those by the item analysis, but the fact, that the item analytic results are poorer than those which could be obtained by mere chance, makes this slight superiority unreliable.

The configural results were compared with the results which could be expected by mere chance. The former results were superior to the latter but not significantly.

The item analytic results which were obtained in this study were unusual, nevertheless, they were checked thoroughly.

VII. SUMMARY AND CONCLUSIONS

The present study investigated the differences in pattern of responses to selected items of the Academic Activity Preferences Inventory by freshmen who scored high on verbal items but low on numerical items versus those who scored high on numerical items but low on verbal items of the College Qualification Tests. The study also showed the comparison between the results obtained by item analytic method and those by agreement analysis.

McQuitty-Lingoes machine agreement analysis was applied to differentiate two categories of people. In our present study we have assumed that the students who have high verbal but low numerical abilities have patterns of responses different from those who have high numerical but low verbal abilities. Since they were taken to be two categories of people, agreement analysis was applied to differentiate them.

Three hundred and forty freshmen were selected out of 824, who had both College Qualification Tests and Academic Activity Preference Inventory in September, 1958, Michigan State University, on the basis of their verbal and numerical scores. Group A was formed of 170 freshmen who had high verbal but low numerical abilities. Group B had 170 freshmen who had high numerical but low verbal abilities. Each group was further subdivided into two equal subgroups. These subgroups were

called A_1, A_2; B_1, B_2. A_1 and B_1 were taken as the experimental sample and A_2 and B_2 as the cross-validation sample. Their responses on the AAPI were subjected to item analysis and agreement analysis. The results obtained by these methods were compared and the following conclusions were drawn:

1. The results of both the approaches did not support the hypothesis significantly that the patterns of responses differ as a function of high verbal and low numerical ability versus high numerical and low verbal ability.
2. Item analysis showed significantly poorer classification on cross-validation sample in cases of 3 and 4 most significant items chosen item analytically.
3. The difference between the two approaches is significant in the cases of 3 and 4 most significant items, but is not significant in case of 13 items chosen item analytically.
4. Although the configural approach is slightly better in general, the fact that neither approach yielded better than chance prediction does not allow us to assess the merits of one method over the other.

However, the prospective researcher is recommended to prepare the matrices of all the 275 items of the AAPI and construct thereby matrices of differences. Then he would be in a better position to select configurally suited items. Similarly all the items should be exposed to item analysis. This would give him a correct picture of the relative merits of both the methods.

An experimental design of this kind stresses the necessity of a theoretical approach toward the preparation of configurally suited items. If a theory could be developed through which items suited for configural method could be prepared, it would facilitate the situation tremendously by saving the time of the researcher that he spends in selecting such items.

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TABLE I. INTERCORRELATION OF EVERY ITEM WITH EVERY OTHER ITEM IN GROUP A. (SUBJECTS HAVING HIGH VERBAL AND LOW NUMERICAL SCORES)

Items	2	3	4	5	6	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
2		0316	1797	-1608	-2007	1513	1069	1050	-2016	0278	1765	0554	0252	-1319	2616	0447	1232	-1335	2212	-1212	2762	1835	-1071	2632	1088	2392	-0561	1299	-1268	0784	0422	2805	1509	1522	0870	0495	1180	0965
3	0316		0234	-0511	-0164	1311	0732	1111	0018	-0671	-1997	-1121	-0086	1694	-0128	-0140	-0511	0474	-1826	0046	0084	-0394	-0747	-1696	1760	-1135	-1546	-1104	0154	-1400	-0029	-0119	-0524	-1978	0532	0966	-0907	-0577
4	1797	0234		-1790	-0120	-0598	0471	-0361	-2427	-0330	1781	2147	-2999	-0031	-1351	0164	-3602	-1218	1927	0470	2201	0158	-2069	2247	4830	2521	-0965	3035	-1878	-1611	1143	2087	-0256	0372	2657	2415	4991	0744
5	-1608	-0511	-1790		-0949	1101	0557	-0059	1821	2262	0561	-0275	0416	0042	1894	3421	-0343	0096	0858	1147	-0461	0176	1549	-1422	0217	-1048	2082	-0336	0160	2030	-1845	-2064	-0903	0467	0667	-1220	-1168	1283
6	-2007	-0164	-0120	-0949		-0388	-0893	-0568	1703	-1030	0078	-2112	0425	0719	-0619	1509	-0594	1659	-1352	1722	-0178	-0111	0570	0676	-2755	-0686	0855	-0233	1924	0531	-0177	0272	1088	0763	-0665	-0967	-0303	-1510
8	1513	1311	-0598	1101	-0388		2532	1184	-0545	-0258	0281	1037	3306	0078	0657	-1524	0444	-0524	0784	2129	2467	1597	-0960	1266	0308	1344	0039	1079	0379	1358	-1561	0685	-0717	-0607	0486	-1066	0870	-0697
9	1069	0732	0471	0557	-0893	2532		-0981	-0670	-0610	2136	2619	0531	0062	-0556	-2252	0715	-2177	-0025	-2554	1174	0361	0978	1146	1752	3452	-1988	0957	-2845	-1445	0226	1151	-0172	-0120	0761	-0287	1503	0886
10	1050	1111	-0361	-0059	-0568	1184	-0981		0557	0587	-0938	-1086	2582	0974	1902	0776	1091	0537	-0649	0763	-0456	2545	0691	0351	0392	-1099	-1896	0800	1525	1083	0010	1383	0612	0216	-1115	1381	-3134	0617
11	-2016	0018	-2427	1821	1703	-0535	-0670	0557		1715	-0502	-2087	2416	1188	-0066	-0060	2807	0170	-1429	1501	-3005	-0259	3347	-3031	-1798	-2216	1429	-2000	2824	2153	-0626	-3872	-0281	-0441	-1378	-1304	-2680	-1614
12	0278	-0671	-0330	2262	-1030	-0258	-0610	0587	1715		-1370	0934	-1987	-0215	0003	0473	0887	2124	-1209	-0273	-4060	0037	1414	-1897	-0967	-1305	1563	-1343	2824	3622	1910	0183	1338	-1497	-2228	4024	0818	-0646
13	1765	-1997	1781	0561	0078	0281	2136	-0938	-0502	-1370		0988	0586	-1093	1744	0344	0220	-3535	1891	0524	1518	1495	-1539	1872	1124	2564	0543	3931	-0972	0121	-0356	0710	2105	3285	2184	0813	2674	2407
14	0554	-1121	2147	-0275	-2112	1037	2619	-1086	-2087	0934	0988		-2162	-0117	0407	0219	-2766	-0849	-0034	-2021	1822	0714	-0826	2731	2907	4195	-1414	2236	-3310	0370	0963	2074	-0232	0722	1025	0499	4208	1194
15	0252	-0086	-2999	0416	0425	3306	0531	2582	2416	-1987	0586	-2162		1491	1202	-0669	1749	-0727	0236	1427	0654	2375	0691	0548	-0777	-0753	1552	-0743	3419	1527	-0884	-1025	1496	0998	0236	-1163	-3384	0469
16	-1319	1694	-0031	0042	0719	0078	0062	0974	1188	-0215	-1093	-0117	1491		0290	0511	0054	1186	0152	-0526	-1319	-2676	0289	-0596	3368	-0638	-2255	1172	0915	-1354	2808	-0176	0868	-0379	0661	0220	0462	1403
17	2616	-0128	-1351	1894	-0619	0657	-0556	1902	-0066	0003	1744	0407	1202	0290		6204	-0111	-0288	0352	1712	0812	2761	-0743	1965	1099	-0180	0187	1067	-0622	1990	0797	1896	2729	0475	0352	-0882	-0267	1299
18	0447	-0140	0164	3421	1509	-1524	-2252	0776	-0060	0473	0344	0219	-0669	0514	6204		-1629	0276	0615	2314	0243	0793	-0789	1273	0395	-0714	1914	-0019	-0252	0939	0566	1696	0037	1168	1265	-0610	0396	1628
19	1232	-0511	-3602	-0343	-0594	0444	0715	1091	2807	0887	0220	-2766	1749	0054	-0111	-1629		-0935	0394	1621	-1823	0768	-0407	0652	-1956	-0300	-0414	-1240	1515	1565	0161	-0590	0517	0815	0125	0866	-2334	-0387
20	-1335	0474	-1218	0096	1659	-0524	-2177	0537	0170	2124	-3535	-0849	-0727	1186	-0288	0276	-0935		-0981	0843	-2115	0980	2945	-1949	-1636	-1363	0700	-2628	2280	2976	2666	-0154	0444	-0732	-2998	0252	-2862	-3803
21	2212	-1826	1927	0858	-1352	0784	-0025	-0649	-1429	-1209	1891	-0034	0236	0152	0352	0615	0394	-0981		1201	2029	1190	2077	1913	1227	2761	0284	4845	-1185	-0721	-1120	2019	-0655	0951	1732	-0964	2016	1700
22	-1212	0046	0470	1147	1722	2129	-2554	0763	1501	-0273	0524	-2021	1427	-0526	1712	2314	1621	0843	1201		1036	1339	2001	-0100	-1581	-0454	0782	0159	2830	2191	-1349	-0556	-0615	0787	1004	-0641	0747	-2917
23	2762	0084	2201	-0461	-0178	2467	1174	-0456	-3005	-4060	1518	1822	0654	-1319	0312	0243	-1823	-2115	2029	1036		2061	-2065	2855	0530	2593	0306	2707	-1270	-1333	-3361	0997	-0320	-0137	1805	-1684	1435	0755
24	1835	-0395	0158	0176	-0111	1597	0361	2545	-0259	0037	1495	0714	2375	-2676	2761	0793	0768	0980	1190	1339	2061		-0254	1468	0877	1528	1368	1358	0380	3220	-0275	2021	1791	1657	1160	0380	-0002	0419
25	-4071	-0747	-2069	1549	0570	-0960	0978	0691	3347	1414	-1539	-0826	0691	0289	-0743	-0789	-0407	2945	-2077	2001	-2065	-0254		-3400	-1797	-0902	0162	-2432	2760	1163	0574	-2118	0290	-0624	-1652	-0495	-3053	-1618
26	2632	-1696	2247	-1422	0676	1266	1146	0351	-3031	-1897	1872	2731	0548	-0596	1965	1273	0652	-1949	1913	-0100	2855	1468	-3400		0992	3957	-0348	3283	-2765	-0000	-0217	3369	0711	1605	3067	0439	2654	1548
27	1088	1760	4830	0217	-2755	0308	1752	0392	-1798	-0967	1124	2907	-0777	3368	1099	0395	-1956	-1636	1227	-1581	0530	0877	-1797	0992		2142	-3798	2495	-2673	-1007	2378	3083	0961	-0035	3196	2460	3399	3147
28	2392	-1135	2521	-1048	-0686	1344	3452	-1099	-2216	-1305	2564	4195	-0753	-0638	-0180	-0714	-0300	-1363	2761	-0454	2593	1528	-0902	3957	2142		0768	3859	-2475	-0196	0326	3444	1851	0646	1528	0973	4030	1738
29	-0561	-1546	-0965	2082	0855	0039	-1988	-1896	1429	1563	0543	-1414	1552	-2255	0187	1914	-0414	0700	0284	0732	0306	-1368	0162	-0348	-3798	-0768		-1726	1539	2409	-1957	-2170	-0377	-0794	-2486	-0609	-0824	-1144
30	1299	-1104	3035	-0336	-0233	1079	0957	0800	-2000	-1343	3931	2236	-0743	1172	1067	-0019	-1240	-2628	4845	0159	2707	1358	-2432	3283	2495	3859	-1726		-2588	-0920	-0951	3722	1706	1566	3556	0236	3062	1450
31	-1268	0154	-1878	0160	1924	0379	-2845	1525	2824	2824	-0972	-3310	3449	0915	-0622	-0252	1515	2280	-1185	2830	-1270	0380	2760	-2765	-2673	-2475	1539	-2588		2329	2313	-1207	3087	0308	-2428	1137	-2507	-3020
32	0784	-1400	-1611	2030	0531	1358	-1445	1083	2153	3622	0121	0370	1527	-1354	1990	0939	1565	2976	-0721	2191	-1333	3220	1163	-0000	-1007	-0196	2409	-0920	2329		1373	-0824	2469	0158	-1391	1640	0389	-2894
33	0422	-0029	1143	-1845	-0177	-1561	0226	0010	-0626	1910	-0356	0963	-0884	2808	0797	0566	0161	2666	-1120	-1349	-3361	-0275	0574	-0217	2378	0326	-1957	-0951	2313	1373		1086	2324	1894	0125	2811	0753	-0229
34	2805	-0119	2087	-2064	0272	0685	1151	1383	-3872	0183	0710	2074	-1025	-0176	1896	1696	-0590	-0154	2019	-0556	0997	2021	-2118	3369	3083	3414	-2170	3722	1207	-0824	1086		1390	0219	1552	2428	1537	1271
35	1509	-0524	-0256	-0903	1088	-0717	-0172	0612	-0281	1338	2105	-0232	1196	0868	2729	0037	0517	0444	-0655	-0615	-0320	1791	0290	0711	0961	1851	-0377	1706	3087	2469	2324	1390		0161	0970	3481	0206	-0412
36	-1522	-1978	-0372	0467	0763	-0607	-0120	0216	-0441	-1497	3285	0722	0998	-0379	0475	1168	9815	-0732	0951	0787	-0137	1657	-0624	1605	-0035	0646	-0794	1566	0308	0158	1894	0219	0161		0715	0480	0300	-0255
37	0870	0532	2657	0667	-0665	0486	0761	-1115	-1378	-2228	2184	1025	0236	0664	0352	1265	0125	-2998	1732	1004	1805	1160	-1652	3067	3196	1528	-2486	3556	-2428	-1391	0125	1552	0970	0715		0488	2643	3404
38	0495	0966	2415	-1220	-0967	-1066	-0287	1381	-1304	4024	0813	0499	-1163	0220	-0882	-0610	0866	0252	-0964	-0641	-1684	0388	-0495	0439	2460	0973	-0609	0236	1437	1640	2811	2428	3481	0480	0488		1575	0419
39	1180	-0907	4991	-1168	-0303	0870	1503	-3134	-2680	0818	2674	4208	-3384	0462	-0267	0396	-2334	-2862	2016	0747	1435	-0002	-3053	2654	3399	4030	-0824	3062	-2507	0289	0753	1537	0206	0300	2643	1575		1269
40	0965	-0577	0744	1283	-1510	-0697	0886	0617	-1614	-0646	2407	1194	0469	1403	1299	1628	-0387	-3803	1700	-2917	0755	0419	-1618	1548	3147	1738	-1144	1450	-3020	-2894	-0229	1271	-0412	-0255	3404	0419	1269	

Note: Decimal points are omitted.

TABLE II. INTERCORRELATION OF EVERY ITEM WITH EVERY OTHER ITEM IN GROUP B. (SUBJECTS HAVING HIGH NUMERICAL AND LOW VERBAL SCORES)

Items	2	3	4	5	6	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
2		-0960	2390	-2059	-2088	2321	4056	0407	-0225	-0121	1325	1482	-0047	0550	-0009	0677	1253	-1328	0860	0359	1457	2321	-2321	3447	2087	2219	0735	2272	-1966	-0818	1558	3784	0209	-0346	1774	0300	3194	3042
3	-0960		-0422	0348	0138	0691	-1075	0160	-0887	1323	-0192	-0428	0982	-0833	0621	0169	-0366	0020	0073	-1142	1927	0545	0902	1234	0944	-0817	-0716	-0367	-0260	-0101	-1104	0664	0555	-0452	0338	0795	1042	0479
4	2390	-0422		-0746	-1478	-0895	0676	-0144	0091	-1476	2449	2782	-0522	-0144	1479	0438	-0558	-2179	2018	-1228	-0477	1823	-1082	2915	5005	2584	-1019	3248	-1310	-0899	0868	2667	1279	1368	2540	-0942	4094	1374
5	-2059	0348	-0746		0733	-1971	-2181	0546	0507	1056	-0188	0493	-1869	-0626	2462	1878	0669	0099	-0430	0119	-1712	-0590	1981	-0892	-1470	-0122	1079	0337	1842	0128	-0736	-1191	-1431	0649	-0563	-1150	-1381	-1687
6	-2088	0138	-1478	0733		0440	-2140	-0426	-0270	-0145	-0197	-1519	-0684	1557	0248	0000	0042	2871	-1735	1207	-1749	-2030	2888	-1379	-1141	-2539	-0286	-2263	-0965	-1473	-0853	-3251	-1424	-1344	-2696	-1234	-2575	-1826
8	2321	0691	-0895	-1971	0440		2912	-0059	-0968	0724	2031	1097	1949	3545	0819	0045	1079	-2360	1083	-0081	2835	1938	0522	0828	1449	-0822	-0312	1123	-1933	-0827	1191	-0851	-0104	-1108	1760	0409	0000	1251
9	4056	-1075	0676	-2181	-2140	2912		-0449	-1164	0250	1260	0712	-0148	0733	0643	0248	1128	-0905	1070	-1936	1362	1959	-2143	2290	1529	3004	0371	1553	-1806	-0932	2132	2987	-1085	-1989	1465	1332	1667	1714
10	0407	0160	-0144	0546	-0426	-0059	-0449		-0285	0730	0459	0343	0319	-0085	1483	-0094	1309	-0525	-0624	-0069	0384	-1088	0196	-0913	-0968	-1557	-0137	0377	0000	-0005	-1552	-1061	-0476	0676	-0347	0551	-0178	0651
11	-0225	-0887	0091	0507	-0270	-0968	-1164	-0285		2122	-2200	-1017	0475	1503	0464	-0274	-0359	1573	-0118	1039	0347	-1702	3464	-1390	1178	0584	0712	-0716	2370	0216	-0073	-0632	1082	0936	0659	2523	-1016	-0235
12	-0121	1323	-1476	1056	-0145	0724	0250	0730	2122		-0535	-0375	-1139	-1594	0350	0177	-1743	1800	-1185	-3685	1224	-1861	1031	-1588	-1080	1059	3256	-1665	1775	1893	-0471	0372	0582	-0311	-1001	4498	-0546	-0710
13	1325	-0192	2449	-0188	-0197	2031	1260	0459	-2200	-0535		2224	0079	0261	1391	0463	2083	-1998	2517	0637	0965	0496	-0397	1910	3724	1954	0727	2652	0148	0771	0560	1210	1895	1595	1521	0783	1932	0037
14	1482	-0428	2782	0493	-1519	1097	0712	0343	-1017	-0375	2224		-1161	-0784	0440	0523	2482	-1647	0069	-0462	1833	1241	-1518	3855	3366	1619	-1328	1423	0490	0603	-0126	2251	-0073	0549	3157	-0192	4036	1660
15	-0047	0982	-0522	-1869	-0684	1949	-0148	0319	0475	-1439	0079	-1161		2822	0871	-1749	1313	-1999	0609	3328	1762	-0891	1319	-1333	0021	-0274	-0534	-1236	-1450	-2467	-1054	-2023	1739	0839	-0502	1240	0440	-0993	-0732	0228	-0542	1881	1172	1169	1612	0904	0100	0935	-0857	2139		-0816	0252	1085	0697
16	0550	-0833	-0144	-0626	1557	3545	0733	-0035	1503	-1594	0261	-0784	2822		0598	0065	1283	-1757	0541	0740	0784	1025	1007	-1438	0403	-0722	-1164	-1259	-0533	-1686	-0135	-1405	0542	-0810	-0015	0081	-1466	0299
17	-0069	0621	1479	2462	0248	0819	0643	1483	0464	0350	1391	0440	0871	0598		6745	1414	-1273	1963	0819	-0806	1779	1324	1236	2219	0422	0977	1358	-0133	0292	-1529	0502	-0294	0738	1472	-0378	-0133	0045
18	0677	0169	0438	1878	0000	0045	0248	-0094	-0274	0177	0463	0523	-1749	0065	6745		-0444	-1495	1513	0197	-0774	0875	-0255	2428	1939	0272	2325	0664	0675	1528	-2007	1200	-1150	-0190	0975	0294	0270	0060
19	1253	-0366	-0558	0669	0042	1079	1128	1309	-0359	-1743	2083	2482	1313	1283	1414	-0444		-0758	1001	1609	1555	-0423	0225	1632	-0139	-0620	0135	-0856	2223	0550	0594	-0418	0004	-1275	1187	-1585	1112	1556
20	-1328	0020	-2179	0099	2871	-2360	-0905	-0525	1573	1800	-1998	-1647	-1999	-1757	-1273	-1495	-0758		-3917	0167	-1573	-1743	2890	-0489	-2588	-0789	0062	-1696	1030	0509	-0703	-0940	1393	-0502	-2173	-0217	-1888	-2606
21	0860	0073	2018	-0430	-1735	1083	1070	-0624	-0118	-1185	2517	0069	0609	0541	1963	1513	1001	-3917		0523	-0180	1071	-1175	0895	3548	1113	1472	3275	0000	-1476	-1421	1659	-0132	1240	0711	0407	2100	2219
22	0359	-1142	-1228	0119	1207	-0081	-1936	-0069	1039	-3685	0637	-0462	3328	0740	0819	0197	1609	0167	0523		1096	-1096	1636	-0954	0115	-0776	-1234	-0085	-1137	-1765	0132	-0365	2752	0440	0458	-1854	-1949	-0772
23	1457	1927	-0477	-1712	-1749	2835	1362	0384	0347	1224	0965	1814	1762	0784	-0806	-0774	1555	-1573	-0180	1096		0623	-0733	1776	1619	0934	1103	-0282	-0803	-0289	0189	0642	2186	-0993	0611	1043	0964	3138
24	2321	0545	1823	-0590	-2030	1938	1959	-1088	-1702	-1861	0496	1241	-0891	1025	1779	0875	-0423	-1743	1071	-1096	0623		-1203	3869	2415	0896	-2109	3694	-1514	-0387	-0131	2864	-1224	-0732	4123	-0411	0675	1705
25	-2321	0902	-1082	1981	2888	0522	-2143	0196	3464	1031	-0397	-1518	1319	1007	1324	-0255	0225	2890	-1175	1636	-0733	-1203		-1447	-0210	-1616	-0763	-2167	0191	-0524	-1890	-3046	-0050	0228	-0296	0274	-2671	-2683
26	3447	1234	2915	-0892	-1379	0828	2290	-0913	-1390	-1588	1910	3855	-1333	-1438	1236	2428	1632	-0489	0895	-0954	1776	3869	-1447		3522	1072	-0258	1906	-1998	1075	-0998	3184	-1617	-0842	4271	-1167	3197	2231
27	2087	0944	5005	-1470	-1141	1449	1529	-0968	1178	-1080	3724	3366	0021	0403	2219	1939	-0139	-2588	3548	0115	1619	2415	-0210	3522		2720	-1156	3462	-1482	-0579	0949	3068	1217	1881	3473	1711	4446	3560
28	2219	-0817	2584	-0122	-2539	-0822	3004	-1557	0584	1059	1954	1619	-0274	-0722	0422	0272	-0620	-0789	1413	-0776	0934	0896	-1616	1072	2720		1718	3327	0000	-0069	0633	5318	0746	1172	1548	1049	3364	1898
29	0735	-0716	-1019	1079	-0286	-0312	0371	-0137	0712	3256	0727	-1328	-0534	-1164	0977	2325	0135	0062	1472	-1234	1123	-2109	-0763	-0258	-1156	1713		-0751	0943	0837	-2372	0750	0459	1169	-2162	0141	1347	0024
30	2272	-0367	3248	0337	-2263	1123	1553	0377	-0716	-1665	2652	1423	-1236	-1259	1385	0664	-0856	-1696	3275	-0085	-0282	3694	-2167	1906	3462	3327	-0751		-0437	-2006	0352	3968	-0471	1612	3236	-0162	4371	2632
31	-1966	-0260	-1310	1842	-0965	-1933	-1806	0000	2370	1775	0148	0490	-1150	-0533	-0133	0675	2223	1030	0000	-1137	-0803	-1574	0191	-1998	-1482	0000	0943	-0437		2034	0676	-0197	0000	0904	-1504	2324	0757
32	-0818	-0101	-0899	0128	-1473	-0827	-0932	-0005	0216	1893	0771	0603	-2467	-1686	0292	1528	0550	0509	-1476	-1765	-0289	-0387	-0524	1075	-0579	-0069	0837	-2006	2034		0474	-0493	0569	0100	0678	-0564	-0924	0390
33	1558	-1104	0868	-0736	-0853	1191	2132	-1552	-0073	-0471	0560	-0126	-1054	-0135	-1529	-2007	0594	-0703	-1421	0132	0189	-0131	-1890	-0998	0949	0633	-2372	0352	0676	0474		0966	0772	0935	1340	0494	0507	0474
34	3784	-0664	2667	-1191	-3251	-0851	2987	-1061	-0632	0372	1210	2251	-2023	-1405	0502	1200	-0418	-0940	1659	-0365	0642	2864	-3046	3184	3068	5318	0750	3968	-0197	-0493	0966		-0234	-0857	1682	1789	3751	2418
35	0209	0555	1279	-1431	-1424	-0104	-1085	-0476	1082	0582	1895	-0073	1739	0542	-0294	-1150	0004	1393	-0132	2752	2186	-1224	-0050	-1617	1217	0746	0459	-0471	0000	0569	0772	-0234		2139	-0222	-0385	-0631	-1337
36	-0346	-0452	1368	0649	-1344	-1108	-1989	0676	0936	-0311	1595	0549	0839	-0810	0738	-0190	-1275	-0502	1240	0440	-0993	-0732	0228	-0542	1881	1172	1169	1612	0904	0100	0935	-0857	2139		-0816	0252	1085	0697
37	1774	0338	2540	-0563	-2696	1760	1465	-0347	0659	-1001	1521	3157	-0527	-0015	1472	0975	1187	-2173	0711	0458	0611	4123	-0296	4271	3473	1598	-2462	3236	1504	0678	1340	1682	-0222	-0816		0803	2820	1931
38	0300	0795	-0942	-1150	-1234	0409	1332	0551	2523	4498	0783	-0192	-2092	0081	-0378	0294	-1585	-0217	0407	-1854	1043	-0411	0274	-1167	1711	1049	0141	-0162	2324	-0564	0494	1789	-0385	0252	0803		0581	1094
39	3194	1042	4094	-1381	-2575	0000	1667	-0178	-1016	-0546	1932	4086	-0644	-1466	-0133	0270	1112	-1888	2100	-1949	0964	0675	-2671	3197	4446	3364	1347	4371	0757	-0924	0507	3751	-0631	1085	2820	0581		4336
40	3042	0479	1374	-1687	-1826	1251	1714	0651	-0235	-0710	0037	1660	1098	0299	0045	-0060	1556	-2606	2219	-0772	3138	1705	-2683	2231	3560	1898	0024	2632	0897	0390	0474	2418	-1337	0697	1931	1094	4336	

Note: Decimal points are omitted.

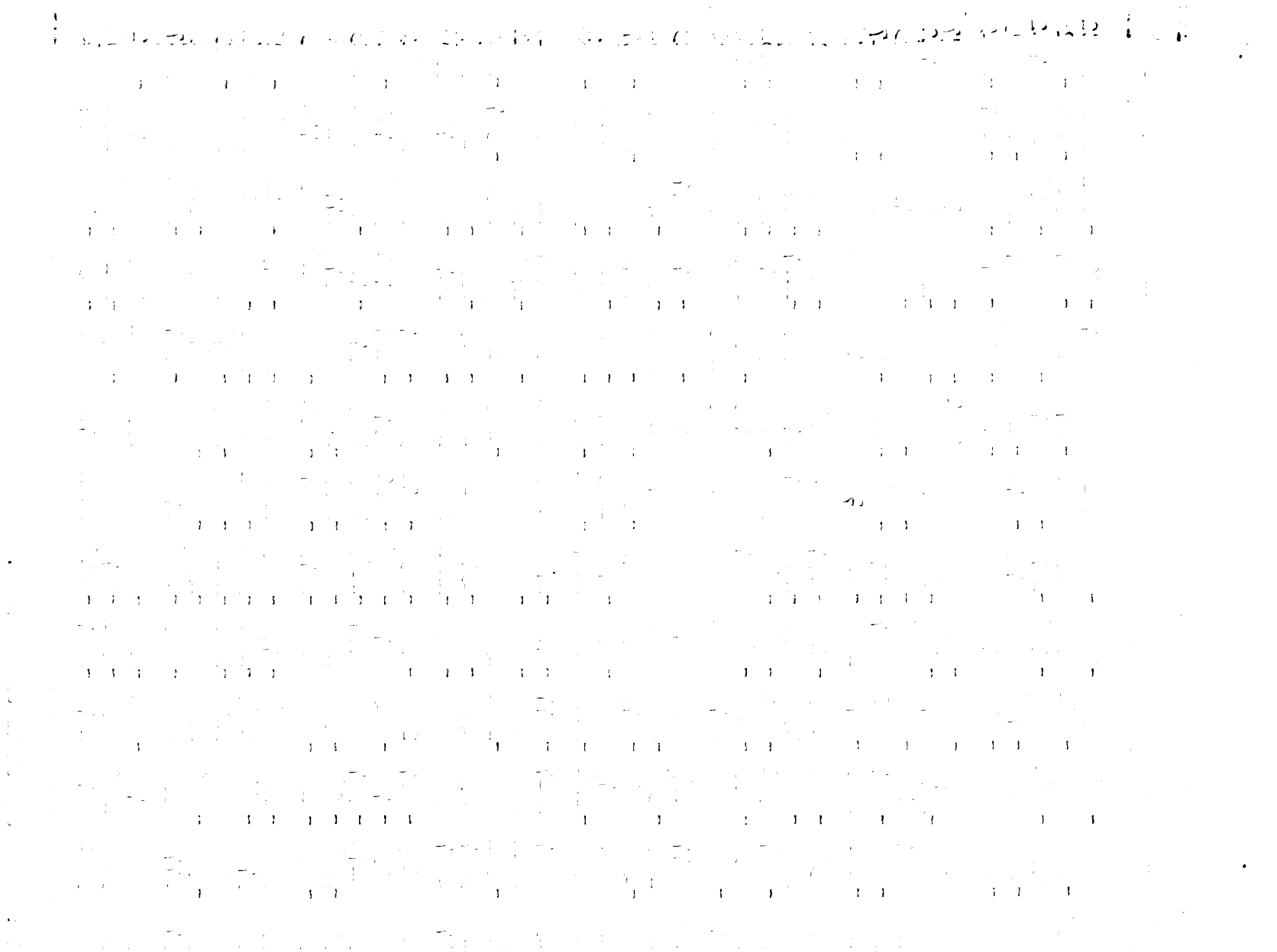


TABLE III. MATRIX OF DIFFERENCES: CELL ENTRIES OF TABLE I MINUS CELL ENTRIES OF TABLE II.

Items	2	3	4	5	6	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
2		1276	0593	0451	0081	0808	2987	0643	1791	0399	0440	0928	0299	1869	2685	0230	0021	0007	1352	1571	1305	0486	1750	0815	0999	0173	1296	0973	0698	1602	1136	0979	1300	1176	0904	0195	2014	2077
3	1276		0656	0859	0302	0620	1807	0951	0905	1994	1805	0693	1068	2527	0749	0309	0145	0454	1899	1188	1843	0939	1649	2930	0816	0318	0830	0737	0414	1299	1075	0545	1079	1526	0194	0171	1949	1056
4	0593	0656		1044	1358	0297	0205	0217	2518	1146	0668	0635	2477	0113	2830	0274	3044	0961	0091	1698	2678	1665	0987	0668	0175	0063	0054	0213	0568	0712	0275	0580	1535	0996	0117	3357	0897	0630
5	0451	0859	1044		1677	0870	2738	0605	1314	1206	0749	0768	2285	0584	0568	1543	1012	0003	1288	0998	1251	0766	0432	0530	1687	0926	1003	0673	1682	1902	1109	0873	0508	0182	1230	0070	0213	2970
6	0081	0302	1358	1677		0828	1247	0142	1973	0885	0275	0593	1109	0838	0867	1509	0636	1212	0383	0515	1571	1919	2310	2055	1614	1853	1141	2030	2889	2004	0676	3523	2512	2111	2031	0267	2272	0316
8	0808	0620	0297	0870	0828		0380	1243	0433	0982	1750	0060	1357	3467	0162	1569	0635	1836	0299	2210	0368	0341	1482	0438	1141	2166	0351	0044	2312	2185	2752	1536	0613	0501	1279	1475	0870	1948
9	2987	1807	0205	2738	1247	0380		0532	0494	0860	0876	1907	0679	0671	1199	2500	0413	1272	1095	0618	0188	1598	3121	1144	0223	0448	2359	0596	1039	0513	1906	1872	0913	1869	0704	1619	0164	0828
10	0643	0951	0217	0605	0142	1243	0532		0842	0143	1397	1429	2263	1059	0419	0870	0218	1062	0025	0832	0840	3633	0495	0562	1360	0458	1759	0123	1525	1088	1562	2444	1088	0460	0768	0830	2956	0034
11	1791	0905	2518	1314	1973	0433	0494	0842		0407	1698	1070	1941	0315	0530	0214	3166	1403	1311	0462	3352	1443	0117	1641	2976	2800	0717	1284	0454	1937	0553	3240	0801	1377	2037	3827	1664	1379
12	0399	1994	1146	1206	0885	0982	0860	0143	0407		0835	1309	0548	1379	0347	0296	2630	0324	0024	3412	5284	1898	0383	0309	0113	2364	1693	0322	1049	1729	2381	0189	0756	1186	1227	0474	1364	0064
13	0440	1805	0668	0749	0275	1750	0876	1397	1698	0835		1236	0507	1354	0353	0119	1863	1537	0626	0113	0553	0999	1142	0038	2600	0610	0184	1279	1120	0650	0916	0500	0210	1690	0663	0030	0742	2370
14	0928	0693	0635	0768	0593	0060	1907	1429	1070	1309	1236		1001	0667	0033	0304	5248	0798	0103	1559	0008	0527	0692	1124	0459	2576	0086	0813	3800	0233	1089	0177	0159	0173	2132	0691	0122	0466
15	0299	1068	2477	2285	1109	1357	0679	2263	1709	0548	0507	1001		1331	0331	1080	0436	1272	0373	1901	1108	3266	0628	1881	0798	0479	2086	0493	4899	3994	0170	0998	0243	0159	0763	0929	2740	0629
16	1869	2527	0113	0584	0838	3467	0671	1059	0315	1379	1354	0667	1331		0308	0449	1229	2943	0389	1266	2103	3701	0781	0842	2965	0084	1091	2431	1448	0332	2943	1229	0326	0431	0679	0139	1928	1104
17	2685	0749	2830	0568	0867	0162	1199	0419	0530	0347	0353	0033	0331	0308		0541	1525	0985	1611	0893	1608	0982	2067	0729	1120	0602	0790	0318	0489	1698	2326	1394	3023	0263	1120	0504	0134	1254
18	0230	0309	0274	1543	1509	1569	2500	0870	1214	0296	0119	0304	1080	0449	0541		1185	1771	0898	2117	1017	0082	0534	1155	1544	0986	0411	0683	0927	0589	2573	0496	1187	1358	0290	0904	0126	1688
19	0021	0145	3044	1012	0636	0635	0413	0218	3166	2630	1863	5248	0436	1229	1525	1185		0177	0607	0012	3378	1191	0632	0980	1817	0300	0549	0384	0708	1015	0433	1008	0513	2090	1062	2451	3446	1943
20	0007	0454	0961	0003	1212	1836	1272	1062	1403	0324	1537	0798	1272	2943	0985	1771	0177		2936	0676	0542	2723	0055	1160	0952	0574	0638	0932	1250	2467	3369	0786	0949	0230	0825	0469	0974	1197
21	1352	1899	0091	1288	0383	0299	1095	0025	1311	0024	0626	0103	0373	0389	1611	0898	0607	2936		0678	2209	0119	0902	1818	2321	1348	1188	1570	1185	0754	0301	0360	0523	0289	1020	1371	0084	0519
22	1571	1188	1698	0998	0515	2210	0618	0832	0462	3412	0113	1559	1901	1266	0893	2117	0012	0676	0678		0060	2435	0365	0854	1696	0322	2016	0244	3967	3956	1481	0191	3367	0347	0546	1213	2696	2145
23	1305	1843	2678	1251	1571	0368	0188	0840	3352	5284	0553	0008	1108	2103	1608	1017	3378	0542	2209	0060		1438	1332	1079	1089	1659	0817	2989	0467	1044	3550	0355	2506	0856	1194	2727	0471	2383
24	0486	0939	1665	0766	1919	0341	1598	3633	1443	1898	0999	0527	3266	3701	0982	0082	1191	2723	0119	2435	1438		0949	2401	1538	0632	0741	2336	1954	3607	0144	0843	3015	2389	2963	0799	0677	1286
25	1750	1649	0987	0432	2310	1482	3121	0495	0117	0383	1142	0692	0628	0781	2067	0534	0632	0055	0902	0365	1332	0949		1953	1587	0714	0925	0265	2569	1687	2464	0928	0240	0852	1356	0769	0382	1065
26	0815	2930	0668	0530	2055	0438	1144	0562	1641	0309	0038	1124	1881	0842	0729	1155	0980	1460	1818	0854	1079	2401	1953		2530	2885	0090	1377	0767	1075	0781	0185	2328	2147	1204	1606	0543	0683
27	0999	0816	0175	1687	1614	1141	0223	1360	2976	0113	2600	0459	0798	2965	1120	1544	1817	0952	2321	1696	1089	1538	1587	2530		0578	2642	0967	1191	0428	1429	0015	0256	1916	0277	0749	1047	0413
28	0173	0318	0063	0926	1853	2166	0448	0458	2800	2364	0610	2576	0479	0084	0602	0986	0300	0574	1348	0322	1659	0632	0714	2885	0578		2486	0532	2475	0127	0307	1904	1105	0526	0120	0076	0666	0160
29	1296	0830	0054	1003	1141	0351	2359	1759	0717	1693	0184	0086	2086	1091	0790	0411	0549	0638	1188	2016	0817	0741	0925	0090	2642	2486		0975	0596	1572	0415	2920	0836	1963	0024	0750	2171	1168
30	0973	0737	0213	0673	2030	0044	0596	0423	1284	0322	1279	0813	0493	2431	0318	0683	0384	0932	1570	0244	2989	2336	0265	1377	0967	0532	0975		2151	1086	1303	0246	2177	0046	0320	0398	1309	1182
31	0698	0414	0568	1682	2889	2312	1039	1525	0454	1049	1120	3800	4899	1448	0489	0927	0708	1250	1185	3967	0467	1954	2569	0767	1191	2475	0596	2151		0295	1637	1010	3087	0596	0924	0887	3264	3917
32	1602	1299	0712	1902	2004	2185	0513	1088	1937	1729	0650	0233	3994	0332	1698	0589	1015	2467	0754	3965	1044	3607	1687	1075	0428	0127	1572	1086	0295		0899	0331	1900	0058	2069	2204	1213	3284
33	1136	1075	0275	1109	0676	2752	1906	1562	0553	2381	0916	1089	0170	2943	2326	2573	0433	3369	0301	1481	3550	0144	2464	0781	1429	0307	0415	1303	1637	0899		0120	1552	0959	1215	2317	0246	0703
34	0979	0545	0580	0873	3523	1536	1872	2444	3240	0189	0500	0177	0998	1229	1394	0496	1008	0786	0360	0191	0355	0843	0928	0185	0015	1904	2920	0246	1010	0331	0120		1624	1076	0130	0639	2214	1147
35	1300	1079	1535	0508	2512	0613	0913	1088	0801	0756	0210	0159	0243	0326	3023	1187	0513	0949	0523	3367	2506	3015	0240	2328	0256	1105	0836	2177	3087	1900	1552	1624		1978	1192	3866	0837	0925
36	1176	1526	0996	0182	2111	0501	1869	0460	1377	1186	1690	0173	0159	0431	0263	1358	2090	0230	0289	0347	0856	2389	0852	2147	1916	0526	1963	0046	0596	0058	0959	1076	1978		1531	0228	0785	0952
37	0904	0194	0117	1230	2031	1279	0704	0768	2037	1227	0663	2132	0763	0679	1120	0290	1062	0825	1021	0546	1194	2963	1356	1204	0277	0120	0024	0320	0924	2069	1215	0130	1192	1531		0315	0177	1473
38	0195	0171	3357	0070	0267	1475	1619	0830	3827	0474	0030	0691	0929	0139	0504	0904	2451	0469	1371	1213	2727	0799	0769	1606	0749	0076	0750	0398	0887	2204	2317	0639	3866	0228	0315		0994	0675
39	2014	1949	0897	0213	2272	0870	0164	2956	1664	1364	0742	0122	2740	1928	0134	0126	3446	0974	0084	2696	0471	0677	0382	0543	1047	0666	2171	1309	3264	1213	0246	2214	0837	0785	0177	0994		3067
40	2077	1056	0630	2970	0316	1948	0828	0034	1379	0064	2370	0466	0629	1104	1254	1688	1943	1197	0519	2145	2383	1286	1065	0683	0413	0160	1168	1182	3917	3284	0703	1147	0925	0952	1473	0675	3067	
	38209	39577	36995	38569	49524	41608	43584	37177	55386	41911	34497	35668	48521	47315	37357	34598	48102	42021	33870	50629	57222	58425	40561	45607	45615	36242	41331	36101	60210	53538	49067	38607	51029	37272	35975	40985	47418	49100

Note: The decimal points are omitted.

TABLE IV. TYPES DEVELOPED THROUGH LINKAGE ANALYSIS FROM TABLE III (MATRIX OF DIFFERENCES)

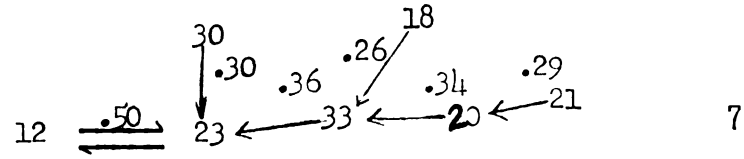
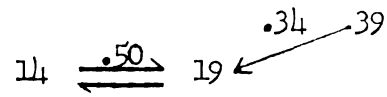
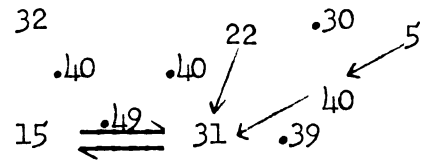
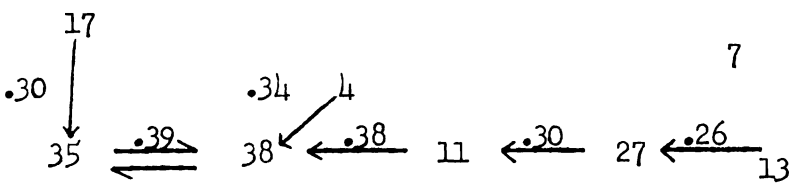
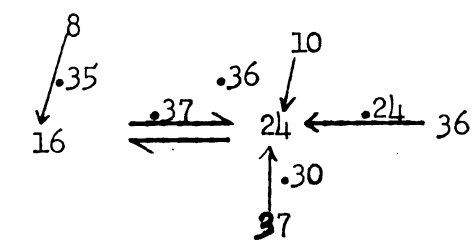
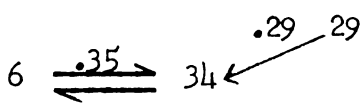
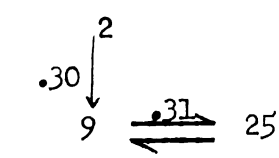
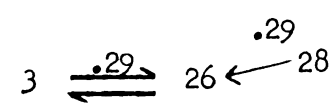
Type I		7
Type II		3
Type III		6
Type IV		7
Type V		6
Type VI		3
Type VII		3
Type VIII		3

TABLE V. MATRIX OF RECIPROCAL PAIRS

Items	3	6	9	12	14	15	16	19	23	24	25	26	31	34	35	38
3		0302	1807	1994	0693	1068	2527	0145	1843	0939	1649	2930	0414	0545	1079	0171
6	0302		1247	0885	0593	1109	0838	0636	1571	1919	2310	2055	2889	3523	2512	0267
9	1807	1247		0860	1907	0679	0671	0413	0188	1598	3121	1144	1039	1872	0913	1691
12	1994	0885	0860		1309	0548	1379	2630	5284	1898	0383	0309	1049	0189	0756	0474
14	0693	0593	1907	1309		1001	0667	5248	0008	0527	0692	1124	3800	0177	0159	0691
15	1068	1109	0679	0548	1001		1331	0436	1108	3266	0628	1881	4899	0998	0243	0929
16	2527	0838	0671	1379	0667	1331		1229	2103	3701	0781	0842	1448	1229	0326	0139
19	0145	0636	0413	2630	5248	0436	1229		3378	1191	0632	0980	0708	1008	0513	2451
23	1843	1571	0188	5284	0008	1108	2103	3378		1438	1332	1079	0467	0355	2506	2727
24	0939	1919	1598	1898	0527	3266	3701	1191	1438		0949	2401	1954	0843	3015	0799
25	1649	2310	3121	0383	0692	0628	0781	0632	1332	0949		1953	2569	0928	0240	0769
26	2930	2055	1144	0309	1124	1881	0842	0980	1079	2401	1953		0767	0185	2328	1606
31	0414	2889	1039	1049	3800	4899	1448	0708	0467	1954	2569	0767		1010	3087	0887
34	0545	3523	1872	0189	0177	0998	1229	1008	0355	0843	0928	0185	1010		1624	0639
35	1079	2512	0913	0756	0159	0243	0326	0513	2506	3015	0240	2328	3087	1624		3866
38	0171	0267	1691	0474	0691	0929	0139	2451	2727	0799	0769	1606	0887	0639	3866	
Total =	18106	22656	19150	19947	18596	20124	19211	21598	25387	26438	18936	21584	26987	15125	23167	18106
M =	1132	1416	1197	1267	1162	1258	1201	1350	1587	1652	1184	1349	1687	9453	1448	1132
Rank order =	XV	V	XI	IX	XIII	VIII	X	VI	III	II	XII	VII	I	XVI	IV	XIV

General mean of all the sixteen columns = 1309
Mean of first thirteen largest columns = 1364

Note: The decimal points are omitted.

TABLE VI. SUMS AND AVERAGES IN DESCENDING ORDER OF COLUMNS OF TABLE III (MATRIX OF DIFFERENCES)

Number	Item	Column Sum	Column Average
1	31	60210	1584
2	24	58425	1538
3	23	57222	1506
4	11	55386	1458
5	32	53538	1409
6	35	51029	1343
7	22	50629	1332
8	6	49524	1303
9	40	49100	1292
10	33	49067	1291
11	15	48521	1277
12	19	48102	1266
13	39	47418	1248
14	16	47315	1245
15	27	45615	1200
16	26	45607	1200
17	9	43584	1147
18	20	42021	1106
19	12	41911	1103
20	8	41608	1095
21	29	41331	1088
22	38	40985	1079
23	25	40561	1067
24	3	39577	1042
25	34	38607	1016
26	5	38569	1015
27	2	38309	1008
28	17	37357	983
29	36	37272	981
30	10	37177	978
31	4	36995	974
32	28	36242	954
33	30	36101	950
34	37	35975	947
35	14	35668	937
36	18	34598	910
37	13	34497	908
38	21	33870	891

Mean of the first sixteen items = 1343
Mean of the first thirteen items = 1373

Note: Decimal points are omitted.

TABLE VII. MATRIX OF ITEMS OF THE LARGEST COLUMN-SUM IN TABLE III (MATRIX OF DIFFERENCES)

Items	6	11	15	16	19	22	23	24	26	27	31	32	33	35	39	40
6		1973	1109	0838	0636	0515	1571	1919	2055	1614	2889	2004	0676	2512	2272	0316
11	1973		1941	0315	3166	0462	3352	1443	1641	2976	0454	1937	0553	0801	1664	1379
15	1109	1941		1331	0436	1901	1108	3266	1881	0798	4899	3994	0170	0243	2740	0629
16	0838	0315	1331		1229	1266	2103	3701	0842	2965	1449	0332	2943	0326	1928	1104
19	0636	3166	0436	1229		0012	3378	1191	0980	1817	0708	1015	0433	0513	3446	1943
22	0515	0462	1901	1266	0012		0060	2435	0854	1696	3967	3956	1481	3367	2696	2145
23	1571	3352	1108	2103	3378	0060		1438	1079	1089	0467	1044	3550	2506	0471	2383
24	1919	1443	3266	3701	1191	2435	1438		2401	1538	1954	3607	0144	3015	0677	1286
26	2055	1641	1881	0842	0980	0854	1079	2401		2530	0767	1075	0781	2328	0543	0683
27	1614	2976	0798	2965	1817	1696	1089	1538	2530		1191	0428	1429	0256	1047	0413
31	2889	0454	4899	1448	0708	3967	0467	1954	0767	1191		0295	1637	3087	3264	3917
32	2004	1937	3994	0332	1015	3956	1044	3607	1075	0428	0295		0899	1900	1213	3284
33	0676	0553	0170	2943	0433	1481	3550	0144	0781	1429	1637	0899		1552	0246	0703
35	2512	0801	0243	0326	0513	3367	2506	3015	2328	0256	3087	1900	1552		0837	0925
39	2272	1664	2740	1928	3446	2696	0471	0677	0543	1047	3264	1213	0246	0837		3067
40	0316	1379	0629	1104	1943	2145	2383	1286	0683	0413	3917	3284	0703	0925	3067	
Total =	22863	24021	26446	22671	20903	26813	25599	30015	20440	19118	30944	26983	17197	24168	26111	24177
M =	1429	1501	1653	1417	1306	1676	1600	1876	1278	1195	1934	1686	1075	1511	1632	1511
Rank order =	XI	X	V	XII	XIII	IV	VII	II	XIV	XV	I	III	XVI	IX	VI	VIII

General mean of all the sixteen columns = 1518
Mean of first thirteen largest columns = 1595

Note: Decimal points are omitted

TABLE VIII. MATRICES OF ALL THE ITEMS APPEARING IN EIGHT TYPES

Type I

Items	12	23	30	33	20	18	21
12		5284	0322	2381	0324	0296	0024
23	5284		2989	3550	0542	1017	2209
30	0322	2989		1303	0932	0683	1570
33	2381	3550	1303		3369	2573	0301
20	0324	0542	0932	3369		1771	2936
18	0296	1017	0683	2573	1771		0898
21	0024	2209	1570	0301	2936	0898	
Total =	8631	15591	7799	13477	9874	7238	7938
M =	1233	2227	1114	1925	1411	1034	1134
GM =	1040						

Type II

Items	14	19	39
14		5248	0122
19	5248		3446
39	0122	3446	
Total =	5370	8694	3568
M =	1790	2898	1189
GM =	1959		

Type III

Items	15	31	32	22	40	5
15		4899	3994	1901	0629	2285
31	4899		0295	3967	3917	1682
32	3994	0295		3965	3284	1902
22	1901	3967	3965		2145	0998
40	0629	3917	3284	2145		2970
5	2285	1682	1902	0998	2970	
Total =	13708	14760	13440	12976	12945	9837
M =	2285	2460	2240	2163	2158	1640
GM =	2158					

Continued

TABLE VIII - Continued

Type IV

Items		35	38	11	4	17	27	13
35			3866	0801	1535	3023	0256	0210
38		3866		3827	3357	0504	0749	0030
11		0801	3827		2518	0530	2976	1698
4		1535	3357	2518		2830	0175	0668
17		3023	0504	0530	2830		1120	0353
27		0256	0749	2976	0175	1120		2600
13		0210	0030	1698	0668	0353	2600	
Total	=	9691	12333	12350	11083	8360	7876	5559
M	=	1384	1762	1764	1583	1194	1125	794
GM	=	1372						

Type V

Items		16	24	10	8	37	36
16			3701	1059	3467	0679	0431
24		3701		3633	0341	2963	2389
10		1059	3633		1243	0768	0460
8		3467	0341	1243		1279	0501
37		0679	2963	0768	1279		1531
36		0431	2389	0460	0501	1531	
Total	=	9337	13027	7163	6831	7220	5312
M	=	1556	2171	1194	1139	1203	886
GM	=	1358					

Type VI

Items		6	34	29
6			3523	1141
34		3523		2920
29		1141	2920	
Total	=	4664	6443	4061
M	=	1555	2148	677
GM	=	1460		

Continued

TABLE VIII - Concluded

Type VII

Items		9	25	2
9			3121	2987
25		3121		1750
2		2987	1750	
Total	=	6108	4871	4737
M	=	2036	1629	1579
GM	=	1746		

Type VIII

Items		3	26	28
3			2930	0318
26		2930		2885
28		0318	2885	
Total	=	3248	5815	3203
M	=	1083	1938	1068
GM	=	1363		

Over-all Mean = 1588

Note: Decimal points are omitted.

TABLE IX. MATRIX OF ITEMS HAVING LARGEST ENTRIES IN THEIR COLUMNS IN TABLE III (MATRIX OF DIFFERENCES)

Items	10	11	12	14	15	16	19	22	23	24	31	32	33	35	38	40
10		0842	0143	1429	2263	1059	0218	0832	0840	3633	1525	1088	1562	1088	0830	0034
11	0842		0407	1070	1941	0315	3166	0462	3352	1443	0454	1937	0553	0801	3827	1379
12	0143	0407		1309	0548	1379	2630	3412	5284	1898	1049	1729	2381	0756	0474	0064
14	1429	1070	1309		1001	0667	5248	1559	0008	0527	3800	0233	1089	0159	0691	0466
15	2263	1941	0548	1001		1331	0436	1901	1108	3266	4899	3994	0170	0243	0929	0629
16	1059	0315	1379	0667	1331		1229	1266	2103	3701	1448	0332	2943	0326	0139	1104
19	0218	3166	2630	5248	0436	1229		0012	3378	1191	0708	1015	0433	0513	2451	1943
22	0832	0462	3412	1559	1901	1266	0012		0060	2435	3967	3956	1481	3367	1213	2145
23	0840	3352	5284	0008	1108	2103	3378	0060		1438	0467	1044	3550	2506	2727	2383
24	3633	1443	1898	0527	3266	3701	1191	2435	1438		1954	3607	0144	3015	0799	1286
31	1525	0454	1049	3800	4899	1448	0708	3967	0467	1954		0295	1637	3087	0887	3917
32	1088	1937	1729	0233	3994	0332	1015	3956	1044	3607	0295		0899	1900	2204	3284
33	1562	0553	2381	1089	0170	2943	0433	1481	3550	0144	1637	0899		1552	2317	0703
35	1088	0801	0756	0159	0243	0326	0513	3367	2506	3015	3087	1900	1552		3866	0925
38	0830	3827	0474	0691	0929	0139	2451	1213	2727	0799	0887	2204	2317	3866		0675
40	0034	1379	0064	0466	0629	1104	1943	2145	2383	1286	3917	3284	0703	0925	0675	
Total =	17386	21949	23463	19256	24659	19342	24571	28068	30248	30337	30094	27517	21414	24104	24029	20937
M =	1087	1372	1466	1204	1541	1209	1536	1754	1891	1896	1881	1720	1338	1507	1502	1309
Rank order =	XVI	XI	X	XV	VI	XIV	VII	IV	II	I	III	V	XII	VIII	IX	XIII

Note: Decimal points are omitted.

TABLE X. TWO X TWO TABLES OF THIRTY-EIGHT ITEMS SHOWING CELL FREQUENCIES

Number	Item	Cell Frequencies		
	A	B	C	D
2	54	63	28	25
3	16	14	66	74
4	39	13	43	75
5	54	53	28	35
6	43	35	39	53
8	48	55	34	33
9	35	49	47	39
10	19	28	63	60
11	50	40	32	48
12	49	63	33	25
13	52	51	30	37
14	43	43	39	45
15	53	67	29	21
16	53	58	29	30
17	47	53	35	35
18	46	52	36	36
19	21	37	61	51
20	34	40	48	48
21	56	51	26	37
22	56	56	26	32
23	23	29	59	59
24	38	46	44	42
25	32	23	50	65
26	51	53	31	35
27	39	18	43	70
28	28	34	54	54
29	20	47	62	41
30	49	44	33	44
31	25	26	57	62
32	35	38	47	50
33	27	25	55	63
34	38	43	44	45
35	39	38	43	50
36	66	66	16	22
37	45	45	37	43
38	25	31	57	57
39	25	29	57	59
40	42	56	40	32

TABLE XI. RANKED CHI-SQUARE VALUES* FOR THIRTY-EIGHT ITEMS

Item	Chi-Square
4	19.975
29	13.778
27	12.803
19	4.395
11	3.504
25	2.659
9	2.372
6	2.255
40	2.195
15	2.178
12	2.144
21	1.526
30	1.259
40	1.183
36	.454
2	.411
24	.382
5	.359
13	.325
23	.277
38	.243
22	.227
33	.222
28	.200
35	.174
3	.170
8	.137
20	.135
37	.111
14	.096
18	.056
17	.051
39	.032
34	.030
26	.010
32	.007
31	.000
16	.000

*Yates correction for continuity applied.

TABLE XII. SPECIMEN PATTERN OF RESPONSE (PRODUCED BY MISTIC)

012
011
010
009
009
008
007
007
006
224 193 194 220 208 230 165 166 195 167

0F0
0N1
0N2
0JN
0J0
0F6
0+5
0+6
0N3
0+7
3+00000000814313LLLLLL

ACADEMIC ACTIVITY PREFERENCE INVENTORY

Items

1. Studying during free hours in the day, so as to reduce the evening's load.
2. Believing that my parents would sooner have me work than go to school.
3. Discussing books with friends.
4. Going to parties where couples are expected to pair off.
5. Staying away from school activities in which I don't do well.
6. Going along with a chairman's decision rather than starting a fuss.
7. Working on tasks for long periods of time, without interruption or diversion.
8. Having friends who are inferior to me in academic ability.
9. Cutting classes when I need to cram for a test.
10. Learning to repair such things as the radio, sewing machine, or car.
11. Considering studying as important as work I will do later.
12. Participating in a discussion that is exceptionally logical, precise, and coherent.
13. Pretending that I agree with a teacher after I see that he has his mind made up.
14. Giving up on a problem rather than doing it in a way that may be wrong.
15. Feeling that examinations measure what I have learned.
16. Feeling that examinations measure what I know.
17. Changing my answers on examination questions.
18. Doing more constructive things than studying.
19. Going to school.

20. Relying on specific class assignments to spur me on to accomplish things.

21. Keeping to a regular schedule, which means working when I don't really feel like it.

22. Believing that teachers, on the whole, are fair in the ways they grade.

23. Spending a good deal of my time on activities which are amusing but of little practical value.

24. Preparing for examinations by first taking time to arrange the facts I must learn in some logical order.

25. Reading great novels written in the past.

26. Searching continually for the source of difficulty in a problem until I've located it.

27. Working in science and mathematics rather than art or music.

28. Trying to develop a sincere interest in every course I take.

29. Laughing at a dirty joke every once in awhile.

30. Reading books which stress adventure.

31. Sitting around and thinking.

32. Giving all my energy to whatever I happen to be doing.

33. Spending some time to get "warmed up" to the task of studying.

34. Believing that my parents regarded going to school as important as working.

35. Setting a goal as to how much material I will cover before each study period.

36. Fixing things around the house.

37. Looking up things in original sources in order to find out for myself.

38. Completing assignments if they are boring and dull.

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