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THE COMPARATIVE RELIABILITY OF OBJECTIVE
TESTS IN ENGLISH GRAMMAR

This Thesis for the M.A. Degree, by

Inez B. Prosser

not proof read, has been approved for the

By Inez Beverly Prosser, B. A.
Sam Huston College, 1926

Education

By

Harry M. Prosser

A THESIS

Submitted to the Faculty of the Graduate School of the
University of Colorado as partial fulfillment of the
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COLLEGE OF EDUCATION

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Date Aug 15 1927

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Inez B. Prosser

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Department of
Education

By

Harry M. Barrett

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2. Hopkins, L. Thomas: Construction and use of Objective Examinations.

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examination.

C H A P T E R I

Foreword

The problem involved in this investigation was to determine the comparative reliability of four types of tests in English Grammar. The forms selected were the true-false, multiple choice, completion and matching tests.¹

The basis on which comparisons are to be made are: character of the ungrouped scores, the frequency distribution, the range of scores, the median, standard deviation, coefficient of correlation, probable error of the coefficient of correlation, indices of reliability, coefficient of alienation, probable error of the score and standard error of the score.

Chapter II

The Construction and Administration of Tests.

Realizing that it is very necessary in constructing any new type examination to adhere to certain basic rules of construction and administration,² the author worked keeping in mind the guiding principles underlying a good

1. Samples of Tests: Appendix

2. Hopkins, L. Thomas: Construction and use of Objective Examinations.

examination. The tests were given by the author to 197

children. During the summer of 1926, under the direction of the College of Education, University of Colorado, new type examinations in English Grammar were made by the author. The questions in these examinations were based on analysis of text books, National Education Association essentials, and the course of study, Austin, Texas Public Schools, together with other courses of study. Yet in order to assure the maximum validity it was found necessary to revise the tests in September, 1927 and supplement them with material drawn from actual teaching from day to day.

About four months were used for the construction of the revised examination. The procedure in the construction being as follows: at the close of each day's lesson a number of new type questions, drawn from the material taught that day were made. When practicable, questions were given preference when it was seen that they were adaptable to each of the four forms which were needed for the tests. An interesting fact in this connection was that some questions were easier to state in one form than in another form. When a sufficient amount of material was collected at the end of the four-month period, the data was evaluated and the questions were selected and printed. The aim was to have the same body of material in each test and both fact and reasoning questions were used in as nearly equal proportion as was possible.

3.

These tests were given by the author to 197 children in January and to 106 in March, in grades 8 to 11 of Anderson High School, Austin, Texas. The children were directed not to guess. The 303 cases involved were thrown together in the final tabulation of results. All scoring, giving and compilation of data was done by the author during the school session 1926 and 1927. The true-false examination of 100 items was given first, experimental evidence¹ having shown the wisdom of this procedure in dealing with a number of tests. Three days later the multiple-choice examination of fifty items was given, then the following week the completion of fifty items followed by the matching test of fifteen items. Each test required one hour with the exception of the matching examination which required thirty minutes. A score key was made for each examination none of which required changing except in the case of the completion examination which was revised to suit a variety of correct responses which had been made by students but which had been overlooked as possible correct statements when the tests were made. The scoring of the multiple-choice test was facilitated by having students draw lines through all except the correct items.

1. Remmers, H. H. : Negative Suggestion Effect of True-False Questions, Journal Education Psychology, Vol. 17, No. 1, January 1926, pages 52-56.

The next step after the scoring of papers, was the making of graphs to represent the frequency distribution. That there is a general tendency of quantitative data to follow the normal probability curve is now accepted as true. It was desirable, therefore, to determine whether or not the data found had approximated the bell-shaped curve. It was found that all the tests have a tendency to follow the normal curve.

The entire area under the frequency curve represents the total number of frequencies in the distribution. Graphs 1 to 4 represent the distribution of tables I to IV respectively. The limits of the step-intervals (the abscissas) are laid off at regular intervals along the base line, x axis, from the origin and the frequencies within each interval (the ordinates) are measured off on a scale along the y axis. To represent the steps on the diagram, it is necessary to go out on the x axis to the mid-point of the interval and locate the points. The frequency on each succeeding step is in every case represented by a point the specified number of scores (y units) above the x axis and midway between the upper and lower limits of the step on which it lies. When all the points are located, they are joined in regular order to give

the outline of the frequency polygon. All correlations reported in this study are Pearson Product-Moment coefficients to which no corrections have been applied save the usual corrections for a guessed average. The self-correlation method of finding reliability was used. In this method each test is divided into chance halves. First, two independent sets of scores are made by some combination of exercises in the test. In this case the alternate exercises were used. One set of scores was the performance on the odd exercises and the other set was the performance on the even exercises. The two sets were then correlated to find the reliability of the half test. The reliability of the whole test was then found by using Brown's formula. In using this formula, the assumption is made that the halves of the test as they have been made are approximately equivalent in function.

Chapter III

Results of True-False

The total score possible on the true-false examination was 100. The range of the total scores on this test was 80: the minimum score was 12; the maximum 92.

1. Appendix	Page	30
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1. Table of Chance-Halves: True-False	Page 30	

The PEM was 3.12 which indicates that in any given score there is a probable error of 3.12 points. If a score of 80 is made, the chances are that the true score lies somewhere between 77 and 83. The $\sigma_m = 4.31$. The σ_m is practically the equivalent of the PEM. The median performance is slightly above the midpoint of the total score, being 58.5 rather than 50. The test discriminated well; no zeros and no perfect scores were made. The standard deviation of the score is 2.76 that of the interval 13.8. In a normal distribution, the σ when measured off above and below the median, marks off the limits of the middle 68.26% of the cases. This is approximately true of the less symmetrical distributions also.

On the odd and even scores, the range is 6 to 48 for the odd score and 6 to 46 for the even scores; median is 29 for the odd score and 29.5 for the even score; the σ of scores 1.3 on the odd score and 1.4 on the even score; σ of the interval 6.5 on the odd score and 7.0 on the even score. These facts prophesy that the self-correlation will be high.

Observation of the ungrouped scores₁ indicate that there are perfect correlations in 78 cases and high cor-

1. Diagram 5

1. Table of Chance-Halves: True-False

Page 57
Page 30

relations of .9 approximately in 42 cases. These results are based on inspection of the number of scores that break even 20-20 or almost even 19-20 etc.

The self-correlation₁ of the entire true-false test was .88; the probable error of coefficient of correlation was .01.

The index of reliability gives as the maximum reliability of the test .93. The coefficient of alienation .47 which indicates that more than half of the chance factors have been eliminated.

95-90	1		
90-85	3		
85-80	19		
80-75	26		
75-70	29		
70-65	23	2	1
65-60	21	18	15
60-55	14	43	38
55-50	10	71	79
50-45	5	88	92
45-40	6	47	55
40-35	3	20	20
35-30	1	10	9
30-25	-	4	3
25-20	-	-	-
20-15	-	-	-
15-10	-	-	-
10-5	-	-	-
5-0	-	-	-
	303	303	303

Range	Minimum	12	6	6
	Maximum	92	48	46
PE ₁		3.12		
σ _r		4.31		
No. of perfect scores		0	0	0
No. of zero scores		0	0	0
Median		58.5	29	29.5
		r = 2.76x5=13.3	r = 1.3x5=6.5	r = 1.4x5=7.0

Chapter IV

Results of Multiple-Choice₁

1. Diagram 5 The total score possible on the Multiple-Choice examination was 50. The range of scores was 40: the minimum

1. Table 2

being 5 and the maximum Table I

Showing the frequencies of the True-False test total scores means that and the odd and even scores when grouped.

above or below the score he actually received. The test

True-False Scores: no zer Total no per Oddt score Evenade.

90-95	m = 3.01.	1		
85-90		3		
80-85	The median is 24.610	10	which is almost one-half of the	
75-80		19		
70-75	possible score 50.	19		
65-70		26		
60-65	The standard deviation of the score is 1.72; of	57		
55-60		57		
50-55	interval 3.6.	29		
45-50		23	2	1
40-45	On the odd and even scores, 118 range is:	21	18	16
35-40	Odd	14	43	38
30-35	3 to 24	10	71	79
25-30	Median 12.3	5	88.9	82
20-25	s.d. of score .97	5	47.92	55
15-20	s.d. of interval 4.8	3	20.8	20
10-15		1	10	9
5-10	The self-correlation of the test was found to be	4		3
0-5		--	--	--
±.85; the probable error was 303		303	303	303

gave .92 The coefficient of alienation = .51.

Range	Minimum	12	6	6
	Maximum	92	48	46
PEm = 3.12				
$\sigma_m = 4.31$				
No. of perfect scores		0	0	0
No. of zero scores		0	0	0
Median		58.5	29	29.5
$\sigma = 2.76 \times 5 = 13.8$		$\sigma = 1.3 \times 5 = 6.5$	$\sigma = 1.4 \times 5 = 7.0$	

Chapter IV

Results of Multiple-Choice₁

The total score possible on the Multiple-Choice examination was 50. The range of scores was 40: the minimum

being 5 and the maximum 45.

The probable error of the score was 2.17; which means that any student's true score lies between 2.17 points above or below the score he actually received. The test discriminated well: no zero and no perfect score was made.

The $\sigma_m = 3.01$.

The median is 24.6 which is almost one-half of the total possible score 50.

The standard deviation of the score is 1.72; of the interval 8.6.

On the odd and even scores, the range is:

	Odd	Even
Range	3 to 24	2 to 26
Median	12.3	12.9
p.d. of score	.97	.92
p.d. of interval	4.8	4.6

The self-correlation of the test was found to be $\pm .85$; the probable error was .01. The index of reliability gave $\pm .92$. The coefficient of alienation $\pm .51$.

Chapter V

Results of the Completion Test

Table III shows the results of the completion test. The total number of items in the completion test is 50. A fair range of scores is shown in this test 42: the minimum is 1; the maximum 43. The discrimination was not perfect; there are no perfect scores but there are 5 zero scores.

1. Table III

Page 13.

The median Table II that lower than would be ex-

pected 17 Showing the frequencies of the Multiple-Choice test total scores, odd and even scores when grouped.

the interval. 2.15. The probable error of score is 2.24.

Multiple-Choice Scores	total	odd	even
45-50	2		
40-45	11		
35-40	25		
30-35	49		
25-30	60	-	1
20-25	62	20	11
15-20	53	70	89
10-15	31	115	110
5-10	10	84	80
0-5	-	14	12
Standard deviation	303	303	303

Range	minimum	5	3	2
	maximum	45	24	26
Number perfect		0	0	0
Number zero		0	0	0
Median		24.6	12.3	12.7
$\sigma =$		$1.72 \times 5 = 8.6$	$.97 \times 5 = 4.8$	$.92 \times 5 = 4.6$
PEm		2.17		
σ_m		3.01		

The index of reliability of this test is .91. The

Chapter V

coefficient of alienation is .55, a little more than half the chance factors not having been eliminated.

Results of the Completion Test₁

Table III shows the results of the completion test. The total number of items in the completion test is 50. A fair range of scores is shown in this test 42: the minimum is 1; the maximum 43. The discrimination was not perfect: there are no perfect scores but there are 534 zero scores.

The median is somewhat lower than would be expected 17.7.

The standard deviation of the scores is 1.63; of the interval, 8.15. The probable error of score is 2.24. The standard error of score is 2.99.

The performance on the odd and even exercises was approximately equal as the results indicate:

	Odd	Even
Range	1 to 21	1 to 22
Median	3.03	4.28
Standard deviation of score	.8	.9
Standard deviation of interval	4.0	4.5

A comparison by inspection₁ of the ungrouped chance halves indicate there were 91 cases of perfect correlation and 49 where it would be .9 or above . The self-correlation of the entire test is .83. The probable error of coefficient of correlation is .01.

The index of reliability of this test is .91. The coefficient of alienation is .55, a little more than half the chance factors not having been eliminated.

Table IV shows the results of the Matching test. The total number of items is 15. The range of scores was 14; minimum 1 and maximum 15. A fair discrimination with 1 perfect score and three zero scores resulted.

1. Table of Chance Halves, Appendix

Table III

Showing the frequencies of the completion total scores, odd, and even scores when grouped.

Completion scores	total	odd	even
40-45	2		
35-40	10		
30-35	9		
25-30	22		
20-25	57	2	8
15-20	89	18	29
10-15	53	69	90
5-10	39	143	123
0-5	17	57	39
N=	298	289	289
Zero scores	5	14	14
Perfect	0	0	0
Range Minimum	1	1	1
Maximum	43	21	22
Median	17.7	3.03	4.28
σ	1.63x5=8.15	.8x5=4.0	.9x5=4.5
PEm =	2.24		
σ_m =	2.99		

Chapter VI

Results of Matching Test₁

Table IV shows the results of the Matching test. The total number of items is 15. The range of scores was 14; minimum 1 and maximum 15. A fair discrimination with 1 perfect score and three zero scores resulted.

The median of 7.2 is about what the normal mid-

point would be expected to be.

The standard deviation is 3.1 in case of scores and 3.1 in case of the interval, as the step-interval here is 1. The probable error of score is 1.04; the standard error 1.08.

The results of the odd and even performances are:

	Odd	Even
Range	1-7	1-8
Medians	2.9	3.4
Standard deviation	1.1	1.6

The character of the ungrouped scores would predict a high correlation. There are 174 perfect correlations and 43 are .9 or better.

The self-correlation of the matching₁ test labeled $r_{\frac{1}{2}}$, $\frac{1}{2}$ has been corrected for time by Brown's formula as the matching test required only one-half as much time as the other tests. Brown's formula gives what would be expected if the test were twice as long. The results are labeled r_{12} and are marked "corrected for time."

The self-correlation after corrections are made for time is $r_{12} = .85$. The probable error of the coefficient of correlation is $\pm .01$. The coefficient of alienation is .52.

The highest reliability as indicated by the index of reliability is $r_{12} = .92$.

Table IV

Showing the frequencies of the Matching test, total scores, odd and even scores.

Matching scores	Total	Even	Odd
15	1		
14	5		
13	4		
12	9		
11	16		
10	28		
9	32		
8	25		1
7	38	6	11
6	37	21	44
5	33	41	44
4	20	61	57
3	17	64	57
2	18	37	36
1	17	37	17
	300	267	267
Minimum	1	1	1
Maximum	3	7	8
Number perfect	1	-	-
Number zero	3	32	32
Median	7.2	2.9	3.4
σ	3.1	1.1	1.6
PE _m	1.04		
σ_m	1.08		

it is observed that the scores of pupil 1: 82, 36, 35 and 10, are 18 points, 14, 15 and 5 respectively, from the highest possible score. Those of pupil 2 are: 40, 33, 29, 10 points from the highest score. The irregularity continues in greater or less degree throughout, which indicates that the correlation between tests is somewhat low. This fact, together with results obtained from the individual tests, points out that although the single tests are highly re-

liable, they are not Chapter VII same function.

Comparative Results of All Tests the graphic representation. The first basis of comparison is the Chance Halves of each test. mine whether the results of these tests were

characteristic of average Table V in the tendency to follow

the normal Showing estimated correlations of all the tests part of the scores made on Chance Halves.

approximate the normal and that the multiple-choice test

Perfect correlations Correlations .9

has the best curve.

True-False 78 42

The fourth basis of comparison will be the

Multiple-Choice 119 56

medians, range, and s.d.'s of scores.

Completion 91 49

Table VI

Matching 174 43

Showing medians, range etc of tests.

These correlations were made by inspection based

on a division which falls 41-41, 35-36 etc. when the scores

True-False 53.5 80 2.76

Multiple-Choice 24.5 40 1.72

were tabulated. Such a division further indicates that the

Completion 17.7 42 1.53

functions of the test were fairly well equated.

Matching 7.2 14 3.1

The second basis of comparison is the character

of the ungrouped scores. 1 With regard to the ungrouped scores

It will be seen that as regards the median and

it is observed that the scores of pupil 1: 82, 36, 35 and 10,

range the tests are about equal. The standard deviation

are 18 points, 14, 15 and 5 respectively, from the highest

is high in case of true-false and matching and low in case

possible score. Those of pupil 2 are: 40, 33, 29, 10 points

of Multiple-choice and completion, which indicates that the

from the highest score. The irregularity continues in

limits of 60% of the cases are closer in case of the multiple-

greater or less degree throughout, which indicates that the

choice and completion tests and further apart in case of true-

correlation between tests is somewhat low. This fact, to-

gether with results obtained from the individual tests,

points out that although the single tests are highly re-

liable, they are not measuring the same function.

The third basis of comparison is the graphic representation₁ of the frequency distribution. It was desirable to determine whether the results of these tests were characteristic of average tests in the tendency to follow the normal curve. It will be observed that all the tests approximate the normal and that the multiple-choice test has the best curve.

The fourth basis of comparison will be the medians, range, and s.d.'s of scores.

Table VI

Showing medians, range etc of tests.

	Median	Range	s.d.
True-False	58.5	80	2.76
Multiple-Choice	24.6	40	1.72
Completion	17.7	42	1.63
Matching	7.2	14	3.1

It will be seen that as regards the median and range the tests are about equal. The standard deviation is high in case of true-false and matching and low in case of Multiple-choice and completion, which indicates that the limits of 68% of the cases are closer in case of the multiple-choice and completion tests and further apart in case of true-false and matching tests.

times that The next basis of comparison is the probable error of the scores and the standard error of scores. The same can be said of the other Table VII.

Showing the PEm and σ_m of the scores. comparison of the intercorrelation $\sigma_m = .6745 \sqrt{1-r^2}$ $\sigma_m = \sigma_r \sqrt{r-r^2}$

True-False	3.12	4.31
Multiple-Choice	2.17	3.01
Completion	2.24	2.99
Matching	1.04	1.08

Showing coefficient of correlation

All things being equal the test with the lowest PEm or σ_m is the best test. The PEm and σ_m enable us to tell the probable divergence of an individual's obtained score from his corresponding true score when we know the σ and r .

The sixth basis of comparison is the self-correlation of tests. question of importance is just what may be considered

Table VIII correlation? Garret states: "Strictly speaking the correlation and the percent of error of the correlation. to coefficients which are .95 or above. However, in mental

	Correlation	PEr.
True-False	$\pm .88.$	$\pm .01$
Multiple-Choice	$\pm .86$	$\pm .01$
Completion	$\pm .83$	$\pm .01$
Matching	$\pm .85$	$\pm .01$

1. Garret The fact that the PEm of the true-false is three.

times that of the matching, while r is three points above it, would place the two tests on equal footing. The same can be said of the other two tests. The seventh basis of relationship was a comparison of the intercorrelation of the separate tests to ascertain whether or not they measured the same function. Six correlations were necessary. The results were:

Table IX

Intercorrelation of all Tests.

Showing coefficient of correlation and the probable error of the coefficient when all tests are compared.

	r	PER	Diagram No.	Page
True-False and Completion	.56	.02	10	61
True-False and Multiple-Choice	.56	.02	9	62
True-False and Matching	.19	.03	11	63
Multiple-Choice and Completion	.65	.02	12	64
Multiple-Choice and Matching	.55	.02	13	65
Completion and Matching	.59	.02	14	66

The next question of importance is just what may be considered a high correlation? Garret states: "Strictly speaking the term 'high correlation' should be applied only to coefficients which are .95 or above. However, in mental social and educational measurements, there are so many actual and potential sources of error due to the variability of the material dealt with, and the relative crudity of the measurements made, that very few tests indeed meet this re-

1. Garrett, Henry: Statistics in Psychology and Education. Page 298
2. Appendix: Page 9

quirement. There seems to be fairly general agreement given among workers with tests that an r from $\pm .00$ to $\pm .20$ denotes indifferent relationships for r from $\pm .20$ to $\pm .40$ denotes low relationship among tests. r from $\pm .40$ to $\pm .70$ denotes substantial relationship. r from $\pm .70$ to ± 1.00 denotes high relationship."

The highest intercorrelation was between Multiple-Choice and Completion tests. $65 \pm .02$. K. % of reduction.

True-False There was a fair degree of discrimination in all tests. There were no perfect scores and no zero scores made in the True-False test and Multiple-Choice test. On the Completion test no perfect score but five zero scores were made. In the Matching test, one perfect score and four zero scores were made. In their present form would be that

The fact that the highest possible score in Multiple-Choice test and Completion test was fifty, made it necessary to weight these scores by multiplying them by 2 when comparing them with the true-false test lest undue weight be given the true-false. Tables 13 and 14 show the slight shift of frequencies which occurred when the scores were weighted.

The Matching scores, tables 15 and 16, of 15 items on being compared with Multiple-Choice tests and Completion tests were multiplied by 3; and by 6 when compared with

1. Appendix:
2. Appendix:

Page 289.

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Page 29

True-False tests. However, the other tests were still given slight advantage over the Matching test (45 vs. 50 and 90 vs. 100 as a highest possible score). This probably accounts for the low correlation between True-False and Matching tests.

The indices of reliability and coefficient of alien- of the tests give the following results:

Table X			
	r	K. % of reduction	
True-False	+.93	+.47	.53
Multiple-Choice	+.92	+.51	.49
Completion	+.91	+.55	.45
Matching	+.92	+.52	.48

This r means the highest reliability which any of the tests could reach in their present form would be that of the above figures.

Tables XI and XII give a summary of the results given in the separate tables.

The coefficient of reliability must be .866 before K is halfway between perfect correlation and a guess: ie. before the standard error of estimate is reduced one-half. The larger the coefficient of alienation, the greater the lack of relation and the less the value of the prediction.

1. Tables 11 and 12
2. Garrett, Henry: Statistics in Psychology and Education. Page 289.

Summarized Table XI.

Showing a partial basis of comparison.

Total Score	No. of Items	Median	Range	s.d	No. Zeros	No. Perfect.
True-False	100	58.5	12-92	2.76	0	0
Multiple-Choice	50	24.6	5-45	1.72	0	0
Completion	50	17.7	1-63	1.63	5	0
Matching	15	7.1	1-14	3.1	4	1

Table XII

Self-Correlation of Chance Halves of all tests.

Range	Median	S.d.	r	PER	PEM	σ m
True-False						
O=3-24	29	1.5	±.88	±.01	3.12	4.31
E=6-46	29.5	1.4				
Multiple-Choice						
O=3-24	12.3	.97	±.85	±.01	2.17	3.01
E=2-26	12.7	.92				
Completion						
O=1-21	3.03	.8	±.83	±.01	2.24	2.99
E=1-22	4.28	.9				
Matching						
O=1-7	2.9	1.6	±.75	±.02	1.04	1.08
E=1-7	3.4	1.1				

As regards the character of the ungrouped scores of these tests were divided for odd and even scores O= odd and E = even. The results found for all tests are shown above. The probable error of the scores is fairly low ranging 1.04 to 3.12; the standard error 1.08 to 4.31.

Summary and Conclusions.

7. The probable errors of the coefficient of correlation are negligible .01 to .03. This was an investigation of the reliability of True-False, Multiple-Choice, Completion and Matching tests in English Grammar. Tests were made with high school pupils. The indices of reliability show that each test can be raised to a maximum reliability of between .81 and .93. The time element would not be too great for high school students as the tests would be only twice as long; method as discussed in chapters II-VIII. In this section a summary of the conclusions is made.

1. The chance halves so divided themselves as to each case is low enough to place the results on a fair basis have perfect correlation in a large number of cases in each for prediction. of the tests.

2. The low intercorrelation indicates that no one test can be taken as the most reliable instrument largely each half-test are almost equal to that of the other half, because it appears that each is measuring a different function. indicating that the functions were fairly well equated. A battery test would probably be most effective if it were

3. The distribution of scores approximates normal distribution fairly well considering that there were only 303 cases. That objective tests in English Grammar are highly reliable instruments for teachers of English has been

4. The tests discriminated well. On the Multiple-Choice test and True-False test, no perfect score and no zero score was made; on the completion test five zeros; on the Matching test one perfect score and four zeros were made.

5. As regards the character of the ungrouped scores of each test, those individuals who scored high on one test in most instances scored high in all tests.

6. The probable error of the scores is fairly low ranging 1.04 to 3.12; the standard error 1.08 to 4.31.

7. The probable errors of the coefficient of correlation are negligible .01 to .03.

8. The indices of reliability show that each test can be raised to a maximum reliability of between .91 and .93. The time element would not be too great for high school students as the tests would be only twice as long; two hours instead of one. The coefficient of alienation in each case is low enough to place the results on a fair basis for prediction.

9. The low intercorrelation indicates that no one test can be taken as the most reliable instrument largely because it appears that each is measuring a different function. A battery test would probably be most effective if it were desirable to measure both fact and reasoning.

That objective tests in English Grammar are highly reliable instruments for teachers of English has been evidenced by this investigation and the future of the new type test in this field appears promising.

20. The past tense of lay is used: He laid the flowers away.
21. The word is an adverbial object: The book cost one dollar.
22. The correct form of set is used: "Set the flower pot away.
23. The nominative pronoun, who, is correctly used.
I do not know who she wants.
24. Sit is used in the past tense: I sat there a long time.
25. The following verb phrase is intransitive: She will arrive shortly.
26. The phrase, has been sent, is in past-perfect tense.
27. The pronoun "what" is used in the objective case: I know what she said.
28. The correct form of drive is used: Have you ever drove a horse.

True-False Test

1. The phrase is an adjective-prepositional phrase: He stood beside the tomb.
2. The appositive in this sentence is in the nominative case: Explaining the subject complement: She talked of Corpus Cristi, the Naples of the gulf.
3. In its form the sentence is complex: He smiled when you came in.
4. The phrase is participial in form; adjective in use: The boy, rushing from the house, stopped the runaway.
5. The word is used as an indirect object: She had met the girl who played.
6. The appositive is used in the nominative case explaining the subject: Mr. Jones, the owner of the house, had gone.
7. The phrase is infinitive in form; noun in use: To see is to believe.
8. The word is an object complement: The woman considered the child a gift from heaven.
9. The correct form of lay is used: He has laid the package on the shelf.
10. It is sometimes correct to use a dangling participle.
11. The verb in this sentence is transitive: He touched the base with his right foot.
12. The correct verb is used: Each of the boys is here.
13. To parse a verb we tell its six tenses.
14. The correct form of set is used: He has set the plants out.
15. Chose is used correctly: Had he chose the one he wanted?
16. The past tense of lie is used: He lay still for more than an hour.
17. All the tenses are found below: Present; future; past-perfect; present-perfect.
18. Lie is used correctly: They have lain here a long time.
19. The word is a gerund: Skating on thin ice is very dangerous.
20. The past tense of lay is used: He laid the flowers away.
21. The word is an adverbial object: The book cost one dollar.
22. The correct form of set is used: Set the flower pot away.
23. The nominative pronoun, who, is correctly used: I do not know who she wants.
24. Sit is used in the past tense: I sat there a long time.
25. The following verb phrase is intransitive: She will arrive shortly.
26. The phrase, has been sent, is in past-perfect tense.
27. The pronoun "what" is used in the objective case: I know what she said.
28. The correct form of drive is used: Have you ever drove a horse.

Completion Test.

1. Had you ever seen him before? In its use the sentence is _____.
2. She was all that was left after the cyclone.
The word is is used as a predicate _____.
3. The top of the tower and walls of the city had been destroyed. The form of the sentence is _____.
4. Mr. Jones, the owner of the house had gone. The _____ is used in the _____ case because it _____ the _____.
5. To see is to believe. The phrase is _____ in form; _____ in use.
6. She talked of Corpus Christi, the Naples of the Gulf.
The _____ in this sentence is in _____ case _____ the _____.
7. The people walked and talked in the moonlight.
The form of the predicate is _____ with _____ (nor) modifier.
8. They had sat quiet for a long time.
Use "sat" because the _____ verb is needed to express _____.
9. He touched the base. The kind of verb is _____.
10. Choose. Had he _____ the one he wanted? _____
11. Pronouns that are used to ask questions are _____ pronouns.
12. Drive. Have you ever _____ a horse? _____
13. Is, Are. Each of the boys _____ here. because the subject is _____.
14. We saw him climb the fence. Climb in this sentence is _____.
15. Who. I do not know _____ she wants. Because it is _____ of _____.
16. The book cost one dollar. The word is used as _____.
17. He lay still for more than an hour. The _____ tense of _____ is used.
18. Set the flower pot away. We use set because the _____ verb is needed.
19. He went to the place where you had stood. The clause is _____.
20. Is, Are. The man with his five friends _____ waiting below.
21. Is, Are. There _____ your mother and father.
22. Is, Are. Neither Mary nor Jane _____ going.
23. Skating on thin ice is very dangerous. The word is _____.
24. They have lain here a long time. "Lain" is _____ of _____.
25. Lay the cover over here. _____ beyond them he caught a glimpse
The _____ of tense of _____ is used. _____ in the country.
(b) They danced and played with much glee all day.
(c) She thought you thought her careless.

1. Complex sentence with a noun clause.
2. Complex sentence with an adjective clause.
3. Complex sentence with an adverbial clause.
4. Simple sentence, simple subject and predicate.
5. Simple sentence, compound subject and predicate.
6. Simple sentence, simple subject, compound predicate.
7. Compound sentence.

Matching Test

Draw a line under the correct verb. (B) Match this number of the rule with your sentences which are marked by letters.

- I
- (a) It (was, were) twenty-five dollars.
 - (b) Neither of the four men (has, have) returned.
 - (c) The large engine with two smaller ones (was, were) all we had.

Rules

1. Each, everyone, everybody, either, neither and similar words are singular.
2. Collective nouns may be regarded as singular or plural.
3. Singular subjects joined by (or), or (nor), take singular verbs.
4. The meaning, rather than the form, determine the number of the verb.
5. Singular subjects followed by, with, together with etc. takes the singular verb.
6. The verb agrees with its subject in person and number.

- II
- (a) Mary, come quickly. 1. Subject of sentence.
 - (b) We spoke to James, the valet. 2. Nominative of address.
 - (c) I sent Janie, a present. 3. Object complement.
 - 4. Object appositive.
 - 5. Indirect object.
 - 6. Adverbial object.

- III
- (a) Them 1. Relative pronoun.
 - (b) What? 2. Interrogative pronoun.
 - (c) Knighthood. 3. Personal pronoun.
 - (d) Seeing 4. Abstract noun.
 - 5. Collective noun.
 - 6. Verb
 - 7. Participle.
 - 8. Gerund.

- IV
- (a) In the distance far beyond them he caught a glimpse of one of the prettiest scenes in the country.
 - (b) They danced and played with much glee all day.
 - (c) She thought you thought her careless.

1. Complex sentence with a noun clause.
2. Complex sentence with an adjective clause.
3. Complex sentence with an adverbial clause.
4. Simple sentence, simple subject and predicate.
5. Simple sentence, compound subject and predicate.
6. Simple sentence, simple subject, compound predicate.
7. Compound sentence.

Table XIII

Weighed scores of Multiple-Choice tests used when the test was compared with True-False test.

Multiple-Choice by 2

90-	: 2
80-90:	11
70-80:	25
60-70:	49
50-60:	60
40-50:	62
30-40:	53
20-30:	31
10-20:	10
	303

Table XIV

Weighed scores of Completion test. Used when the test was compared with True-False test.

Completion by 2

80-90 :	2
70-80 :	10
60-70 :	9
50-60 :	22
40-50 :	57
30-40 :	89
20-30 :	53
10-20 :	39
0-10 :	17
	303

Table XV

Weighed scores and frequencies of Matching test with the True-False test.

Matching by 6

Pupil	1	2	3	4
	F			
1				
2	84	5		
3				
4	78	4		
5				
6	72	9		
7				
8	66	16		
9				
10	60	28		
11				
12	54	32		
13				
14	48	25		
15				
16	42	38		
17				
18	36	37		
19				
20	30	33		
21				
22	24	20		
23				
24	18	17		
25				
26	12	18		
27				
28	6	17		
29				
30				
31		299		
32				
33				
34				
35				
36				
37				
38				
39				
40				

Table XVI

Weighed scores and frequencies of Matching test. Used when test was compared with Multiple-choice and Completion tests.

Pup	1	2	3	4
	F			
1				
2	42	5		
3				
4	39	4		
5				
6	36	9		
7				
8	33	16		
9				
10	30	28		
11				
12	27	32		
13				
14	24	25		
15				
16	21	38		
17				
18	18	37		
19				
20	15	33		
21				
22	12	20		
23				
24	9	17		
25				
26	6	18		
27				
28	3	17		
29				
30				
31		299		
32				
33				
34				
35				
36				
37				
38				
39				
40				

Table XVII continued:

Table XVII													
Showing the individual scores when the True-False test was divided into chance Halves on the alternate exercises of the test.													
Pupil	1	&	3	2	&	4	Pupil	1	&	3	2	&	4
1			41			41	41			35			32
2			30			30	42			29			27
3			31			31	43			37			38
4			28			28	44			31			31
5			20			20	45			30			41
6			25			25	46			42			30
7			30			30	47			29			19
8			32			32	48			18			43
9			30			30	49			44			30
10			29			29	50			31			31
11			31			31	51			30			31
12			18			18	52			32			25
13			23			23	53			36			21
14			36			36	54			22			34
15			20			20	55			33			9
16			28			28	56			8			22
17			34			34	57			21			25
18			15			15	58			24			30
19			27			27	59			29			22
20			28			28	60			21			16
21			35			35	61			17			17
22			31			31	62			16			26
23			37			36	63			25			28
24			29			28	64			27			28
25			39			40	65			29			26
26			33			32	66			25			18
27			30			29	67			19			29
28			19			20	68			28			31
29			33			31	69			32			36
30			23			25	70			35			35
31			31			29	71			36			24
32			40			38	72			25			39
33			24			26	73			40			37
34			41			39	74			38			38
35			39			41	75			39			28
36			34			32	76			26			29
37			28			26	77			27			38
38			40			42	78			36			25
39			25			26	79			23			27
40			33			32	80			29			32

Table XVII Continued:

Table XVII continued:

Pupil	1 & 3	2 & 4	Pupil	1 & 3	2 & 4
81	33	31	125	25	22
82	28	26	126	29	26
83	23	21	127	37	24
84	30	32	128	31	28
85	13	15	129	11	14
86	25	23	130	30	27
87	29	31	131	38	35
88	30	28	132	27	30
89	30	28	133	30	23
90	31	29	134	21	24
91	35	37	135	11	8
92	29	31	136	27	24
93	21	23	137	29	26
94	9	7	138	27	24
95	29	27	139	30	33
96	27	29	140	22	25
97	34	33	141	26	29
98	14	12	142	29	32
99	27	29	143	15	18
100	23	25	144	36	39
101	40	43	145	36	33
102	28	25	146	31	34
103	26	29	147	35	31
104	39	42	148	27	33
105	29	32	149	27	31
106	33	30	150	27	32
107	20	23	151	25	21
108	43	43	152	29	31
109	39	36	153	27	22
110	31	34	154	27	22
111	33	30	155	16	20
112	16	19	156	10	14
113	23	20	157	20	24
114	35	32	158	31	26
115	28	31	159	34	28
116	22	19	160	40	35
117	28	25	161	30	24
118	23	20	162	28	23
119	30	33	163	31	38
120	29	26	164	23	17
121	34	31	165	27	32
122	30	33	166	30	25
123	31	28	167	27	33
124	23	26	168	30	25

Table XVII Continued:

Pupil	1 & 3	2 & 4	Pupil	1 & 3	2 & 4
169	24	29	216	33	28
170	24	29	217	34	35
171	29	36	218	35	27
172	25	32	219	24	31
173	24	31	220	23	16
174	27	24	221	35	28
175	21	29	222	16	20
176	36	31	223	17	24
177	32	38	224	22	33
178	32	28	225	48	44
179	35	38	226	29	33
180	29	24	227	29	22
181	33	37	228	34	30
182	25	20	229	23	17
183	41	33	230	26	30
184	28	33	231	27	33
185	43	34	232	35	40
186	29	39	233	26	30
187	27	32	234	34	41
188	36	32	235	30	36
189	22	30	236	32	28
190	41	37	237	29	24
191	29	32	238	30	26
192	35	30	239	20	24
193	32	27	240	39	28
194	17	10	241	36	41
195	26	30	242	33	37
196	39	33	243	32	36
197	36	29	244	40	33
198	32	37	245	42	38
199	35	31	246	44	39
200	25	21	247	34	28
201	37	41	248	27	36
202	34	42	249	26	34
203	32	36	250	32	38
204	35	28	251	34	29
205	35	28	252	31	26
206	21	25	253	32	38
207	33	28	254	29	25
208	27	23	255	22	10
209	37	31	256	17	22
210	35	24	257	21	11
211	27	33	258	33	27
212	23	15	259	15	25
213	30	26	260	25	20
214	35	46	261	25	18
215	33	29	262	28	33

Table XVIII

Table XVII continued:

Showing the distribution of individual			Showing the distribution of individual		
Pupil	1 & 3	2 & 4	Pupil	1 & 3	2 & 4
263	32	28			
264	26	32			
265	29	34			
266	28	36	48	21	19
267	25	33	47	9	6
268	30	22	48	13	15
269	29	12	49	22	17
270	40	29	50	5	6
271	40	37	51	11	12
272	23	27	52	10	11
273	22	22	53	12	8
274	12	20	54	13	9
275	24	26	55	18	14
276	24	23	56	9	9
277	27	30	57	8	9
278	15	13	58	9	16
279	11	22	59	19	17
280	24	22	60	15	16
281	13	17	61	10	12
282	20	19	62	9	8
283	19	26	63	11	10
284	17	22	64	11	9
285	22	32	65	7	7
286	18	18	66	13	12
287	36	36	67	13	13
288	35	38	68	5	5
289	19	19	69	14	13
290	26	30	70	14	13
291	15	18	71	24	20
292	8	12	72	12	13
293	11	10	73	23	19
294	12	11	74	16	17
295	6	6	75	16	14
296	23	22	76	7	15
297	22	21	77	17	13
298	24	23	78	17	13
299	23	23	79	6	10
300	45	40	80	5	4
301	22	23	81	14	12
302	44	44	82	6	9
303	27	27	83	12	7
			84	15	12
			85	14	17
			86	13	17
			87	13	17
			88	18	20
			89	13	10
			90	14	13

Table XVIII

Showing the distribution of individual scores when the Multiple-Choice test was divided into Chance Halves.

Pupil	1 & 3	2 & 4	Pupil	1 & 3	2 & 4
1	20	16	46	21	19
2	6	11	47	8	6
3	9	11	48	13	15
4	11	14	49	22	17
5	7	11	50	5	6
6	8	15	51	11	12
7	13	15	52	10	11
8	14	13	53	12	8
9	12	14	54	13	9
10	14	9	55	18	14
11	14	12	56	9	9
12	14	7	57	8	9
13	13	12	58	9	16
14	22	20	59	19	17
15	11	13	60	15	16
16	23	19	61	10	12
17	18	18	62	9	8
18	7	8	63	11	10
19	6	7	64	11	9
20	17	13	65	7	7
21	9	8	66	13	12
22	8	10	67	13	13
23	22	18	68	5	5
24	13	12	69	14	13
25	17	18	70	14	13
26	9	11	71	24	20
27	15	17	72	12	13
28	9	9	73	23	19
29	17	19	74	16	17
30	16	14	75	16	14
31	10	4	76	7	15
32	10	10	77	17	13
33	14	13	78	17	13
34	19	18	79	6	10
35	20	22	80	5	4
36	18	16	81	14	12
37	16	15	82	6	9
38	19	17	83	12	7
39	5	6	84	15	12
40	4	8	85	14	17
41	18	17	86	13	17
42	14	15	87	13	17
43	17	14	88	18	20
44	15	16	89	13	10
45	14	13	90	14	13

Table XVIII continued:

Pupil	1 & 3	2 & 4	Pupil	1 & 3	2 & 4
179	12	16	225	20	21
180	13	14	226	13	13
181	16	15	227	18	16
182	17	9	228	15	18
183	20	19	229	8	10
184	18	6	230	14	12
185	17	15	231	17	13
186	14	10	232	18	16
187	15	15	233	14	15
188	15	16	234	17	15
189	22	23	235	9	10
190	18	15	236	9	18
191	14	17	237	12	10
192	8	7	238	15	12
193	8	8	239	9	11
194	7	9	240	17	19
195	15	7	241	21	22
196	14	15	242	9	14
197	21	18	243	11	12
198	14	14	244	19	16
199	14	16	245	18	17
200	11	11	246	17	17
201	19	15	247	17	15
202	21	21	248	17	16
203	19	25	249	16	17
204	17	18	250	18	16
205	12	14	251	9	12
206	10	10	252	15	17
207	18	15	253	9	6
208	13	12	254	5	11
209	17	15	255	8	8
210	9	8	256	7	9
211	11	4	257	11	9
212	11	8	258	12	13
213	11	14	259	13	10
214	20	13	260	7	9
215	13	6	261	12	14
216	8	6	262	13	11
217	14	18	263	11	7
218	12	7	264	10	10
219	8	6	265	6	11
220	5	10	266	9	13
221	13	17	267	11	17
222	6	11	268	15	19
223	5	6	269	8	6
224	14	14	270	5	8

Table XVIII continued: Table XIX

Pupil	1 & 3	2 & 4	Pupil	1 & 3	2 & 4
271	18	18			
272	3	4			
273	2	3			
274	4	3			
275	6	6	44	16	21
276	12	7	45	8	18
277	5	6	46	16	21
278	4	4	47	1	5
279	2	5	48	8	9
280	11	11	49	14	18
281	4	4	50	7	8
282	3	7	51	8	9
283	5	10	52	4	3
284	5	6	53	8	13
285	7	9	54	9	11
286	6	5	55	9	10
287	9	15	56	7	6
288	13	15	57	2	4
289	6	10	58	7	6
290	9	12	59	12	14
291	8	5	60	12	14
292	1	4	61	6	8
293	8	9	62	5	4
294	10	13	63	6	3
295	3	5	64	6	10
296	14	13	65	1	0
297	9	15	66	9	13
298	17	19	67	3	2
299	16	15	68	2	6
300	9	14	69	16	9
301	6	8	70	7	13
302	15	16	71	9	9
303	14	15	72	6	8
30	9	9	73	10	10
31	7	8	74	5	4
32	2	3	75	10	8
33	9	11	76	2	1
34	18	20	77	10	11
35	21	22	78	10	14
36	10	9	79	9	10
37	9	12	80	13	15
38	9	11	81	7	9
39	4	4	82	5	8
40	2	6	83	5	6
41	4	4	84	4	8
42	10	18	85	9	14
43	13	20	86	9	5

Table XIX Continued: Table XIX

Pupil Showing the individual scores when the Completion Test was divided into Chance Halves.

Pupil	1 & 3	2 & 4	Pupil	1 & 3	2 & 4
1	18	17	44	16	21
2	14	7	45	8	18
3	4	5	46	16	21
4	5	10	47	1	5
5	3	7	48	8	9
6	10	5	49	14	18
7	8	14	50	7	6
8	11	13	51	8	9
9	5	10	52	4	3
10	8	8	53	6	13
11	11	11	54	9	11
12	8	10	55	9	10
13	9	10	56	7	6
14	18	21	57	2	4
15	6	8	58	7	6
16	11	8	59	12	14
17	9	9	60	12	14
18	3	0	61	6	8
19	6	6	62	5	4
20	9	7	63	6	3
21	8	6	64	6	10
22	7	8	65	1	0
23	10	13	66	9	13
24	6	8	67	3	2
25	11	18	68	2	6
26	5	8	69	16	9
27	10	8	70	7	13
28	5	4	71	9	9
29	8	12	72	6	8
30	9	9	73	10	10
31	7	8	74	5	4
32	2	3	75	10	8
33	9	11	76	2	1
34	18	20	77	10	11
35	21	22	78	10	14
36	10	9	79	8	10
37	9	12	80	13	15
38	9	11	81	7	9
39	4	4	82	5	8
40	2	6	83	5	6
41	4	4	84	4	6
42	10	18	85	8	14
43	13	20	86	9	5

Table XIX Continued:

Pupil	1 & 3	2 & 4	Pupil	1 & 3	2 & 4
87	9	7	131	6	8
88	12	16	132	4	1
89	7	14	133	2	5
90	7	11	134	0	3
91	16	13	135	6	3
92	14	9	136	7	7
93	7	10	137	9	9
94	3	9	138	9	5
95	7	8	139	10	16
96	9	10	140	8	9
97	6	4	141	8	11
98	4	1	142	14	15
99	9	7	143	9	4
100	5	11	144	12	12
101	10	6	145	11	14
102	2	2	146	11	15
103	1	2	147	5	8
104	17	18	148	9	11
105	10	8	149	6	4
106	9	13	150	8	12
107	11	12	151	2	1
108	13	7	152	6	1
109	8	14	153	9	10
110	8	6	154	7	12
111	8	2	155	3	13
112	3	5	156	1	10
113	9	16	157	7	14
114	7	8	158	9	14
115	9	15	159	6	13
116	8	16	160	10	14
117	8	9	161	8	8
118	10	13	162	12	9
119	6	12	163	10	11
120	5	3	164	3	5
121	10	12	165	4	8
122	3	9	166	11	8
123	6	8	167	8	5
124	10	8	168	11	13
125	3	5	169	9	13
126	9	8	170	6	7
127	10	13	171	15	19
128	3	8	172	5	9
129	4	6	173	12	8
130	8	11	174	11	8

Table XIX continued:

Pupil	1 & 3	2 & 4	Pupil	1 & 3	2 & 4
175	10	6	219	5	10
176	8	9	220	4	7
177	9	11	221	8	14
178	8	10	222	1	5
179	10	13	223	11	12
180	12	13	224	11	13
181	7	11	225	17	18
182	9	9	226	9	12
183	16	20	227	11	17
184	5	5	228	15	16
185	11	8	229	8	4
186	7	9	230	6	7
187	10	11	231	9	14
188	7	11	232	8	8
189	7	8	233	7	11
190	4	6	234	12	16
191	7	7	235	4	10
192	8	7	236	15	15
193	1	1	237	11	10
194	4	3	238	11	8
195	11	10	239	6	9
196	6	11	240	16	19
197	13	13	241	20	20
198	6	11	242	9	9
199	7	11	243	9	5
200	6	9	244	14	14
201	11	11	245	8	12
202	14	17	246	19	16
203	15	16	247	16	15
204	9	16	248	11	11
205	8	7	249	12	8
206	8	9	250	11	4
207	12	6	251	10	5
208	7	12	252	13	15
209	10	15	253	4	6
210	4	1	254	3	2
211	9	5	255	8	9
212	9	11	256	4	2
213	8	6	257	4	2
214	15	17	258	2	0
215	5	5	259	6	7
216	4	6	260	3	5
217	10	19	261	10	8
218	8	10	262	8	11

Table XIX continued:

Pupil	1 & 3	2 & 4	Pupil	1 & 3	2 & 4
263	5	6			
264	3	1			
265	7	6			
266	9	5			
267	5	10			
268	5	8			
269	7	5			
270	4	7			
271	9	6			
272	2	1			
273	1	1			
274	1	0			
275	2	5			
276	1	7			
277	3	2			
278	2	4			
279	0	0			
280	4	3			
281	1	0			
282	0	7			
283	2	2			
284	0	0			
285	3	4			
286	10	8			
287	10	8			
288	1	1			
289	4	9			
290	5	3			
291	0	0			
292	1	0			
293	4	7			
294	2	14			
295	4	14			
296	9	14			
297	10	10			
298	4	7			
299	10	13			
300	5	7			
301	9	9			
302	11	10			
303					

Table XX

Showing the individual scores when the
Matching test was divided into Chance
Halves.

Pupil	1 & 3	2 & 4	Pupils	1 & 3	2 & 4
1	4	6	41	6	6
2	1	4	42	5	6
3	3	4	43	6	6
4	4	6	44	5	8
5	3	3	45	4	5
6	4	4	46	7	7
7	4	5	47	4	3
8	4	5	48	4	6
9	4	8	49	8	7
10	3	3	50	1	5
11	2	3	51	4	6
12	6	5	52	1	1
13	2	4	53	3	6
14	5	5	54	3	6
15	2	2	55	3	2
16	4	5	56	2	3
17	3	3	57	4	3
18	1	0	58	0	0
19	0	2	59	6	5
20	3	3	60	4	6
21	3	3	61	3	4
22	1	3	62	1	1
23	5	6	63	4	5
24	5	6	64	5	3
25	6	5	65	3	3
26	1	2	66	1	2
27	3	4	67	4	5
28	0	2	68	1	2
29	4	4	69	3	2
30	3	4	70	3	5
31	1	3	71	4	3
32	3	2	72	4	3
33	5	4	73	4	4
34	5	6	74	3	3
35	8	7	75	4	5
36	6	5	76	3	2
37	4	4	77	7	3
38	7	6	78	5	3
39	4	7	79	0	2
40	0	1	80	1	3

A P P E N D I X

Table XX continued: Table XX

Showing the individual scores when the Matching test was divided into Chance Halves.

Pupil	1 & 3	2 & 4	Pupils	1 & 3	2 & 4
1	4	6	41	6	6
2	1	4	42	6	6
3	3	4	43	6	6
4	4	6	44	5	6
5	3	3	45	4	5
6	4	4	46	7	7
7	4	6	47	4	3
8	4	5	48	4	6
9	4	8	49	6	7
10	3	3	50	1	5
11	2	3	51	4	6
12	6	5	52	1	1
13	2	4	53	3	6
14	5	5	54	3	6
15	2	2	55	3	2
16	4	5	56	2	3
17	3	3	57	4	3
18	1	0	58	0	0
19	0	2	59	6	5
20	3	3	60	4	6
21	3	3	61	3	4
22	1	3	62	1	1
23	5	6	63	4	5
24	5	6	64	5	3
25	6	5	65	3	2
26	1	2	66	1	2
27	3	4	67	4	5
28	0	2	68	1	2
29	4	4	69	3	2
30	3	4	70	3	5
31	1	3	71	4	3
32	3	2	72	4	3
33	5	4	73	4	4
34	6	6	74	3	3
35	8	7	75	4	5
36	6	5	76	3	2
37	4	4	77	7	3
38	7	6	78	5	3
39	4	7	79	0	2
40	0	1	80	1	3

Table XX continued:

Table XX continued:

Pupil	1 & 3	2 & 4	Pupil	1 & 3	2 & 4
187 81	1	4	211 124	6	3
188 82	5	4	212 125	5	4
189 83	1	1	213 126	5	5
190 84	2	1	214 127	5	6
191 85	4	6	215 128	6	5
192 86	3	4	216 129	3	4
193 87	3	1	217 130	2	3
194 88	4	6	218 131	3	5
195 89	6	5	219 132	1	0
196 90	7	7	220 133	3	4
197 91	5	6	221 134	5	2
198 92	5	5	222 135	4	2
199 93	6	4	223 136	3	6
200 94	4	3	224 137	5	4
201 95	3	4	225 138	3	6
202 96	2	4	226 139	2	5
203 97	0	2	227 140	5	6
204 98	2	4	228 141	2	4
205 99	2	4	229 142	5	5
206 100	3	3	230 143	6	6
207 101	5	4	231 144	4	6
208 102	4	0	232 145	3	6
209 103	3	2	233 146	1	4
210 104	6	5	234 147	0	4
211 105	5	3	235 148	1	1
212 106	1	4	236 149	1	1
213 107	0	5	237 150	0	3
214 108	5	3	238 151	0	2
215 109	5	2	239 152	3	4
216 110	6	4	240 153	4	3
217 111	3	4	241 154	1	4
218 112	5	3	242 155	4	2
219 113	4	4	243 156	0	1
220 114	5	5	244 157	3	3
221 115	7	4	245 158	4	5
222 116	3	2	246 159	4	3
223 117	4	6	247 160	5	6
224 118	2	5	248 161	2	3
225 119	5	5	249 162	1	5
226 120	3	2	250 163	5	1
227 121	1	4	251 164	4	6
228 122	4	1	252 165	0	3
229 123	0	4	253 166	1	2
			254	1	3

Table XX continued:

Pupil	1 & 3	2 & 4	Pupil	1 & 3	2 & 4
167	1	0	211	4	4
168	2	5	212	3	7
169	0	2	213	3	4
170	1	2	214	4	5
171	6	6	215	3	2
172	0	3	216	4	6
173	1	3	217	4	5
174	1	4	218	2	4
175	1	1	219	3	3
176	6	1	220	3	3
177	2	2	221	2	5
178	1	4	222	2	2
179	6	4	223	3	2
180	3	4	224	3	6
181	4	3	225	7	7
182	1	3	226	5	4
183	5	3	227	5	6
184	0	0	228	6	6
185	2	3	229	3	4
186	2	2	230	5	4
187	3	2	231	4	6
188	5	4	232	4	4
189	4	3	233	5	3
190	3	2	234	2	5
191	2	2	235	0	1
192	3	3	236	3	5
193	1	2	237	2	3
194	0	3	238	5	6
195	5	5	239	5	7
196	5	3	240	4	6
197	6	4	241	7	7
198	3	3	242	1	0
199	5	4	243	4	2
200	4	4	244	3	5
201	5	6	245	3	5
202	7	7	246	5	5
203	3	5	247	4	6
204	4	6	248	6	5
205	2	6	249	5	5
206	5	6	250	4	4
207	3	3	251	1	2
208	1	4	252	2	5
209	4	5	253	0	3
210	0	1	254	1	0
			255	1	3

Table XX continued:

Pupil	1 & 3	2 & 4	Pupil	1 & 3	2 & 4
256	5	6	300	5	4
257	3	4	301	4	2
258	0	0	302	2	0
259	2	2	303	4	6
260	3	3			
261	3	4			
262	4	5			
263	3	1			
264	0	1			
265	0	3			
266	2	3			
267	2	3			
268	3	6			
269	2	3			
270	2	3			
271	0	5			
272	2	2			
273	2	1			
274	1	0			
275	2	2			
276	1	2			
277	2	1			
278	1	3			
279	0	1			
280	2	2			
281	0	1			
282	3	3			
283	1	4			
284	0	1			
285	1	0			
286	0	1			
287	3	3			
288	4	4			
289	0	2			
290	2	5			
291	2	1			
292	1	1			
293	0	2			
294	1	2			
295	3	2			
296	4	5			
297	3	4			
298	3	4			
299	4	3			

Table XXI Continued Table XXI

Comparison of Individual scores made on each test.					Matching
Pupil	True-False	Multiple-Choice	Completion	Matching	
1	82	36	35	10	
2	60	17	21	5	
3	62	20	9	7	
4	56	25	15	10	
5	40	13	10	6	
6	50	23	15	8	
7	60	28	22	10	
8	64	27	24	9	
9	60	26	15	12	
10	58	23	16	6	
11	62	26	22	5	
12	36	21	18	11	
13	46	25	19	6	
14	72	42	39	10	
15	40	24	14	4	
16	56	42	19	9	
17	68	36	18	6	
18	30	15	3	1	
19	54	13	12	2	
20	56	20	16	6	
21	70	17	14	6	
22	62	18	15	4	
23	73	40	23	11	
24	57	25	14	11	
25	79	35	29	11	
26	65	20	13	3	
27	59	32	18	7	
28	39	18	9	2	
29	64	36	20	8	
30	48	30	18	7	
31	60	14	15	4	
32	78	20	5	5	
33	50	27	20	9	
34	80	37	38	12	
35	80	42	43	15	
36	66	34	19	11	
37	54	31	21	8	
38	82	36	20	13	
39	51	11	8	11	
40	65	12	8	1	
41	67	35	8	12	
42	56	29	28	12	

Table XXI Continued:

Pupil	True-False	Multiple-Choice	Completion	Matching
43	75	31	33	12
44	63	31	37	11
45	61	27	26	9
46	83	40	37	14
47	59	14	6	7
48	37	28	17	10
49	87	39	32	13
50	61	11	13	6
51	61	23	17	10
52	63	21	7	2
53	51	20	19	9
54	43	22	20	9
55	67	29	19	5
56	17	18	13	5
57	43	17	6	7
58	49	25	13	0
59	59	36	26	11
60	43	31	26	10
61	33	22	14	7
62	33	17	9	2
63	51	21	9	9
64	55	20	16	8
65	57	14	1	5
66	51	25	22	3
67	37	26	5	9
68	57	10	8	3
69	63	27	25	5
70	71	27	20	8
71	71	44	18	7
72	49	25	14	7
73	79	42	20	8
74	75	33	9	6
75	77	30	18	9
76	54	12	3	3
77	56	30	21	7
78	74	30	24	8
79	84	16	18	2
80	56	9	28	4
81	64	26	16	5
82	54	15	13	9
83	44	19	11	2
84	62	27	10	3
85	28	31	22	10

Table XXI continued:

Pupil	True-False	Multiple-Choice	Completion	Matching
86	48	30	14	7
87	60	30	16	4
88	58	38	28	10
89	58	23	21	11
90	60	27	18	14
91	72	34	29	11
92	60	43	23	10
93	44	18	17	10
94	16	23	12	7
95	56	24	15	7
96	56	18	19	6
97	64	20	10	3
98	26	8	5	6
99	56	25	16	6
100	58	21	16	6
101	83	37	16	7
102	53	24	4	1
103	55	23	3	4
104	81	35	35	11
105	61	37	18	8
106	63	24	22	7
107	43	26	23	9
108	86	22	20	6
109	75	31	22	5
110	65	26	14	5
111	63	24	10	4
112	35	25	8	6
113	43	29	25	8
114	67	21	15	10
115	59	23	24	9
116	41	27	24	3
117	53	30	17	10
118	43	23	23	7
119	63	28	18	9
120	55	11	8	3
121	65	27	22	5
122	63	16	3	2
123	59	29	14	7
124	49	42	18	9
125	47	26	8	9
126	55	27	17	10
127	61	35	23	11
128	59	15	11	11
129	25	17	10	7
174				
175				

Table XXI Continued:

Pupil	True-False	Multiple-Choice	Completion	Matching
130	57	25	19	2 5
131	63	17	14	7 8
132	57	20	5	4 1
133	53	13	7	5 7
134	45	12	3	10 7
135	19	23	9	7 6
136	51	19	14	7 9
137	55	22	18	4 9
138	51	26	14	8 9
139	63	31	26	0 7
140	47	28	17	6 11
141	55	24	19	4 6
142	61	36	29	5 10
143	33	31	13	9 12
144	75	36	24	7 10
145	69	23	25	6 9
146	65	30	26	4 5
147	66	24	13	8 5
148	60	19	20	3 2
149	58	33	10	3 2
150	59	23	20	10 3
151	46	16	3	8 2
152	60	18	7	10 7
153	59	24	19	6 7
154	49	14	19	9 5
155	36	24	16	8 6
156	24	13	11	11 1
157	44	29	21	14 6
158	57	32	23	8 9
159	62	19	19	10 7
160	75	29	24	8 11
161	54	21	16	11 5
162	51	17	21	6 6
163	69	26	21	5 6
164	40	22	8	9 10
165	59	16	12	1 6
166	55	26	19	8 4
167	60	16	13	10 1
168	55	24	24	7 7
169	53	10	22	9 2
170	53	21	13	5 3
171	65	31	34	11 12
172	57	16	14	9 3
173	55	24	20	6 4
174	51	22	19	8 5
175	50	16	16	6 2

Table XXI Continued:

Pupil	True-False	Multiple-Choice	Completion	Matching
176	67	36	17	2
177	70	23	20	7
178	60	24	18	4
179	73	28	23	5
180	53	27	25	10
181	70	31	18	7
182	45	16	18	7
183	74	39	36	4
184	61	14	10	8
185	77	32	19	0
186	68	24	16	5
187	59	30	21	4
188	68	31	18	5
189	52	45	15	9
190	78	33	10	7
191	61	31	14	5
192	65	15	15	4
193	59	16	2	6
194	27	16	7	3
195	56	22	21	3
196	72	29	17	10
197	75	39	26	8
198	69	28	17	10
199	66	30	18	6
200	46	22	15	9
201	78	34	22	8
202	76	42	31	11
203	68	44	31	14
204	63	35	25	8
205	63	26	15	10
206	46	20	17	8
207	61	33	18	11
208	50	25	19	6
209	68	32	25	5
210	59	17	5	9
211	60	15	14	1
212	38	17	20	8
213	56	25	14	10
214	81	33	32	7
215	62	19	10	9
216	61	14	10	5
217	69	32	29	10
218	62	19	18	9
219	55	14	15	6
220	39	15	11	6
221	63	30	22	6

Table XXI continued:

Pupil	True-False	Multiple-Choice	Completion	Matching
222	36	17	6	4
223	41	11	23	5
224	55	28	24	9
225	92	41	35	14
226	62	26	21	9
227	51	34	28	11
228	64	33	31	12
229	40	18	12	7
230	56	26	13	9
231	60	30	23	10
232	75	34	16	8
233	56	29	18	8
234	75	32	28	6
235	66	19	14	1
236	60	27	30	8
237	53	22	21	5
238	56	27	19	11
239	44	20	15	12
240	77	36	35	10
241	77	43	40	14
242	76	23	18	1
243	68	23	14	6
244	73	35	28	8
245	80	35	20	8
246	83	34	35	10
247	72	32	31	10
248	63	33	22	11
249	60	33	20	10
250	70	34	15	8
251	63	21	15	3
252	57	32	28	7
253	70	15	10	4
254	54	16	5	1
255	32	16	17	4
256	39	16	6	11
257	30	20	6	7
258	60	25	2	0
259	40	23	13	4
260	45	16	8	6
261	43	26	18	7
262	61	24	19	9
263	60	18	11	4
264	58	20	4	1
265	63	17	13	3

Table XXI continued:

Pupil	True-False	Multiple-Choice	Completion	Matching
266	64	22	14	5
267	58	28	15	5
268	52	34	13	9
269	41	14	12	5
270	69	13	11	5
271	77	36	15	5
272	50	7	3	4
273	44	5	2	3
274	32	7	1	1
275	50	12	7	4
276	47	19	8	3
277	57	11	5	3
278	28	8	6	4
279	32	7	0	1
280	46	22	7	4
281	30	8	0	1
282	39	10	1	6
283	45	15	7	5
284	39	11	4	1
285	54	16	0	1
286	36	11	7	1
287	72	24	18	6
288	73	28	18	8
289	38	16	2	2
290	56	21	13	7
291	33	13	8	3
292	20	5	0	2
293	21	17	1	2
294	23	23	11	3
295	12	8	16	5
296	45	27	18	9
297	43	24	23	7
298	47	36	20	7
299	46	31	11	7
300	85	23	23	9
301	45	14	12	6
302	88	31	18	2
303	54	29	21	10

34 Graphical Representation of True - F also Total scores.

Range { 12 minimum score
92 maximum score

number of perfect scores 0
number of zeros scores 0
median 58.5

$$P = 2.76 \times 5 = 13.8$$

$$PE_m = 3.12$$

Total possible score 100.

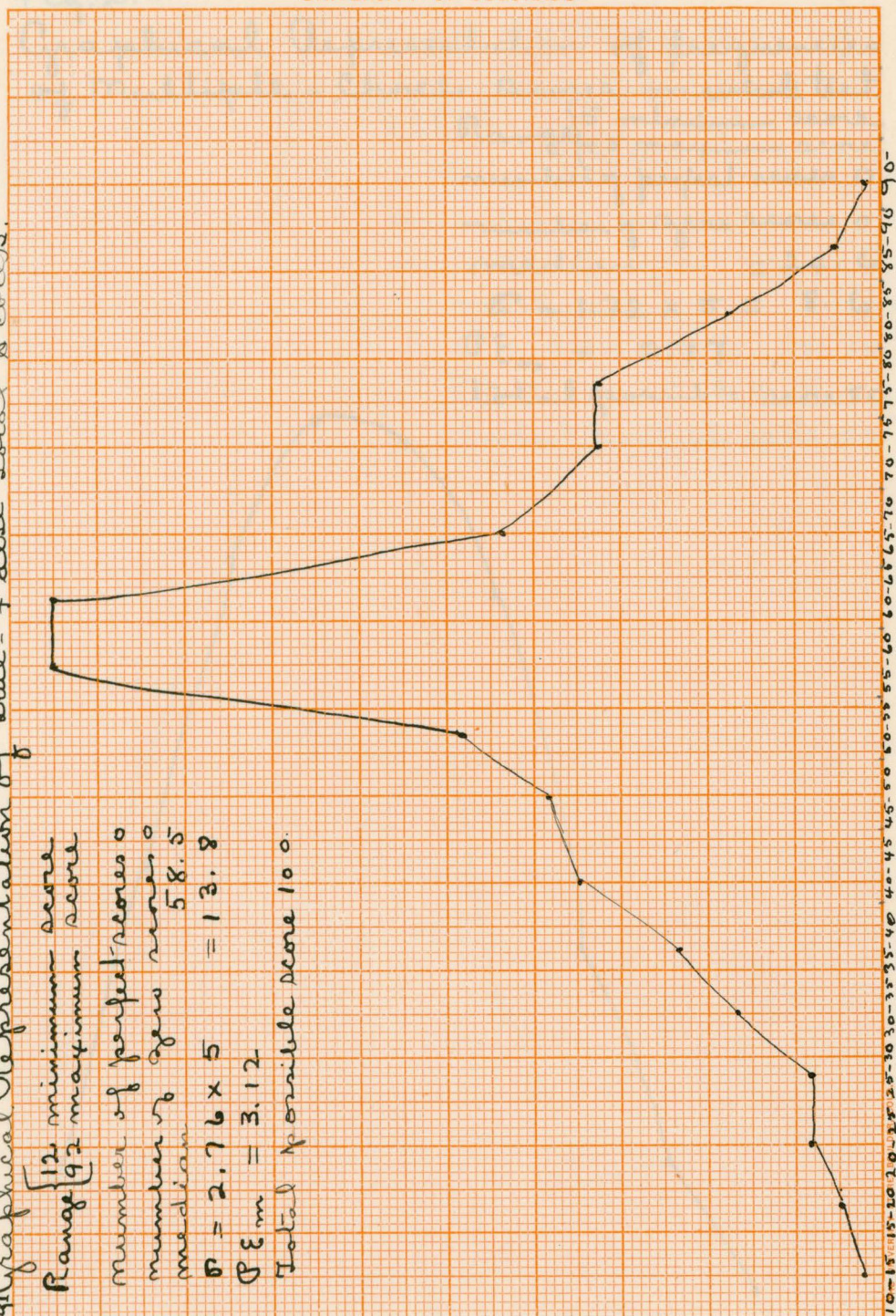


Fig. 2.

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Graphical Representation of frequencies of Multiple-Choice scores on whole test.

Range $\begin{cases} 5 \text{ minimum score} \\ 45 \text{ maximum score} \end{cases}$
 number of perfect scores 0
 number of zero scores 0
 median = 24.6

$$\sigma = 1.72 \times 5 = 8.6$$

$$\sigma \xi_m = 2.17$$

total possible score 50.



Fig. 3

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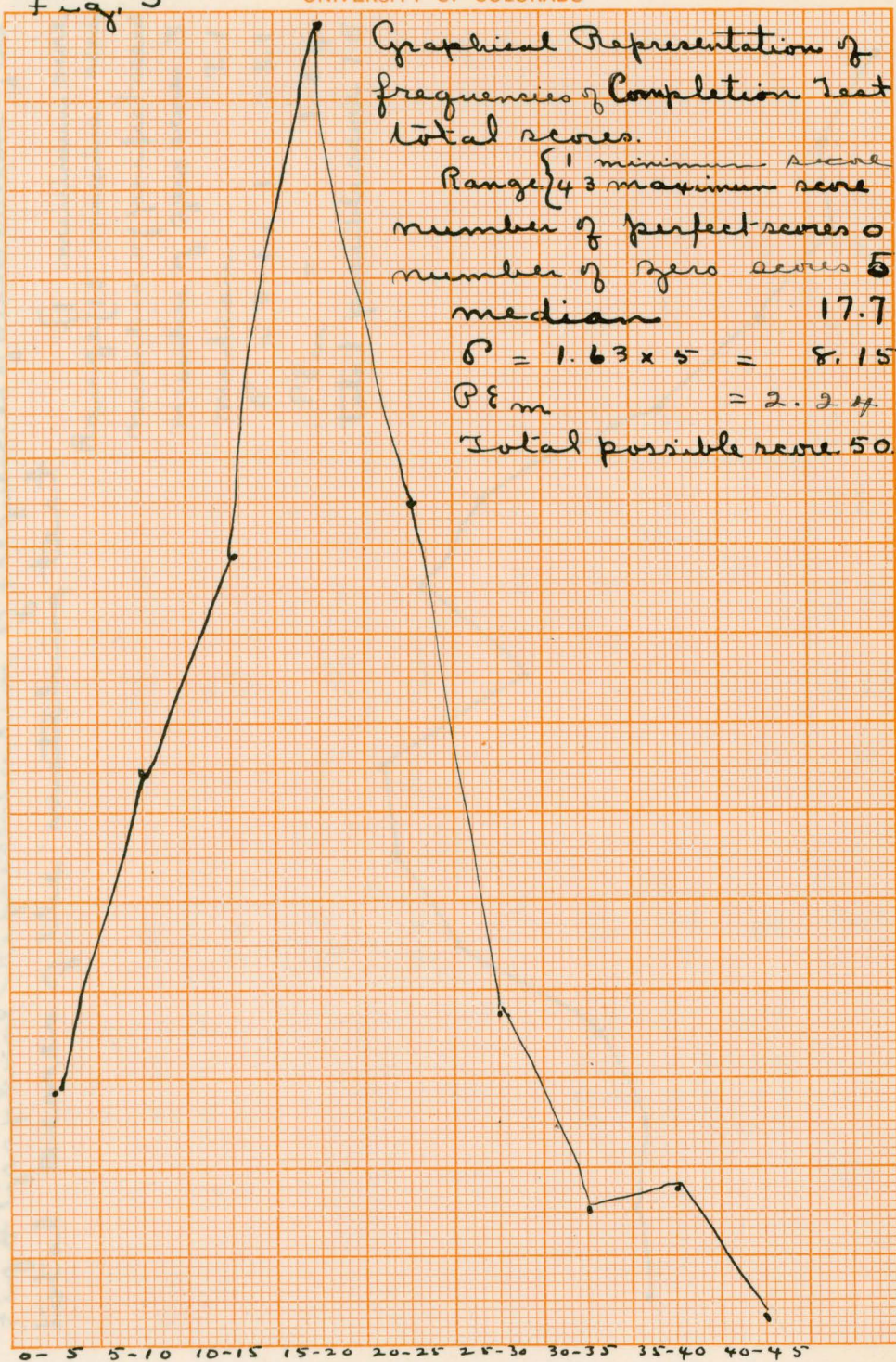


Fig. 4 Graphical Representation of frequencies of distribution of the total scores of the matching test.

Range { minimum score
 15 - maximum score
 number of perfect scores
 number of zero scores 3
 median 7.1
 $\sigma = 3.1 \times 1 = 3.1$
 $PE_m = 1.04$
 total possible score 15.

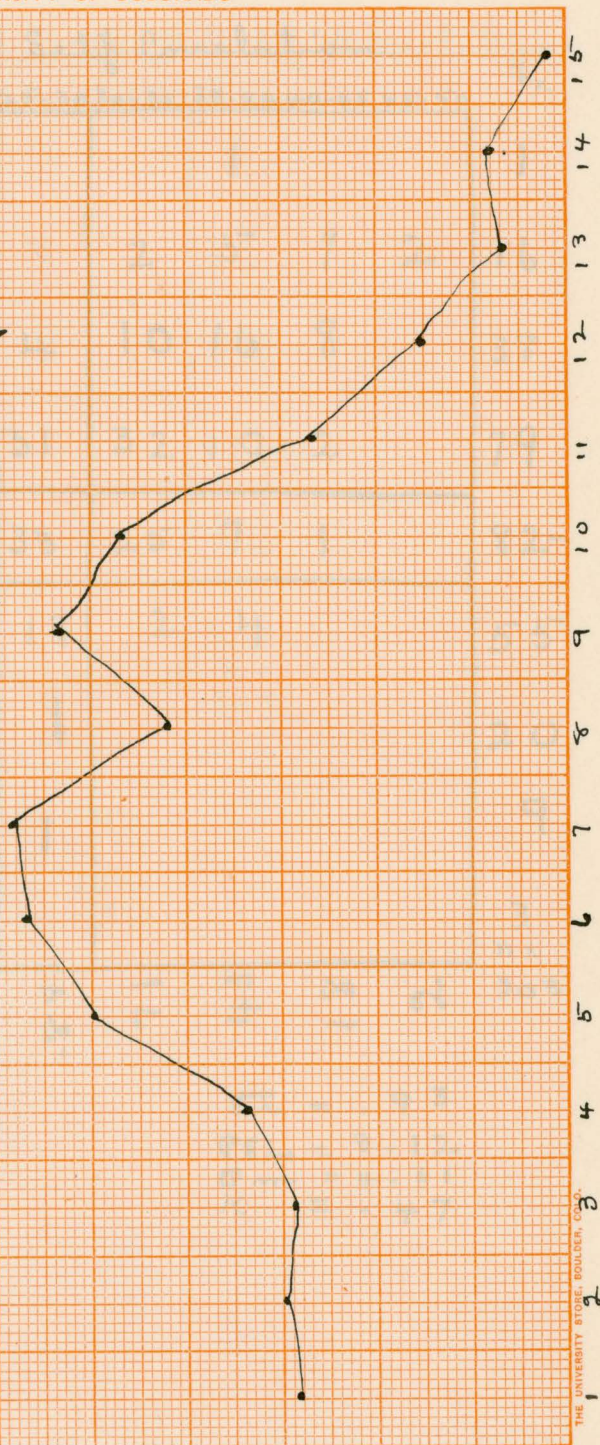


Diagram 5

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True-False Test Self Correlation.

	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50	T_x
5-10										3
10-15	1	5	1	1	1					9
15-20		2	12	5	1					20
20-25		3	5	23	18	2	4			55
25-30			2	14	33	25	7	1		82
30-35				4	31	32	10	2		79
35-40					4	10	16	8		38
40-45						2	5	7	2	16
45-50								1		1
T_y	3	1	2	7	8	7	3	8	2	303

$\sigma_x = 1.3$
 $\sigma_y = 1.4$
 $r = .88 \pm .01$

$r = .93$
 $PE_m = 3.12$
 $\sigma_m = 4.31$
 $K = .47$

Diagram 6

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Multiple Choice Test Self-Correlation

	0-5	5-10	10-15	15-20	20-25	25-30	Σx
0-5				1			1
5-10				2	9		11
10-15		7	23	50	9		89
15-20	2	22	69	15	2		110-
20-25	5	53	20	2			80
25-30	7	2	3				12
Σy	14	80	115	70	2		303
	$n = 14$	$n = 80$	$n = 115$	$n = 70$	$n = 2$		

$$\rho_x = .92$$

$$\rho_y = .97$$

$$r = .85 \pm .01$$

$$\sqrt{r} = .92$$

$$PE_m = 2.17$$

$$\sigma_m = 3.01$$

$$1r = .51$$

Diagram 7 UNIVERSITY OF COLORADO

Completion Test Self-Correlation

0-5	5-10	10-15	15-20	20-25	25-30	Σx
			6	2		8
	4	15	10			29
8	50	32				90
25	75	21	2			123
24	14	1				39
Σy	3	5	8	2		189
	1					

$$\sigma_x = .9$$

$$\sigma_y = .8$$

$$r = .83 \pm .01$$

$$\sqrt{r} = .91$$

$$PE_m = 2.24$$

$$\sigma_m = 2.99$$

$$K = .55$$

Diagram 8

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Matching Test Self-Correlation.

	1	2	3	4	5	6	7	Σx
8				1				1
7			1	2	1	2	5	11
6		1	7	17	12	6	1	44
5	2	7	7	14	7	7		44
4	11	6	20	8	10	2		57
3	7	9	19	15	6	1		57
2	9	11	9	2	2	3		36
1	8	3	1	2	3			17
Σy	17	37	64	69	44	22	6	267

$\sigma_x = 1.6$

$r_n = .92$

$\sigma_y = 1.1$

$\rho_{Em} = 1.04$

$r = .85 \pm .01$

$\sigma_m = 1.08$

$K = .52$

Corrected for time.

Intercorrelation of True-False and Multiple-Choice Tests.

[illegible]

$$\sigma_X = 2.7$$

$$\delta y = 3.02$$

$$n = 0.56 \pm 0.02$$

Diagram 10

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Intercorrelation of True-False and Completion Tests.

10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60	60-65	65-70	70-75	75-80	80-85	85-90	90-	Σ
														1			1
														1			1
												1	1	1			3
									1	1		4			1		7
										1	2						3
								3	1		1		1				6
						1	4		1	2	2						10
					2		1	1	3	3	1	1					12
					4			5	4		3	2					18
			1		1	2	1	7	6	10	2	2	4	2	1		39
				1	1	6	4	10	9	5	5	1		1			43
	1			1	2	2	5	3	11	11	5	2	2	1			46
		1		2	2	3	4	5	4	5	1						27
		1	2	1		1	4	1	1	5	7	1	1	1			26
			1		2	2	1	3	2	2	1	2		1			17
				3	1	4	1	2	3	5	2			1			22
					1	1		2	3	2	1						10
						1	2	1									7
Σ	1	1	1	2	1			1	1								$n = 298$

$\sigma_x = 2.7$

$\sigma_y = 3.02$

$n = 296 \pm .02$

Diagram 11

UNIVERSITY OF COLORADO

Intercorrelation of True-False and Matching Tests.

T	1	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	Σ
F																				
1																				5
5													2							4
10												3	1		2					9
15												2	4		1	1	1			16
20												5	6	2	3	3				28
25																				0
30																				32
35																				25
40																				38
45																				37
50																				33
55																				0
60																				20
65																				17
70																				18
75																				17
80																				
85																				
90																				
Σ	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90		299

$\sigma_x = 3.7$

$\sigma_y = 2.7$

$r = .19 \pm .03$

Diagram 12

UNIVERSITY OF COLORADO

Intercorrelation of Multiple-Choice and Completion Tests.

J _y	J _x															ΣX
	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60	60-65	65-70	70-75	
0-5																2
5-10				2	2	1	2	2	2							11
10-15			4	5	8	4	4									25
15-20		5	6	14	13	7		4								49
20-25	1	6	8	21	19	4	1									60
25-30	4	3	11	30	12	2										62
30-35	6	9	19	15	2											51
35-40	3	11	9	3	4											30
40-45	3	5														8
ΣY	17	39	53	81	55	22	5	0	2							n = 298

$$\sigma_x = 1.7$$

$$\sigma_y = 1.6$$

$$r = .65 \pm .02$$

Diagram 13

UNIVERSITY OF COLORADO

Intercorrelation of Multiple-Choice and Matching Tests.

5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50	T
				1		4			5
			2	3	3	5			13
	2	4	7	6	12	10	2	1	44
		2	8	13	8		1		32
	5	7	14	12	14	7	3	1	63
3	10	13	14	19	8	3			70
2	2	6	7	1	2				20
2	8	15	6	3	1				35
2	4	6	4		1				17
T	5	15	52	50	54	25	10	2	n = 299

$$\sigma_x = 1.9$$

$$\sigma_y = 1.7$$

$$r = .55 \pm .02$$

Summary of Formulas Used.

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Diagram 14

Intercorrelation of matching and Completion Tests.

0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45	7x
		1			1	2	1		5
	1	1	2	2	1	4	1	1	13
	2	2	11	12	10	1	6		44
	3	3	11	9	5	1			32
	1	6	11	23	14	5	2	1	63
2	7	15	31	15					70
3	3	6	6	1	1				20
7	10	11	3	4					35
4	3	4	1	1					13
17	32	53	89	57	22	9	10	2	n = 296

$\sigma x = 1.8$

$\sigma y = 1.6$

$r = .59 \pm .02$

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Summary of Formulas Used.

I. σ (standard deviation) = $\frac{\sum F D^2}{n} - C^2$

Asker, W. : $C = \frac{F D}{n}$

II. Coefficient of Correlation

Batson, W. H. : $r = \frac{\sum x' y'}{n} - c_x c_y$

$r = \frac{\sigma_x \cdot \sigma_y}{\sigma_x \cdot \sigma_y}$

III. $P.E_r = \frac{.6745 \times (1-r^2)}{\sqrt{n}}$

IV. $P.E_m = .6745 \sigma \sqrt{1 - r^2}$

V. $\sigma_m = \sigma_r \sqrt{1 - r^2}$

VI. $K = \sqrt{1 - r^2}$

VII Brown's Formula

$r_x = \frac{n r^{\frac{1}{2}} \frac{1}{2}}{1 + (n - 1) r}$

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