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ABSTRACT OF THESIS

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A CLINICAL TECHNIQUE  
FOR DEFINING CRITICAL AREAS OF DISCREPANCY  
BETWEEN MEASURED ABILITY AND MEASURED ACHIEVEMENT

Submitted by  
Leota Cady Hayward

In partial fulfillment of the requirements  
for the Degree of Master of Arts  
Colorado State College  
of  
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Fort Collins, Colorado

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## ABSTRACT OF THESIS

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Leota Cady Hayward

### Statement of problem

Is there a more accurate technique for measuring and evaluating discrepancy between achievement predicted from standardized academic ability tests and achievement measured by standardized achievement tests than by observing the difference in percentile rank on the tests and deciding on the seriousness of the discrepancy by subjective judgment?

### Assumptions

The writer makes the following assumptions:

1. That ability and achievement are pupil characteristics sufficiently independent that they may be treated separately.
2. That the testing conditions were uniform, the scoring and recording of scores, accurate.
3. That the reliability and validity of each test meet the usual standards (Appendix A).
4. That a technique which increases the accuracy of measurement of discrepancy between achievement predicted by academic ability tests and achievement measured by achievement tests is desirable.

### Procedures and findings

The scores made by 222 ninth grade Fort Collins Junior High School students, on the California Test of Mental Maturity and on the Progressive Achievement Intermediate Battery furnished the raw data for this study. (These tests were administered March 18 to 30, 1941, to all 222 ninth grade students.)

1. The reliability of scores for each test and each part of each test, as quoted in the manuals, was used to compute the Baxter-Paterson ratio for reliability. Baxter and Paterson have summarized the median ratio values thus:

	$\frac{S.E.M}{S.D.}$
Achievement Tests-----	.20
Scholastic Aptitude Tests----	.30
Reading Tests-----	.32

The likelihood that an individual's score is within 20% of the total distribution, is shown by  $\frac{S.E.M}{S.D.}$  of .20.

California Test of Mental Maturity	$\frac{S.E.M}{S.D.}$
Reliability	
Total Mental factors-----	.949 .22
Language factors-----	.913 .29
Non-language factors-----	.931 .26
Test A. Memory-----	.920 .28
Test B. Spacial Rel.-----	.871 .35
Test C. Reasoning-----	.902 .31
Test D. Vocabulary-----	.886 .33

Progressive Achievement Tests  
Intermediate Battery

	Reliability	$\frac{S.E.M}{S.D.}$
Reading Vocabulary-----	.915	.29
Reading Comprehension-----	.893	.32
Arithmetic Reasoning-----	.930	.26
Arithmetic Fundamentals-----	.952	.21
Language-----	.954	.23
Total-----	.974	.16

2. All test scores were tabulated on columnar sheets with boys' and girls' scores in separate groups, listed alphabetically, and numbered consecutively for ease of identification. The arrangement of columns was as follows:

Name of student  
Identifying number (B1, B2,--boys; G1, G2,--girls)  
Score on Non-language, Mental Maturity  
File rank in group  
Score on Language, Mental Maturity  
File rank in group  
Total score on Mental Maturity  
File rank in group  
File rank of total Progressive Achievement Test  
Total score of Progressive Achievement Test  
Grade placement from published norms (1937 Rev.)  
Score on Progressive Achievement Reading Vocab.  
Grade placement from published norms (1937 Rev.)  
File rank in group  
Score on Progressive Achievement Reading Comp.  
Grade placement from published norms (1937 Rev.)  
File rank in group  
Score on Progressive Achievement Arithmetic Reas.  
Grade placement from published norms (1937 Rev.)  
File rank in group  
Score on Progressive Achievement Arithmetic Fund.  
Grade placement from published norms (1937 Rev.)  
File rank in group  
Score on Language test in Progressive Achievement  
Grade placement from published norms (1937 Rev.)  
File rank in group



3. The mean and the standard deviation were computed for each of the parts:

	$\bar{x}$	$\sigma$
Mental Maturity Non-language-----	96.6	13.7
Mental Maturity Language-----	107.4	14.0
Mental Maturity total score-----	103.8	12.2
P. A. total-----	297.6	39.2
P. A. Reading Vocabulary-----	67.9	10.3
P. A. Reading Comprehension-----	43.5	6.2
P. A. Arithmetic Reasoning-----	37.7	7.8
P. A. Arithmetic Fundamentals-----	64.9	10.2
P. A. Language-----	84.2	15.6

4. The correlation coefficients were computed for:

	$r$
Total M. M. and Total P. A. <u>1</u> /-----	.70
M. M., Lang. and P. A. Reading Vocab. <u>2</u> /---	.67
M. M., Lang. and P. A. Reading Compre. <u>3</u> /--	.74
M. M., N. L. and P. A. Arithmetic Reas. <u>4</u> /-	.42
M. M., N. L. and P. A. Arithmetic Fund. <u>5</u> /-	.25
M. M., Lang. and P. A. Language-----	.60

5. From the correlation between ability scores, and achievement scores, regression equations were written which give amounts of discrepancy between the two variables, estimated achievement, and measured achievement,

6. From these regression equations the estimated achievement scores for each student were computed;

a. estimated total achievement score from the regression of total scores of the Progressive Achievement upon total Mental Maturity.

---

1/ M. M., Mental Maturity; P. A., Progressive Achievement.

2/ M. M. Lang., Mental Maturity Language.

3/ P. A. Reading Compre., Progressive Achievement Reading Comprehension.

4/ M. M., N. L., Mental Maturity Non-Language; Arith. Reas., Arithmetic Reasoning.

5/ Arith. Fund., Arithmetic Fundamentals.

$$\text{Est. } A = \bar{A} - r \frac{\sigma_A}{\sigma_M} (M - \bar{M})$$

Est. A = estimated total achievement

$\bar{A}$  = mean of achievement scores

r = correlation

$\sigma$  = standard deviation

M = score on Mental Maturity

$\bar{M}$  = mean of Mental Maturity

b. estimated reading vocabulary score from the regression of Progressive Achievement reading vocabulary upon Mental Maturity, language.

$$\text{Est. } A_V = \bar{A}_V + r \frac{\sigma_{A_V}}{\sigma_{M_L}} (M_L - \bar{M}_L)$$

V = reading vocabulary

$M_L$  = Mental Maturity, Language

c. estimated reading comprehension score from the regression of Progressive Achievement reading comprehension upon Mental Maturity, language.

$$\text{Est. } A_C = \bar{A}_C - r \frac{\sigma_{A_C}}{\sigma_{M_L}} (M_L - \bar{M}_L)$$

C = reading comprehension

7. For each student, these estimated scores of achievement were compared with the measured scores of achievement and the discrepancy noted separately for total achievement, reading vocabulary and reading comprehension:

$$A - \text{Est. } A, A_V - \text{Est. } A_V, A_C - \text{Est. } A_C.$$

8. These amounts of discrepancy were treated as quantitative measures recorded and distributed as three separate sample populations:

- a. Discrepancy scores, total achievement
- b. Discrepancy scores, reading vocabulary
- c. Discrepancy scores, reading comprehension

9. The frame of reference for classification of discrepancy is the standard deviation of discrepancy in each population.

$$\sigma_{\text{Est. A}} = \sigma_A \sqrt{1 - r^2} = 28.01$$

$$\sigma_{\text{Est. A}_V} = \sigma_{A_V} \sqrt{1 - r^2} = 7.97$$

$$\sigma_{\text{Est. A}_C} = \sigma_{A_C} \sqrt{1 - r^2} = 4.21$$

$\sigma$  = standard deviation

Est. A = estimated total achievement

r = correlation

V = reading vocabulary

C = reading comprehension

10. The classification (or discrepancy index) numbers were arbitrarily chosen to be -2, -1, 0, +1, +2, corresponding to the standard deviation units below and above the mean. The algebraic statement of each amount of discrepancy between measured achievement and estimated achievement follows, with classification and interpretation.

If  $A - \text{Est. A} > 2\sigma_{\text{Est. A}}$ , arbitrarily classify as (+2)

a high sufficiency of achievement is indicated.

If  $A - \text{Est. } A > 6_{\text{Est. } A}$ , arbitrarily classify as (+1)  
a definite sufficiency of achievement is indicated.

If  $-6_{\text{Est. } A} < A - \text{Est. } A < 6_{\text{Est. } A}$ , classify as ( 0)  
a proper balance between achievement and mental maturity is assumed.

If  $A - \text{Est. } A < -6_{\text{Est. } A}$ , arbitrarily classify as (-1)  
a definite deficiency in achievement is indicated.

If  $A - \text{Est. } A < -26_{\text{Est. } A}$ , arbitrarily classify as (-2)  
a strong deficiency in achievement is indicated.

11. The discrepancy index for each student was computed and recorded.

NUMBER OF STUDENTS IN EACH CLASSIFICATION  
M. M. , P. A.

-3	-2	-1	-0	+0	+1	+2
B- 1	B- 5	B- 16	B- 37	B- 35	B- 13	B- 0
<u>G- 0</u>	<u>G- 1</u>	<u>G- 11</u>	<u>G- 24</u>	<u>G- 55</u>	<u>G- 23</u>	<u>G- 1</u>
Total						
1	6	27	61	90	36	1

PERCENT OF STUDENTS IN EACH CLASSIFICATION  
M. M. , P. A.

-3	-2	-1	-0	+0	+1	+2
B- .93	B- 4.7	B-14.95	B-34.57	B-32.71	B-12.14	B-0.0
G-0.0	G- .87	G- 9.56	G-20.86	G-47.82	G-20.0	G- .87
Total						
.45	2.70	12.16	27.47	40.54	16.21	.45

Interpretation of findings

For the individual student.--The percentile ranks show under- or over-achievement but do not indicate degree of seriousness of the under- or over-achievement. a discrepancy index number indicates objectively how much the individual deviates from the mean discrepancy. Tables for the group show what percent of students are above, below, or in the same classification of discrepancy.

For the group of students.--The task of classifying and distributing students to classes in which homogeneity is desirable with respect to levels of ability, and with respect to amounts of discrepancy between estimated achievement and measured achievement, is simplified and made an objective procedure by using the technique suggested in this study. If one considers performance on tests of ability as levels, or strata, or horizontal bands one above another, the classifications of discrepancy between ability and achievement (-2, -1, 0, +1, +2)

are like vertical shafts crossing all levels of ability perpendicularly so as to form a cross section or area of homogeneity at each level of ability. Each cross section can then be the basis of class membership which is kept flexible.

Precautions.--Among other precautions, is the one that homogeneity with regard to ability, and discrepancy between ability and achievement, by no means implies homogeneity with regard to other individual characteristics. This technique is not an automatic device that miraculously individualizes mass instruction.

#### Summary of findings

Observation of a difference in the percentile rank of a pupil on a test of ability and a test of achievement is a poor judgement-making device because the accuracy varies with the training, skill, and experience of the counselor making the judgement; it is subject to a wide margin of error because it is a subjective technique of measurement. Classification by means of the discrepancy-index is an objective technique of measurement.

1. The technique developed in this study is another clinical procedure that will enable a personnel administrator or high school principal to make a more objective judgement of:



a. amount of discrepancy between an individual student's expected and measured achievement.

b. areas of seriousness of discrepancy.

c. classification of students in a group where the characteristic discrepancy as well as the ability is similar.

2. Homogeneity with regard to discrepancy between ability and achievement as well as homogeneity with regard to percentile rank in ability and achievement, is made possible by employing this technique in classifying students for instruction.

3. If reliable and valid ability and achievement test data are available, this technique can locate, before classroom instruction begins, the students whose past performance would indicate a problem in the area of educational adjustment. This is a definite aid to teachers and students.

4. This technique locates discrepancy between ability and achievement for students of all levels of ability and exposes the fallacy that normal ability students do not have problems in education.

5. This technique applied to objective data on students entering high school can increase the effectiveness of student personnel work.



The limitations of the discrepancy-index must be recognized. For an individual, the measurement of discrepancy between ability and achievement is only one characteristic of his behavior. For the group, even though levels of ability and achievement and the discrepancy between them are relatively constant within a classification, there are many other inter- and intra-individual differences. Among students of the same level of ability, and within the same discrepancy-classification, the widest range of heterogeneity may exist with regard to interests, aptitudes, personality development, socioeconomic background, and opportunity.

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T H E S I S

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COLORADO STATE COLLEGE  
OF  
AGRICULTURE AND MECHANIC ARTS

August 1, 1941

I HEREBY RECOMMEND THAT THE THESIS PREPARED UNDER MY  
SUPERVISION BY LEOTA CADY HAYWARD  
ENTITLED A CLINICAL TECHNIQUE FOR DEFINING CRITICAL  
AREAS OF DISCREPANCY BETWEEN MEASURED ABILITY AND  
MEASURED ACHIEVEMENT.  
BE ACCEPTED AS FULFILLING THIS PART OF THE REQUIREMENTS FOR THE  
DEGREE OF MASTER OF ARTS  
MAJORING IN COUNSELING  
CREDITS 3

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Dean of the Graduate School

Permission to publish this thesis or any part of it  
must be obtained from the Dean of the Graduate School.

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## Chapter I

### INTRODUCTION

#### Review of the literature

The literature relating history of testing is voluminous and replete with records of experimentation from the time of the early Greeks. Truman L. Kelley (12:1-17) summarizes an historical survey of mental measurement in Chapter I, "Interpretation of Educational Measurements." Described in that research are the concepts of "general intelligence", the "intelligence quotient", "mental age", "subject and achievement ages", "subject and achievement quotients", and the "accomplishment quotient".

In 1920, Franzan popularized the ratio relationship of achievement age to mental age and interpreted a quotient of less than 100 as indicating that the child is not achieving up to his ability. Dr. Franzan now recognizes the dangers of so naive an interpretation.

Dr. McCall, in 1922, wrote:

The accomplishment quotient is the most exact present day measure of the efficiency of study, instruction, and supervision. ...it is the best index of what pupils need special attention and spurring, and of what pupils need restraining, perhaps, and of what pupils need to be 'let alone'. ...the accomplishment quotient asks the pupil to progress at a rate which is proportional to the mental capacity with which nature endowed him.

1  
2  
Otis, (1925) used the ambiguous term "accomplishment ratio" in place of accomplishment quotient. Kelley (1927) referred to reading-age-divided-by-chronological-age as reading quotient and similarly with other quotients. In 1927, Reavis (17) emphasized the importance of pupil diagnosis. Dransfield in 1935 (7) substantiated his opinion that children with superior intelligence suffer seriously in our schools by drifting along without reaching the maximum of their accomplishment. These research studies seem to indicate a groping for expressed relationship of achievement to ability that would have meaningful interpretation.

Cummulative research on the problem of discrepancy between an individual's ability and achievement may be traced in other antecedants (24) to the clinical method of guidance as it is defined and described by such men as Donald Paterson, E. C. Williamson, John G. Darley, and Milton Hahn. "Delivering the student to the classroom in the optimum condition to profit from instruction" (24) implies an individual analysis in the areas of ability, achievement, aptitude, interest, personality, attitudes, health, socio-economic background and opportunities.

Individual analysis of ability and achievement as a clinical procedure (26) employs the technique of percentile rank of measured ability compared with percentile rank of measured achievement utilizing the most reliable and most nearly valid measuring instruments available.

1  
3  
Observing the similarity or discrepancy in percentile rank on tests of ability and on tests of achievement and evaluating that discrepancy as to critical areas of deviation from the average is one phase of the counselor's task (26). A well trained and thoroughly experienced counselor can make these judgments.

The need, however, for a more nearly objective technique of measuring and evaluating discrepancy between achievement estimated from measured ability, and achievement, measured, as an aid to the less experienced counselor eager for accurate judgment spurred the writer to search for a statistical procedure that would serve as an accurate judgment making device.

In the literature there are class experiments based on measured gains in achievement related to standard deviation of achievement (8), but there do not seem to be records of research on measurements of discrepancy between achievement predicted from ability and achievement, measured.

The authors named in the bibliography have assisted the writer in both "point of view", or philosophy, and procedure. Specifically, John G. Darley (6) in his "spotting" of student problem types by graphic relationship of achievement to ability, implies the need for a more objective technique of measuring and evaluating the discrepancy between measured ability and measured achievement.

1  
4  
Before a tentative prognosis (24) of an individual's educational success can be formed, as nearly accurate as possible judgment of amount and seriousness of discrepancy between ability and achievement must be made. The following quotation from the decalogue (26:30) implies the need of a technique for measuring and evaluating the discrepancy between, achievement predicted by a student's ability and his measured achievement.

1. Student personnel work is most effective when it deals with judgments of the student's probable success or failure in meeting training standards rather than occupational standards.

5. Student personnel work is most effective when it tests all quantitative data from test to grades as the personnel equivalent of the doctor's clinical thermometer readings.

7. Student personnel work is most effective when it brings about the strong desire for achievement within the limits of ability, background, interest, and opportunities that may be characterized as morale.

Both for the purpose of individual counseling and as a device to aid in distributing students to classes where they may best profit from instruction, Williamson and Hahn (27) intimates the need for measuring discrepancy between ability and achievement.



### Setting and Need for the Study

In the clinical method of individual counseling the first step is to assemble from various sources, reliable and valid data concerning the individual. In analysing the student, tests of ability, achievement, aptitude, interest, personality, attitude, and records of health and opportunity are desirable tools with which to work.

One of the problem areas in which diagnosis is essential is educational status and needs. The more accurate the measuring devices and the finer the technique of making correct judgement, the more reliable are analysis, synthesis, temporary diagnosis, and tentative prognosis, regarding an individual student.

This study proposes to decrease the margin of error in judging the discrepancy between achievement predicted from tests of ability and achievement measured by tests of achievement. The calibration of this discrepancy, -2σ -1σ 0 +1σ +2σ can be an aid to the counselor of individual students as he makes judgments concerning the individual's educational status and needs. The use of the technique suggested in this study can be an aid in classifying students and distributing them to classes in which they may best expect to profit from the instruction offered.

## Definitions, delimitations, and assumptions

A short sample of human behavior, taken under carefully standardized conditions, is the definition of a test as the word is used in this thesis.

This study analyses the score of 222 students on one test of ability and one test of achievement. The number of frequencies and the number of tests administered are inadequate for making general conclusions, but this inadequacy does not affect the method of measuring discrepancy. In treating the scores on more than one test of ability and more than one test of achievement, a multiple regression equation relating ability and achievement would be used. The procedure from there would be the same as in this study.

The writer makes the following assumptions:

1. That ability and achievement are pupil characteristics sufficiently independent that they may be treated separately.
2. That the testing conditions were uniform, the scoring and recording of scores, accurate.
3. That the reliability and validity of each test meet the usual standards (Appendix A).
4. That a technique which increases the accuracy of measurement of discrepancy between achievement, predicted by tests of ability, and achievement, measured by tests of achievement, is desirable.

# Problem, analysis, and procedure

In the treatment of standardized test data on the ability and achievement of an individual, is there not a more accurate technique for measuring and evaluating the discrepancy between the score of achievement predicted from tests of ability and the score made on the test of achievement, than that of observing differences in percentile rank of scores and deciding on the seriousness of discrepancy by subjective judgement? An analysis of this problem and interpretation of results include the following subsidiary questions:

1. Why is observation of differences in percentile rank on the ability test and achievement test a poor judgment and subject to wide margin of error in estimating the amount and seriousness of the discrepancy?
2. Can the frequencies of amounts of discrepancy between achievement estimated from measured ability and measured achievement, be distributed as a sample population?
3. Then can standard error boundaries be placed above and below the mean discrepancy to mark off and classify the seriousness or lack of seriousness of deviation thus:

Discrepancy between measured ability and measured achievement.

-2 σ                  -1 σ                  0                  +1 σ                  +2 σ



4. Can these boundaries be utilized by the counselor of an individual student?
5. Can these boundaries be utilized by a senior high school administrator to classify and distribute individual students to classes where they will be in the best place to profit from instruction?

The following procedure is used in this thesis:

1. Administer the California Mental Maturity Test and the Progressive Achievement Test to 222 students including pupils in the writer's classes.
2. Find the correlation between abstract ability as measured by the California Mental Maturity Test and scholastic achievement as measured by the Progressive Achievement Test.
3. Find the correlation between the "Language" ability as measured by the California Mental Maturity Test and the achievement in Reading Vocabulary, Reading Comprehension, and Language, as measured by the Progressive Achievement Test.
4. Find the correlation between the non-language factors of the California Mental Maturity Test and achievement in Arithmetic fundamentals and Arithmetic reasoning as measured by the Progressive Achievement Test.
5. Find the correlation between achievement in Reading Comprehension and Language, between

1  
9 Reading Vocabulary and Reading Comprehension.

6. For each individual find the "predicted" score in achievement based on this measured ability score.

(Regression equation.)

7. Calibrate the amounts of discrepancy between estimated achievement and the actual score of measured achievement in terms of 1 and 2 above and below zero discrepancy.

2  
1

## Chapter II

### MATERIALS AND METHODS

#### SOURCES OF DATA

As part of the testing program of Fort Collins Junior High School, beginning March 18, 1941, and on consecutive days until completed, the California Mental Maturity Test 1/ was administered by Miss Helen Wordelman 2/ to 222 ninth grade students during scheduled classes 3/ in social studies. The Progressive Achievement Test 4/ was given by the same psychometrist beginning on March 24, 1941, and during the same scheduled classes for consecutive days until completed. The few students who were absent during either test were given makeup tests as soon as they returned to school.

The Mental Maturity Tests were hand scored and checked by Miss Helen Wordelman and the writer. The Progressive Achievement Tests were hand scored by the

---

1/ See Appendix A for evaluation of the test in Buros Mental Measurement Yearbook 1940.

2/ Helen Wordelman, who is girls' adviser at Fort Collins Junior High School, has been a graduate student in counseling at the University of Minnesota during the summers, 1939, 40, 41.

3/ Average number in class, 37.

4/ See Appendix A for evaluation of the test in Buros Mental Measurement Yearbook 1940.

faculty of the Fort Collins Senior High School. The partial scores, total scores, and grade placements from the published norms were checked by the writer.

The writer recorded individual scores on columnar sheets, directly from the test booklets and checked the record. Miss Helen Wordelman filed the tests in individual folders to become part of the cumulative record sent to the senior high school.

#### PROCEDURES AND TECHNIQUES

The raw data used in the study include 222 individual's scores, (107 boys and 115 girls), of ninth grade students on each of the tests, California Mental Maturity and Progressive Achievement.

From each manual of directions, the quoted reliability was used to compute the Baxter-Paterson ratio for reliability of scores (2) for each test and each part of each test. All test scores were tabulated on columnar sheets, with boys' and girls' scores in separate groups, listed alphabetically, and numbered consecutively for ease of identification. The arrangement of columns was as follows:

Name of student
Identifying number (B1, B2,--boys. G1, G2,--girls)
Score on Non-language, Mental Maturity
File rank in group
Score on Language, Mental Maturity
File rank in group
Total score on Mental Maturity



2  
3

17

%ile rank in group  
%ile rank of total Progressive Achievement Test  
Total score of Progressive Achievement Test  
Grade placement from published norms. (1937 Rev.)  
Score on Progressive Achievement Reading Vocabulary  
Grade placement from published norms. (1937 Rev.)  
%ile rank in group  
Score on Progressive Achievement Reading Compreh.)  
Grade placement from published norms. (1937 Rev.)  
%ile rank in group  
Score on Progressive Achievement Arithmetic Reas.  
Grade placement from published norms. (1937 Rev.)  
%ile rank in group  
Score on Progressive Achievement Arithmetic Fund.  
Grade placement from published norms. (1937 Rev.)  
%ile rank in group  
Score on Language test in Progressive Achievement  
Grade placement from published norms. (1937 Rev.)  
%ile rank in group

The scores were then treated as frequencies in sample population and the following items completed.

1. The percentile rank of each individual was computed for:

- a. Mental Maturity Non-language
- b. Mental Maturity Language
- c. Mental Maturity total score
- d. Progressive Achievement total
- e. Progressive Achievement Reading Vocabulary
- f. Progressive Achievement Reading Compreh.
- g. Progressive Achievement Arithmetic Reas.
- h. Progressive Achievement Arithmetic Fund.
- i. Progressive Achievement Language

2. The mean and the standard deviation were computed for each of the parts:

- a. Mental Maturity Non-language
- b. Mental Maturity Language
- c. Mental Maturity total score
- d. Progressive Achievement total
- e. Progressive Achievement Reading Vocabulary
- f. Progressive Achievement Reading Compreh.
- g. Progressive Achievement Arithmetic Reas.
- h. Progressive Achievement Arithmetic Fund.
- i. Progressive Achievement Language

3. The correlation coefficients were computed for:

Total M. M. 5/ and Total P. A. 6/  
M. M., Lang. 7/ and P. A. Reading Vocabulary  
M. M., Lang. and P. A. Reading Comprehension  
M. M., N. L. 8/ and P. A. Arithmetic Reasoning  
M. M., N. L. and P. A. Arithmetic Fundamentals  
M. M., Lang. and P. A. Language

4. From the correlation between scores, expressing measures of ability, and scores, representing measures of achievement, regression equations were written 9/ which give amounts of discrepancy between the two variables, achievement, estimated from ability, and achievement, measured by a standardized test of achievement.

5. From these regression equations the estimated achievement scores for each student were computed.

a. estimated total achievement score from the regression of total scores of the Pro-

---

5/ M. M. in abbreviation will refer to Mental Maturity.

6/ P. A. in abbreviation will refer to Progressive achievement.

7/ M. M., Lang. in abbreviation will refer to the Language part of the California Mental Maturity Test.

8/ M. M., N. L. in abbreviation will refer to the Non-language part of the California Mental Maturity Test.

9/ The regression equations of Progressive Achievement, arithmetic reasoning, and arithmetic fundamentals, upon Mental Maturity, non-language were not written because the low correlations between them, .42 and .25 probably indicate that whatever M. M. non-language measures, it is not ability in arithmetic since the validity of P. A. arithmetic test meets the usual standards.

gressive Achievement upon total Mental Maturity.

b. estimated reading vocabulary score from the regression of Progressive Achievement reading vocabulary upon Mental Maturity, language.

c. estimated reading comprehension score from the regression of Progressive Achievement reading comprehension upon Mental Maturity, language.

6. For each student, these estimated scores of achievement were compared with the measured scores of achievement and the discrepancy noted separately for total achievement, reading vocabulary and reading comprehension:

7. These amounts of discrepancy were treated as quantitative measures recorded and distributed as three separate sample populations:

- a. Discrepancy scores, total achievement
- b. Discrepancy scores, reading vocabulary
- c. Discrepancy scores, reading comprehension

8. The frame of reference for classification of discrepancy is the standard deviation of discrepancy in each population. The classification number was arbitrarily chosen to be -2, -1, 0, +1, +2, corresponding to the standard deviation.



## COMPUTATION OF DISCREPANCY CLASSIFICATION

From the regression of total achievement upon Mental Maturity, the estimated score for each individual was found by substituting in the following equation:

$$\text{Est. A.} = \bar{A} + r \frac{\sigma_A}{\sigma_M} (M - \bar{M})$$

Est. A = estimated achievement.

$\bar{A}$  =  $\bar{x}$  or mean of the achievement scores made by the whole group.

$r$  = correlation coefficient between Mental Maturity Total and Progressive Achievement Total.

$\sigma_A$  = standard deviation of the scores in Achievement.

$\sigma_M$  = standard deviation of the scores in Mental Maturity.

$M$  = individual's score in Mental Maturity.

$\bar{M}$  =  $\bar{x}$  or mean of scores in Mental Maturity.

For ease of recording calculation, the columnar pads again were used with the following columns:

(minus scores were shown in red; plus scores, in black.)

Identifying number

$(M - \bar{M})$

$r \frac{\sigma_A}{\sigma_M} \frac{10}{\sigma_M} (M - \bar{M})$

---

$\frac{10}{\sigma_M} r \frac{\sigma_A}{\sigma_M}$  being a constant, was calculated only once (slope of regression line).

$$\bar{A} + r \frac{\sigma_A}{\sigma_M} (M - \bar{M}) = \text{Est. A.}$$

The next step was to find the standard error of the estimated achievement by using the following equation:

$$\sigma_{\text{Est. A}} = \sigma_A \sqrt{1 - r^2} \text{ 11/}$$

$\sigma_{\text{Est. A}}$  = standard error of the estimate of achievement.

$\sigma_A$  = standard error of the achievement scores.

$r$  = correlation between total Mental Maturity and total achievement scores.

To measure the discrepancy between the actual achievement score and the estimated achievement, the algebraic subtraction was performed.  $A - \text{Est. A.}$

$A$  = the individual's score in achievement.

$\text{Est. A}$  = the estimated achievement.

This was the next calculation recorded in the column of Appendix .

Next, treating these discrepancies as a sample population and considering zero discrepancy as optimum, the following boundaries, plus and minus, were used to indicate the amount and meaning of the discrepancy. (The number recorded on the columnar sheet for each individual

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11/ Constant, calculated only once.

as "classification" was arbitrarily chosen to be the same as the standard deviation of discrepancy. Appendix B1, column 5.)

If the achievement minus the estimated achievement is greater than twice the standard achievement 12/, a high sufficiency is indicated and a classification of +2 recorded showing that the discrepancy between ability as measured by the California Mental Maturity Test, and achievement as measured by the Progressive Achievement Test, is positive and at least two standard deviations above the mean discrepancy.

If the achievement minus the estimated achievement is greater than one standard deviation of the estimated achievement, but less than two standard deviations of the estimated achievement, a definite sufficiency is indicated and a classification of +1 recorded showing that the discrepancy between ability as measured by the California Mental Maturity Test, and achievement as measured by the Progressive Achievement Test, is positive and between one and two standard deviations above the mean discrepancy.

If the achievement minus the estimated achievement is greater than minus one standard deviation of the estimated achievement but less than plus one standard deviation of the estimated achievement, a proper balance

---

12/ Standard error of the difference

2  
9

23

between achievement and mental maturity is assumed and a classification of 0 recorded showing that the discrepancy between ability as measured by the California Mental Maturity Test, and achievement as measured by the Progressive Achievement Test, is within one standard deviation above and below the mean discrepancy.

If the achievement minus the estimated achievement is less than minus one standard deviation of the estimated achievement but greater than minus two standard deviations of the estimated achievement, a definite deficiency is indicated and a classification of -1 recorded, showing that the discrepancy between ability as measured by the California Mental Maturity Test, and achievement as measured by the Progressive Achievement Test, is negative and at least one standard deviation below the mean discrepancy.

If the achievement minus the estimated achievement is less than minus two standard deviations of the estimated achievement, a strong deficiency is indicated and a classification of -2 recorded showing that the discrepancy between ability as measured by the California Mental Maturity Test, and achievement as measured by the Progressive Achievement Test, is negative and at least two standard deviations below the mean discrepancy.

The algebraic statement of discrepancy between measured achievement and achievement estimated from

ability, follows with interpretation.

If  $A - \text{Est. } A > 2\sigma_{\text{Est. } A}$ , arbitrarily classify as (+2)  
a high sufficiency is indicated.

If  $A - \text{Est. } A > \sigma_{\text{Est. } A}$ , arbitrarily classify as (+1)  
a definite sufficiency is indicated.

If  $-\sigma_{\text{Est. } A} < A - \text{Est. } A < \sigma_{\text{Est. } A}$ , classify as (0)  
a proper balance between achievement and  
mental maturity is assumed.

If  $A - \text{Est. } A < -\sigma_{\text{Est. } A}$ , arbitrarily classify as (-1)  
a definite deficiency is indicated.

If  $A - \text{Est. } A < -2\sigma_{\text{Est. } A}$ , arbitrarily classify as (-2)  
a strong deficiency is indicated.

The specific application to the data used and  
statistics derived in this study is as follows:

If the  $A - \text{Est. } A > 55.02$ , classify as (+2)  
a high sufficiency is indicated.

If the  $A - \text{Est. } A > 28.01 < 56.02$ , classify as (+1)  
a definite sufficiency is indicated.

If  $-28.01 < A - \text{Est. } A < 28.01$ , classify as (0)  
a proper balance between achievement and  
mental maturity is assumed.



2

11

If  $A - \text{Est. } A < -28.01 > -56.02$ , classify as (-1)  
a definite deficiency is indicated.

If  $A - \text{Est. } A < -56.02$ , classify as (-2)  
a strong deficiency is indicated.

A further discrimination is effected by recording scores in the zero classification which are positive, as zeros typed in black, indicating a tendency toward a plus one classification and those which are negative, as zeros typed in red, indicating a tendency toward minus one classification.

Similar treatment of scores in Reading Vocabulary and scores in the Mental Maturity Language, yield -2, -1, 0, +1, +2 classification from the regression of Reading Vocabulary upon Mental Maturity Language.

The calculations are recorded in Appendix E, Table 2.

$$\text{Est. } A_V = \bar{A}_V + r \frac{\sigma_{A_V}}{\sigma_{M_L}} (M - \bar{M}_L)$$

$$\begin{aligned} \text{Est. } A_V &= 67.942 + .67 \frac{10.376}{14.06} (M_L - 107.462) \\ &= 69.942 + .49445 (M_L - 107.462) \end{aligned}$$

$$\begin{aligned} \sigma_{\text{Est. } A_V} &= \sigma_{A_V} \sqrt{1 - r^2} \\ &= 10.376 \sqrt{1 - (.67)^2} \\ &= 10.376 .742 \\ &= 7.966122 \\ &= 7.97 \end{aligned}$$

If  $A_V - \text{Est. } A_V > 15.94$ , classify as (+2)  
a high sufficiency is indicated.

If  $A_V - \text{Est. } A_V > 7.97$ , classify as (+1)  
a definite sufficiency is indicated.

If  $-7.97 < A_V - \text{Est. } A_V < 7.97$ , classify as (0)  
a proper balance between achievement and  
mental maturity is assumed.

If  $A_V - \text{Est. } A_V < -7.97$ , classify as (-1)  
a definite deficiency is indicated.

If  $A_V - \text{Est. } A_V < -15.94$ , classify as (-2)  
a strong deficiency is indicated.

Likewise, scores in Reading Vocabulary and  
scores in the Mental Maturity Language, yield +2, +1, 0,  
-1, -2 classification from the regression of Reading  
Comprehension upon Mental Maturity Language.

$$\begin{aligned}\text{Est. } A_C &= \bar{A}_C + r \frac{\sigma_{A_C}}{\sigma_{M_L}} (M_L - \bar{M}_L) \\ &= 43.532 + \frac{.74 \cdot 6.264}{14.06} (M_L - 107.462) \\ &= 43.532 + .33 (M_L - 107.46)\end{aligned}$$

$$\begin{aligned}\sigma_{\text{Est. } A_C} &= \sigma_{A_C} \sqrt{1 - r^2} \\ &= 6.264 \sqrt{1 - (.74)^2} \\ &= 6.264 \cdot .672 \\ &= 4.2094 \\ &= 4.21\end{aligned}$$

If  $A_C - \text{Est. } A_C > 8.42$ , classify as (+2)

a high sufficiency is indicated.

If  $A_C - \text{Est. } A_C > 4.21$ , classify as (+1)

a definite sufficiency is indicated.

If  $-4.21 < A_C - \text{Est. } A_C < 4.21$ , classify as (0)

a proper balance between achievement and  
mental maturity is assumed.

If  $A_C - \text{Est. } A_C < -4.21$ , classify as (-1)

a definite deficiency is indicated.

If  $A_C - \text{Est. } A_C < -8.42$ , classify as (-2)

a strong deficiency is indicated.

### Chapter III

#### RESULTS OR FINDINGS

##### Reliability of measures

California Test of Mental Maturity		S.E. <sub>M</sub> 1/
	r	S.D.
Total Mental factors-----	.949	.22
Language factors-----	.913	.29
Non-language factors-----	.931	.26
Test A. Memory-----	.920	.28
Test B. Spacial Rel.-----	.871	.35
Test C. Reasoning-----	.902	.31
Test D. Vocabulary-----	.886	.33

Progressive Achievement Tests Intermediate Battery		S.E. <sub>M</sub>
	r	S.D.
Reading Vocabulary-----	.915	.29
Reading Comprehension-----	.893	.32
Arithmetic Reasoning-----	.930	.26
Arithmetic Fundamentals-----	.952	.21
Language-----	.954	.23
Total-----	.974	.16

Baxter-Paterson summary of median ratio values.

Achievement Tests-----	.20
Scholastic Aptitudes Tests-----	.30
Reading Tests-----	.32

The reader may easily ascertain the reliability of the measurements from the tables above.

1/ S.E.<sub>M</sub>, standard error of measurement.

S.D., standard deviation of distribution.

r, reliability coefficient.

$$\frac{S.E._M}{S.D.} = \sqrt{1 - r} \quad (2)$$

When considering an individual's score on either the California Test of Mental Maturity or the Progressive Achievement Test, the likelihood that the person's true score is within 16 to 35 percent of the total distribution is indicated by the Baxter-Paterson ratio. From Bingham (3), the following quotation is pertinent.

The reliability of a measure is its self-consistency. In this technical meaning of the word, a highly reliable test is one which yields approximately the same score when given a second time or when alternative forms of the test are administered to the same persons. One of the best statistical indices for use in comparing the reliability of two tests is known as the standard error of estimate of a true score. Another good index is a measure of the amount of the variable error, called the standard error of measurement. The smaller the standard error of measurement, in comparison with the standard deviation of the distribution of the ability in question, the more reliable the measure.

Baxter and Paterson summarize "A New Ratio For Clinical Counselors" thus.

The  $\frac{S.E.M}{S.D.}$  values for an arbitrary classifi-

cation of tests show that the order of efficiency is as follows: achievement tests, scholastic aptitude tests, reading tests, special aptitude tests, and personality tests.

The significance of the new ratio for the clinical counselor is to be found that a ratio value of .10 means that a test score can locate an individual within the limits of ten percent of the total scale of measurement, whereas a ratio value of .55 means that a test score can locate the individual within a range that is greater than one half of the total scale. It may be said, therefore, that the ratio yields a needed index of efficiency of measurement in evaluating an individual's understanding in a variety of tests.



30

Means, standard deviations, and correlation coefficients

M. M. Total	$r = .69786$	P. A. Total
$\bar{x} = 103.8$		$\bar{x} = 297.68$
$\sigma = 12.195$		$\sigma = 39.1995$
M. M. Lang.	$r = .67$	P. A. Reading Vocabulary
$\bar{x} = 107.46$		$\bar{x} = 67.94$
$\sigma = 14.06$		$\sigma = 10.376$
M. M. Lang.	$r = .74$	P. A. Reading Comprehension
$\bar{x} = 107.46$		$\bar{x} = 43.53$
$\sigma = 14.06$		$\sigma = 6.264$
M. M. Lang.	$r = .60058$	P. A. Language
$\bar{x} = 107.46$		$\bar{x} = 84.207$
$\sigma = 14.06$		$\sigma = 15.632$
M. M. Non-lang.	$r = .422$	P. A. Arithmetic Reasoning
$\bar{x} = 96.675$		$\bar{x} = 39.78$
$\sigma = 13.708$		$\sigma = 7.747$
M. M. Non-lang.	$r = .249$	P. A. Arithmetic Fundamentals
$\bar{x} = 96.675$		$\bar{x} = 64.84$
$\sigma = 13.708$		$\sigma = 10.21$
Reading Comprehension	$r = .8204$	Language Achievement
Reading Vocabulary	$r = .4785$	Language Achievement
Reading Vocabulary	$r = .865$	Reading Comprehension

---

$\bar{x}$  = means  $\sigma$  = standard deviation  $r$  = correlation coeffic.

3  
4

Regression equations

Regression of P. A. 1/ total upon M. M. 2/ total.

$$\text{Est. } A - \bar{A} = r \frac{\sigma_A}{\sigma_M} (M - \bar{M})$$

Est. A. = estimated achievement (individual's score)

$\bar{A}$  = mean of achievement scores.

r = correlation coefficient between Mental Maturity total and Progressive Achievement total.

$\sigma_A$  = standard deviation of scores in P. A. total.

$\sigma_M$  = standard deviation of scores in M. M. total.

M = individual's score in M. M.

$\bar{M}$  = mean of scores in M. M.

Regression of Reading Vocabulary upon M. M., Lang.

$$\text{Est. } A_{R.V.} - \bar{A}_{R.V.} = r \frac{\sigma_{A_{R.V.}}}{\sigma_{M_L}} (M_L - \bar{M}_L)$$

$A_{R.V.}$  = achievement score in reading vocabulary.

$\bar{A}_{R.V.}$  = mean achievement in reading vocabulary.

$\sigma_{A_{R.V.}}$  = standard deviation of scores in P. A. reading vocabulary.

$\sigma_{M_L}$  = standard deviation of scores in M. M. Language

$M_L$  = individual's score in M. M. Lang.

$\bar{M}_L$  = mean scores in M. M. Lang.

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1/ P. A. in abbreviation will refer to Progressive Achievement.

2/ M. M. in abbreviation will refer to Mental Maturity.

# Regression of Reading Comprehension upon M. M., Lang.

$$\text{Est. } A_{R.C.} - \bar{A}_{R.C.} = r \frac{\sigma_{A_{R.C.}}}{\sigma_{M_L}} (M_L - \bar{M}_L)$$

$A_{R.C.}$  = achievement score in reading comprehension.

$\bar{A}_{R.C.}$  = mean achievement score in reading comprehension.

$\sigma_{A_{R.C.}}$  = standard deviation of mean in P. A. reading comprehension.

From the regression of total achievement upon total mental maturity, the discrepancy classification is tabulated.

## DISCREPANCY CLASSIFICATION OF INDIVIDUAL STUDENTS IN STANDARD ERROR UNITS ABOVE AND BELOW THE MEAN, BY SEX.

-3		-2		-1		0		1		2	
B	G	B	G	B	G	B	G	B	G	B	G
63	35	45	1	20	2	6	7	2	3	1	115
	57		21	23	4	14	8	4	32	3	
	55		27	33	5	16	9	5	34	7	
	64		29	54	6	18	11	8	44	9	
	91		57	57	10	24	13	12	50	10	
			58	84	12	25	18	15	56	11	
			60	92	14	27	20	17	72	13	
			79	93	15	31	22	19	76	28	
			81	99	16	36	23	21	85	29	
			86	100	17	37	24	22	89	35	
			87	106	19	42	25	26	92	38	
			90		30	43	26	30	94	40	
			95		36	44	28	32	105	41	
			98		38	46	31	34		56	
			100		39	51	33	39		59	
			106		41	63	40	47		87	
					42	64	45	48		88	
					43	70	47	49		92	
					46	74	48	50		96	

[illegible]

3  
7

NUMBER OF STUDENTS IN EACH CLASSIFICATION  
M. M. 7 P. A.

-3	-2	-1	-0	+0	+1	+2
B- 1	B- 5	B- 16	B- 37	B- 35	B- 13	B- 0
<u>G- 0</u>	<u>G- 1</u>	<u>G- 11</u>	<u>G- 24</u>	<u>G- 55</u>	<u>G- 23</u>	<u>G- 1</u>
1	6	27	61	90	36	1

PERCENT OF STUDENTS IN EACH CLASSIFICATION  
M. M. 7 P. A.

-3	-2	-1	-0	+0	+1	+2
B- .93	B- 4.7	B-14.95	B-34.57	B-32.71	B-12.14	B-0.0
<u>G-0.0</u>	<u>G- .87</u>	<u>G- 9.56</u>	<u>G-20.86</u>	<u>G-47.82</u>	<u>G-20.0</u>	<u>G-0.87</u>
.45	2.70	12.16	27.47	40.54	16.21	.45



Chapter IV  
DISCUSSION AND INTERPRETATION OF FINDINGS  
FOR THE INDIVIDUAL STUDENT

Perhaps one of the best ways to discuss the use of the discrepancy classification is to observe its meaning for an individual student picked at random from the group.

Considering case B 106, the information on the following page is available to the counselor from the results of this study.1/

In analysing the data for the tentative educational diagnosis and prognosis, among other things, one notes:

1. B 106 is approximately average (for this group of 222 ninth grade students) in academic ability, as measured by the California Test of Mental Maturity.2/
2. B 106 is below the average of his group in achievement as measured by the Progressive

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1/ Name, address, date of birth, birth place, father, mother, siblings, nationality, race, religion, socio-economic background, health, attendance, grade, and activity records are available in the school records.

2/ In order to check ability, the writer gave this student the Henmon-Nelson Test with the result, IQ 106.

## Achievement Test.

a. Reading Vocabulary as measured in P. A. Test is the least deficient.

b. Reading Comprehension as measured in the P. A. Test is the most deficient.

3. The percentile ranks in P. A. and M. M. showed 62.3 in ability as measured by the M. M. Test, and 14.3 in achievement as measured by the M. M. Test.

Scores on tests

Ability	Score	$\bar{x}$	$\sigma$
M. M., N. L.-----	299	96.67	13.7
M. M. L.-----	109	107.46	14.06
M. M.-----	107	103.8	12.2

Achievement	Score	$\bar{x}$	$\sigma$	Grade Placement	Norm (1937 Rev.)
P. A. Total-----	253	297.68	39.2	8.0	9.6
Reading Vocab.---	67	67.94	10.4	9.2	9.6
Reading Compre.--	25	43.53	6.26	6.3	9.6
Arith. Reas.-----	28	39.78	7.75	8.2	9.6
Arith. Fund.-----	57	64.84	10.21	8.0	9.6
Lang.-----	76	84.20	15.63	8.0	9.6

Percentile rank in group of 222 ninth grade students.

M. M., N. L.-----	57.2
M. M. L.-----	56.3
M. M.-----	62.3
P. A.-----	14.3
Reading Vocabulary-----	45.5
Reading Comprehension-----	1.4
Arithmetic Reasoning-----	9.1
Arithmetic Fundamentals-----	20.2
Language-----	25.6

### Classification of Discrepancy

M. M. and P. A. Total-----	-1
M. M. L. and Read. Vocab.-----	+0
M. M. L. and Read. Compre.-----	-0

The question arises as to how serious this evident under-achievement is in relation to the performance of the rest of the group. An experienced counselor could make the judgement subjectively; an inexperienced counselor needs a more objective measurement. The technique developed in this study shows statistically that B 106 has a discrepancy classification of -1. The significance of this classification is readily found in the easy-to-read number and percent tables.

### NUMBER OF STUDENTS IN EACH CLASSIFICATION

-3	-2	-1	-0	+0	+1	+2
B- 1	B- 5	B- 16	B- 37	B- 35	B- 13	B- 0
<u>G- 0</u>	<u>G- 1</u>	<u>G- 11</u>	<u>G- 24</u>	<u>G- 55</u>	<u>G- 23</u>	<u>G- 1</u>
1	6	27	61	90	36	1

### PERCENT OF STUDENTS IN EACH CLASSIFICATION

B- .93	B- 4.7	B-14.95	B-34.57	B-32.71	B-12.14	B-0.0
<u>G-0.0</u>	<u>G- .87</u>	<u>G- 9.56</u>	<u>G-20.86</u>	<u>G-47.82</u>	<u>G-20.0</u>	<u>G-0.87</u>
.45	2.70	12.16	27.47	40.54	16.21	.45

1. Only 15 other boys in his group, or 15% of the boys are as definitely under-achieving as B 106 is, (measured by M. M. and P. A.).
2. Only 12% of the whole group under-achieves an approximately equal amount.
3. Only 6 more boys, or 5.6% of the boys and 3.2% of the whole group are greater than B 106 in under-achievement, as measured by the tests used in this study.
4. The A - Est. A score, - 51.85, indicates that B 106 closely approaches -26 3/ from the mean discrepancy where he is even more unfavorably in the minority.
5. Eighty-five other boys in the group, or 79.4% of the boys have proportionately greater scores in achievement in relation to their measured ability than does B 106.
6. One hundred eighty-eight other students, or 84.7% of the group have proportionately greater scores in achievement in relation to their measured ability than does B 106.

These percentages are indicative of strong deficiency and would obligate personnel workers to find possible reasons for the academic behavior of B106. From

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$$\underline{3/} \quad 2 \quad 6 \text{ Est. A} = 56.02$$



other school records he would find, among other things,  
as did the writer:

1. Address - \$10,000 home, excellent location.  
(Family moved to Fort Collins, January 1941.)
2. Chronological age - 14-2, March 18, 1941  
(date of tests).
3. Birthplace - City of 300,000 population.
4. Father - head of line operating department,  
electric company.
5. Mother - Camp Fire leader for past 20 years.
6. Sister - age 11, grade five in public school.
7. Physical characteristics - height and weight  
above average.
8. Health - seemingly normal, although boy is  
growing very fast.
9. School records show C- and D averages for  
first eight grades.
10. Entered ninth grade at beginning of second  
semester. (All other students had completed  
one semester of ninth grade at the time the  
tests were given.)
11. Scholastic record, January to June, 1941,  
shows strong B to C average in Fort Collins  
Junior High School.
12. Activity record shows keen interest in all  
sports.
13. A tutor is giving private instruction to B 106  
in mathematics and social science to make up  
first semester ninth grade, so that B 106 may  
enter tenth grade in September, 1941.

Obviously, these few items are not sufficient to  
provide a complete case study. They are mentioned only  
to show the usual kinds and amounts of information



4  
6  
available.

The classification of amounts of discrepancy between measured ability and measured achievement is a technique useful in the first division of labor mentioned in Williamson and Darley, Student Personnel Work (26).

The first division of labor in the field of student personnel involves the development of analytic techniques that will yield valid means of comparing, differentiating, and selecting students in terms of their ability to profit from instruction.

#### FOR THE GROUP OF 222 STUDENTS

One responsibility of modern personnel workers is classifying and distributing students to classes according to their needs and abilities. At the Fort Collins Senior High School, the personnel workers 4/ have concluded that one way of meeting the needs of tenth grade students entering in September 1941, will be to have the maximum possible homogeneity of students within each of the eight English classes. The writer of this thesis arranged octile ratings in ability and achievement (measured by the California Mental Maturity and the Progressive Achievement tests), as well as the classification of discrepancy to assist in the decisions on class membership. This information is recorded on columnar

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4/ I. K. Bolts, principal, Philip Rule, vice principal, and Vera Hickman, girls' adviser.

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7 pads and the philosophy is that the discrepancy classifications are like vertical shafts each driven through all horizontal levels of ability that are like geological strata; the class personnel is then determined at approximately similar levels of ability.

In practice, the procedure is as follows:

1. Each schedule card is given an index number equivalent to the discrepancy classification of the student.
2. All schedule cards are then divided into levels of ability, each level including a range of about ten points in Mental Maturity.
3. Class memberships are then named wherever a sufficient number of students, properly balanced as to boys and girls, have a very similar level of ability as measured by the California Mental Maturity and the same index of discrepancy between ability and achievement as determined by the techniques of this thesis. (This procedure, it seems to the writer, is decidedly different from the usual one of deciding on classes, high, average, or low, and then putting individual students into them, either on the basis of ability or achievement.)
4. Each English teacher of the eight classes is to receive the discrepancy classification in

4  
8 reading vocabulary and reading comprehension for her students as well as the achievement scores of the total and several parts of the Progressive Achievement Test. All other data are in individual folders and filed in the office.

5. An interpretation of the meaning and use of the discrepancy classification is being prepared for the faculty.

6. When individuals have schedule conflicts, or when there are insufficient numbers of them who are characteristically similar in ability and discrepancy classification, they are placed in the next nearest class in classification and level of ability.

7. When an individual's classification is not the same as that of the majority in his class, a special note is made giving the reason for placement.

8. There are no cases of students of nearly equal ability being in the same class if there are as much as two standard deviations in their amount of discrepancy between ability and achievement.

Even though there is no control group for 1941-42, a follow-up study comparing grades and anecdotal records of individual students with similar records of

the 1940 tenth grade class would be interesting. As early as possible after the fall enrollment, at least one other reliable test of academic ability and a reliable and valid achievement battery should be administered to this group of 222 students; wherever there is greater than average disagreement in these scores with those recorded in this study, a more thorough study should be made of that student. Aptitude tests and interest tests and, perhaps, a personality test are supplementary data to be assembled for some of these students, if not for all. Records of health, visual acuity, and hearing are essential and particularly for those students with -2, -1, +1, and +2 discrepancy classification. These few implications are made to show that the technique of this study is only a very small part of the general function of counseling.

## Chapter V

### SUMMARY

#### Statement of problem

Is there a more accurate technique for measuring and evaluating discrepancy between achievement predicted from standardized academic ability tests and achievement measured by standardized achievement tests than by observing the difference in percentile rank on the tests and deciding on the seriousness of the discrepancy by subjective judgment?

#### Assumptions

The writer makes the following assumptions:

1. That ability and achievement are pupil characteristics sufficiently independent that they may be treated separately.
2. That the testing conditions were uniform, the scoring and recording of scores, accurate.
3. That the reliability and validity of each test meet the usual standards (Appendix A).
4. That a technique which increases the accuracy of measurement of discrepancy between achievement predicted by academic ability tests and achievement measured by achievement tests is desirable.

#### Procedures and findings

The scores made by 222 ninth grade Fort Collins Junior High School students, on the California Test of



Mental Maturity and on the Progressive Achievement Intermediate Battery furnished the raw data for this study. These tests were administered March 18 to 30, 1941, to all of the ninth grade (222). The number of frequencies and the number of tests administered are inadequate for making general conclusions, but this inadequacy does not affect the method of measuring discrepancy. In treating the scores from more than one test of ability and from more than one test of achievement, a multiple regression equation relating ability and achievement would be used. The procedure from there would be the same as in this study.

1. The reliability of scores for each test and each part of each test, as quoted in the manuals, was used to compute the Baxter-Paterson ratio for reliability.

2. All test scores were tabulated on columnar sheets with boys' and girls' scores in separate groups, listed alphabetically, and numbered consecutively for ease of identification.

3. The mean and the standard deviation were computed for each of the parts and for the total score on each test.

4. The correlation coefficients were computed for:

Total M. M. and Total P. A. <u>1</u> /	-----	r	.70
M. M., Lang. and P. A. Reading Vocab. <u>2</u> /	-----		.67
M. M., Lang. and P. A. Reading Compre. <u>3</u> /	-----		.74
M. M., N. L. and P. A. Arithmetic Reas. <u>4</u> /	-----		.42
M. M., N. L. and P. A. Arithmetic Fund. <u>5</u> /	-----		.25
M. M., Lang. and P. A. Language-----			.60

5. From the correlation between scores expressing measures of ability and scores representing measures of achievement, regression equations were written which give amounts of discrepancy between the two variables, achievement estimated from ability and achievement measured by a standardized test of achievement.

6. From these regression equations the estimated achievement scores for each student were computed.

7. For each student, these estimated scores of achievement were compared with the measured scores of achievement and the discrepancy noted separately for total achievement, reading vocabulary, and reading comprehension.

8. These amounts of discrepancy were treated as quantitative measures, recorded, and distributed as three separate sample populations:

- a. Discrepancy scores, total achievement
- b. Discrepancy scores, reading vocabulary
- c. Discrepancy scores, reading comprehension

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1/ M. M., Mental Maturity; P. A., Progressive Achievement.

2/ M. M. Lang., Mental Maturity Language.

3/ P. A. Reading Compre., Progressive Achievement Reading Comprehension.

4/ M. M., N. L., Mental Maturity Non-Language; Arith. Reas., Arithmetic Reasoning.

5/ Arith. Fund., Arithmetic Fundamentals.

9. The frame of reference for classification of discrepancy is the standard deviation of discrepancy in each population.

$$\sigma_{\text{Est. A}} = \sigma_A \sqrt{1 - r^2} = 28.01$$

$$\sigma_{\text{Est. A}_V} = \sigma_{A_V} \sqrt{1 - r^2} = 7.97$$

$$\sigma_{\text{Est. A}_C} = \sigma_{A_C} \sqrt{1 - r^2} = 4.21$$

$\sigma$  = standard deviation

Est. A = estimated total achievement

r = correlation

V = reading vocabulary

C = reading comprehension

10. The classification (or discrepancy index) numbers were arbitrarily chosen to be -2, -1, 0, +1, +2, corresponding to the standard deviation units below and above the mean. The algebraic statement of each amount of discrepancy between measured achievement and estimated achievement follows, with classification and interpretation.

If  $A - \text{Est. A} > 2\sigma_{\text{Est. A}}$ , arbitrarily classify as (+2)  
a high sufficiency of achievement is indicated.

If  $A - \text{Est. A} > \sigma_{\text{Est. A}}$ , arbitrarily classify as (+1)  
a definite sufficiency of achievement is indicated.

If  $-\sigma_{\text{Est. A}} < A - \text{Est. A} < \sigma_{\text{Est. A}}$ , classify as (0)  
a proper balance between achievement and mental maturity is assumed.

If  $A - \text{Est. } A < - 6 \text{ Est. } A$ , arbitrarily classify as (-1)  
a definite deficiency in achievement is  
indicated.

If  $A - \text{Est. } A < - 26 \text{ Est. } A$ , arbitrarily classify as (-2)  
a strong deficiency in achievement is  
indicated.

11. The discrepancy index for each student was  
computed and recorded.

NUMBER OF STUDENTS IN EACH CLASSIFICATION  
M. M. , P. A.

-3	-2	-1	-0	+0	+1	+2
B- 1	B- 5	B- 16	B- 37	B- 35	B- 13	B- 0
G- 0	G- 1	G- 11	G- 24--	G- 55	G- 23	G- 1
Total						
1	6	27	61	90	36	1

PERCENT OF STUDENTS IN EACH CLASSIFICATION  
M. M. , P. A.

-3	-2	-1	-0	+0	+1	+2
B- .93	B- 4.7	B-14.95	B-34.57	B-32.71	B-12.14	B-0.0
G-0.0	G- .87	G- 9.56	G-20.86	G-47.82	G-20.0	G- .87
Total						
.45	2.70	12.16	27.47	40.54	16.21	.45

Interpretation of findings

For the individual student.--The percentile  
ranks show under- or over-achievement but do not indicate  
degree of seriousness of the under- or over-achievement.



A discrepancy index number indicates objectively how much the individual deviates from the mean discrepancy. Tables for the group show what percent of students are above, below, or in the same classification of discrepancy.

For the group of students.--The task of classifying and distributing students to classes in which homogeneity is desirable with respect to levels of ability, and with respect to amounts of discrepancy between estimated achievement and measured achievement, is simplified and made an objective procedure by using the technique suggested in this study. If one considers performance on tests of ability as levels, or strata, or horizontal bands one above another, the classifications of discrepancy between ability and achievement (-2, -1, 0, +1, +2) are like vertical shafts crossing all levels of ability perpendicularly so as to form a cross section or area of homogeneity at each level of ability. Each cross section can then be the basis of class membership which is kept flexible.

Precautions.--Among other precautions, is the one that homogeneity with regard to ability, and discrepancy between ability and achievement, by no means implies homogeneity with regard to other individual characteristics. This technique is not an automatic device that miraculously individualizes mass instruction.



### Summary of findings

Observation of a difference in the percentile rank of a pupil on a test of ability and a test of achievement is a poor judgement-making device because the accuracy varies with the training, skill, and experience of the counselor making the judgement; it is subject to a wide margin of error because it is a subjective technique of measurement. Classification by means of the discrepancy-index is an objective technique of measurement.

1. The technique developed in this study is another clinical procedure that will enable a personnel administrator or high school principal to make a more objective judgement of:

a. amount of discrepancy between an individual student's expected and measured achievement.

b. areas of seriousness of discrepancy.

c. classification of students in a group where the characteristic discrepancy as well as the ability is similar.

2. Homogeneity with regard to discrepancy between ability and achievement as well as homogeneity with regard to percentile rank in ability and achievement, is made possible by employing this technique in classifying students for instruction.

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8  
3. If reliable and valid ability and achievement test data are available, this technique can locate, before classroom instruction begins, the students whose past performance would indicate a problem in the area of educational adjustment. This is a definite aid to teachers and students.

4. This technique locates discrepancy between ability and achievement for students of all levels of ability and exposes the fallacy that normal ability students do not have problems in education.

5. This technique applied to objective data on students entering high school can increase the effectiveness of student personnel work.

The limitations of the discrepancy -index must be recognized. For an individual, the measurement of discrepancy between ability and achievement is only one characteristic of his behavior. For the group, even though levels of ability and achievement and the discrepancy between them are relatively constant within a classification, there are many other inter- and intra-individual differences. Among students of the same level of ability, and within the same discrepancy-classification, the widest range of heterogeneity may exist with regard to interests, aptitudes, personality development, socioeconomic background, and opportunity.

A P P E N D I X    A

BUROS' MENTAL MEASUREMENTS  
YEARBOOK

Criticisms of

CALIFORNIA TEST OF MENTAL MATURITY

and

PROGRESSIVE ACHIEVEMENT TESTS

## CALIFORNIA TEST OF MENTAL MATURITY

Grades Kgn.-1, 1-3, 4-8, 7-10, 9-adults; 1936-39; 1 form, 3 editions; \$1.25 per 25 copies of the regular edition; 75¢ per 25 copies of the short-form edition; 25¢ per specimen set of any one edition at any one level; 2¢ per machine-scorable answer sheet; (90) minutes for the regular edition; (45) minutes for the short-form editions; Elizabeth T. Sullivan, Willis W. Clark, and Ernest W. Tiegs; Los Angeles, Calif.: California Test Bureau.

a) PRE-PRIMARY BATTERY. Grades Kgn.-1; Regular Edition; Pre-Primary S-Form.

b) PRIMARY BATTERY. Grades 1-3; Regular Edition; Primary S-Form.

c) ELEMENTARY BATTERY. Grades 4-8; Regular Edition; Elementary S-Form; Elementary S-Form: Machine Scoring Edition.

d) INTERMEDIATE BATTERY. Grades 7-10; Regular Edition; Intermediate S-Form; Intermediate S-Form: Machine Scoring Edition.

e) ADVANCED BATTERY. Grades 9-adults; Regular Edition; Advanced S-Form; Advanced S-Form: Machine Scoring Edition.

### References

- 1 Tiegs, Ernest W. "Breaking Down the I.Q." Prog Ed 13:603-5 D '36.
- 2 Maxfield, Francis N. "California Test of Mental Maturity." Ed Res B 16:188-9 + O '37.
- 3 Traxler, Arthur E. "A Study of the California Test of Mental Maturity," pp. 49-60. In 1937 Fall Testing Program in Independent Schools: Including a Study of the California Test of Mental Maturity. Educational Records Bulletin No. 22. New York: Educational Records Bureau, January 1938. Pp. x, 60. \$1.50. Paper, lithotyped.
- 4 Traxler, Arthur E. "Some Correlation Data for the California Test of Mental Maturity," pp. 63-9. In 1938 Fall Testing Program in Independent Schools and Supplementary Studies. Educational Records Bulletin No. 26. New York: Educational Records Bureau, January 1939. Pp. x, 69. \$1.00. Paper, lithotyped.
- 5 Traxler, Arthur E. "Study of the California Test of Mental Maturity, Advanced Battery." J Ed Res 32:329-35 Ja '39.

Raymond B. Cattell, G. Stanley Hall Professor of Genetic Psychology, Clark University. This test has a

regular and a short form and is available in hand-scored or machine-scored printings. However, since the same principles of construction are well observed throughout, it is possible to consider the merits of the test as a whole.

A plan of which most psychologists will approve is the breaking-up of the range of mental improvement into several ranges, each of two or three years' span. In this way the measurement is made finer by more items and the type of test is better adapted to the child's mental age. On the other hand, the tester needs to know beforehand, by some preliminary omnibus test, in what range of mental age any given child is likely to fall.

These tests are exceedingly well designed from the point of view of adaptation to school needs and the convenience of the teacher. All the data regarding consistencies, standardization, correlation with school progress, etc., that one could reasonably demand, are clearly presented in the handbook of instructions. In only one case is there some danger of misunderstanding, and then only by the test user not familiar with the statistical and psychological notions of the professional psychologist. This occurs in the table on "IQ's and Related Data as Shown by School Surveys" in which one finds opposite IQ 114, 99th percentile; and opposite IQ 85, 5th percentile. Many teachers will probably need to be emphatically warned that this is not the percentile distribution of individual IQ's, but of group medians (and how big are these groups?). In the same table, years of retardation in reading are set against IQ levels. That this relation depends on the absolute age of the pupil is not conspicuously suggested by the table.

An admirable feature of this test is the courageous manner in which the authors come out into the open regarding the purpose, principles, and theory of test design. They point to factor analysis as their foundation, but reject the two-factor theory of a general intellectual power  $g$  in favor of a multiple-factor supposition. They are, of course, quite entitled to do this, since either of these theories fits the correlations, but it seems a little wayward deliberately to adopt the more complex rather than the more simple explanation, with special cause for doing so.

A possible reason for this behavior becomes evident when we come to the application of results. People having little acquaintance with intelligence test research, as is well known, like to pass beyond the mere IQ, possibly because they feel that a single index is a small return for so much labor of testing. They wish to



elaborate their analysis of the child and will generalize, from particular test items, or even from the child's manner of answering or his handwriting, in a far-reaching way about temperament or special abilities. Every psychologist is familiar with the tendency in teachers or parents, but not all are willing to cater to it.

The authors evidently feel that this desire to find out more than about intelligence from an intelligence test alone is to be encouraged, for they write, "dealing only with mental ages and intelligence quotients obscures and ignores the separate important factors." They add, rightly, that independent special factors have been found in verbal and arithmetical fields and (incorrectly) in spatial performance but then proceed to speak as if the separate subtests in their test measure these factors and are independent. They offer a profile which "analyzes and summarizes the various factors which are measured by the test situations," and claim that this "reduces the 'mystery' which has surrounded the meaning of mental age and intelligence quotient." This attempt to produce for special consumption a "psychology without mystery" ends by appearing to the psychologist to be "mystery without psychology." No proof is offered that these subtests do, in fact, test independent factors or that one is justified in generalizing from them to performances in everyday life which happen to have the same verbal label.

A useful application of ingenuity in these tests is the introduction of tests of visual acuity and hearing at the beginning of the test. Most psychologists have known "mental defectives" who turn out only to be somewhat deaf.

Ingenuity is less happy in the use of terms; indeed, originality here seems to have become perverse. Why, for example, "Foresight in Spatial Situations," or why call the familiar and correctly described "Classifications" test a "Similarities" test? Why bring confusion and mystery into a very good intelligence test by departing from custom so far as to call it a "Mental Maturity" test? The term "maturity" in personality measurement has become increasingly associated with the notion of emotional maturity. Intelligence is not "maturity," otherwise we should count a child's teeth in assessing it, and it would continue in growth far beyond adolescence. It is to be hoped, both in the interests of their test and of avoiding disruption of clear discussion in psychology, that the authors will indicate by a better label that their test belongs to the category of intelligence tests.

F. Kuhlmann, Director of the Division of Examinations and Classification, State Department of Public Institutions, St. Paul, Minnesota. These tests include five batteries to cover the range from kindergarten to grade 14, inclusive. There is a long and short form, the long form requiring two sessions of about forty-five minutes each to give. In each battery there is a test on visual acuity, auditory acuity, and motor co-ordination. Following this the tests are grouped as tests of Memory, Spatial Relationships, Reasoning, and Vocabulary. The tests in these four groups are also classed as "Language Factors" tests, and "Nonlanguage Factor" tests. Age norms are given for each of these and for the total number of right responses on the whole battery, making it possible to compute seven sets of mental ages and corresponding IQ's. Profile scoring is provided for and recommended.

The outstanding features of these batteries are: first, the inclusion of tests on vision, hearing, and motor co-ordination, which, if defective, would invalidate the results on the other tests; second, the wealth of material included in each battery; third, the underlying theory on which the selection of the tests and construction of the batteries are based.

We do not believe there is much merit in labeling tests as regards functions measured, as the authors have done; first, because it cannot be done correctly by inspection; and second, because these labels are not of much value until we know also how these functions enter into school achievement in different school subjects. Also, when a battery is divided into several different measures the tests assigned to measure any particular function tend to become inadequate in number and range to do so reliably. It would be hazardous, indeed, to conclude from the score on two brief tests that a child has a poor memory, for example. It seems to be implied also that the child mind is simply the adult mind in miniature, so that tests should measure the same function at all ages. We believe the empirical and more usual procedure is better. This starts out experimentally to find tests of maximum discriminative capacity at each age, and regards the question of what functions are measured at any age by such tests as of minor importance. The author's distinction between language factor and nonlanguage factor tests is also somewhat misleading. Language enters both, the real distinction being that in the former the child has to read test material, while in the latter he is told what to do with picture material and, with a few exceptions, no reading is involved.

The authors have probably built much better than they planned. The different tests in each battery

probably measure a much greater variety of functions than they are intended to measure. They should have given more evidence that the tests are arranged in order of difficulty in each battery and that they are more or less equally spaced on the basis of difficulty. The increase in total raw score with increase in age does this only rather roughly. Outside of this, we believe the unabbreviated batteries are to be classed among the very best on the market for determining general levels of mental maturity. It is gratifying to see authors with the courage to offer tests that take more than a single class period to give and who do not attempt to get the maximum economy in time and dollars, by sacrificing everything necessary to attain this end.

Chicago Sch J 21:304 My-Je '40. D(avid) K(opel).  
[Review of the Short Form.] Each test contains six subtests, of which three are designated as "non-language" and three as "language." It is claimed, quite reasonably, that this feature is particularly valuable in cases where reading or language difficulties may invalidate the results obtained from use of the ordinary group verbal test of intelligence. An unusual feature is the inclusion of a pre-test of visual acuity. Since many items in each test consist of pictures and other symbols containing fine details, it is thought necessary to identify individuals suffering from gross visual defect for whom the test is therefore inappropriate.



## PROGRESSIVE ACHIEVEMENT TESTS

Grades 1-3, 4-6, 7-9, 9-13; 1933-38; 4 levels; the tests in reading, arithmetic, mathematics, and language are available as separates; 25¢ per specimen set of any one level; Ernest W. Tiegs and Willis W. Clark; Los Angeles, Calif.: California Test Bureau.

a) PRIMARY BATTERY. Grades 1-3; 1933-38; 3 forms; \$1 per 25; 100(115) minutes.

b) ELEMENTARY BATTERY. Grades 4-6; 1933-37; 3 forms; \$1.25 per 25 120(135) minutes.

c) INTERMEDIATE BATTERY. Grades 7-9; 1933-37; 3 forms; \$1.25 per 25; 150(165) minutes.

d) ADVANCED BATTERY. Grades 9-13; 1934; 2 forms; \$1.50 per 25; 150(165) minutes.

### References

1 Paterson, Donald G.; Schneider, Gwendolen G.; and Williamson, Edmund G. Student Guidance Technique, pp. 111-3. New York: McGraw-Hill Book Co., Inc., 1938. Pp. xviii, 316. \$3.00. (London: McGraw-Hill Publishing Co., Ltd. 18s.)

C. W. Odell, Associate Professor of Education, The University of Illinois. Although these tests are entitled to rank among the best of their type now on the market, they scarcely fulfill all the claims made for them. They do, as stated, cover many of the important elements in a modern curriculum, but inasmuch as the number of elements devoted to each phase of content is often quite small, even reaching only one, they can hardly deserve the term "diagnostic" so fully as the publisher's statements appear to imply. Perhaps "analytic" would more appropriately designate them. Moreover the directions for administering them are such that power, to the virtual exclusion of speed, is measured. It may be defended as more significant, but scarcely as all important.

The information as to selection of content and general validity is so brief and noninformative as to be practically valueless. Coefficients of reliability are given, but neither more meaningful measures such as errors of measurement and their ratios to means and standard deviations nor the data from which they may be calculated are supplied. The norms were rather indirectly determined, but except for those at the secondary school level are probably as satisfactory as those for most standard tests. Those for the advanced test are based on only fifteen

hundred cases from seven high schools.

Although this series is better than several others which the reviewer has examined recently in the quality of English employed, it is not free from some slips therein. Such expressions as "Revision of Norms have," "above story," and the incorrect placement of interrogatives (this quite frequently) are to be found.

In a large portion of the test for primary grades the designated placement of answers is such as to be unnecessarily difficult to score. Presumably this has been allowed in the interest of rendering pupil responses easier and less confusing, but it has been amply demonstrated that the additional difficulty introduced by placement in more convenient scoring form is so slight as to bother very few children. The same test likewise has much waste space. The chart for the pupil profile on the first page has the lines poorly placed, so that they do not correspond with the names of the sections to which they apply. The correct answers are upon such light stock that it will hardly survive, at least in easily usable form, very much use. In some multiple-answer sections of the tests there is, within a single section, variation in the number of suggested answers, a feature which does not represent the best practice. Elsewhere pupils are directed to underline correct answers as well as copy their numbers or letters in the proper blanks, a practice not necessary above the lower grades and probably not even there. In the vocabulary section, where words are grouped according to their subject-matter fields, it is difficult to see why certain words are classed as they are rather than otherwise. For example, "cause" and "convict" are listed under literature, whereas they appear to belong at least as much under social science.

Despite the various points criticized, the reviewer believes that these tests have real value and rank high in the assistance which they offer teachers in diagnosing the achievements of their pupils, both in the amount thereof and in the ease with which they make it available.

Hugh B. Wood, Professor of Education, University of Oregon. The Progressive Achievement Tests are designed to measure comprehension and ability in the basic skills, and comprise five tests: reading vocabulary, reading comprehension, mathematical reasoning, mathematic fundamentals, and language, each with appropriate subtests. In addition to general survey results, the tests provide diagnostic scores for individual pupils, classes, and subjects.



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Major advantage of tests over most achievement batteries is high validity and fidelity to objectives of progressive education. The manual is vague on validity beyond reference to "progressive courses of study" but examination and comparison of items with observed progressive practice support commendation on validity. Experimental forms and norms were developed for the most part in progressive schools.

A second advantage of tests is their diagnostic value. Profile chart and diagnostic analysis sheet attached to each test permit general diagnosis for all pupils and specific diagnosis for those needing it. Many teachers will object to the amount of time required for complete diagnosis (including scoring, about 30 minutes), but this is no longer than usually required. The diagnostic value of tests is limited, however, by inadequate sampling in many of the subtests (as few as 5 items in some), but this represents a shortage rather difficult to overcome in a battery test. Sub-tests include: reading vocabulary in mathematics, science, social science, and literature; reading comprehension in following directions, organization, and interpretations; mathematical reasoning in number concepts, symbols and rules, numbers and equations, and problems; mathematic fundamentals in addition, subtraction, multiplication, and division; and language capitalization, punctuation, complete sentences, grammar, spelling, and handwriting.

Reliability, based on odds-even and two-form techniques, runs from .84 to .98. Revised norms, comparable from grade to grade and subject to subject, are based on one hundred thousand cases.

Major weaknesses of tests lie in the limited sampling and in the exceptional difficulty of the primary battery which many teachers report leads to discouragement on part of pupils. First and second grades should probably have separate booklets. Other weaknesses include: lack of objectivity of scoring handwriting leading to questionable validity and influencing language score too much; scoring directions not entirely clear on some parts and all possible answers not always given; punctuation test difficult to score; text of tests continue into answer columns, making scoring more difficult; paper on which key is printed not sufficiently durable.

The manual of directions and class record sheet provide adequately for administration and interpretation.

Because they avoid the difficulties encountered in battery testing in the content areas, the Progressive Achievement Tests are the best battery tests available.

## PROGRESSIVE LANGUAGE TESTS

Harry A. Greene, Director of the Bureau of Educational Research and Service and Professor of Education, The State University of Iowa. These tests are identical in content with the language sections of the battery Progressive Achievement Tests. Capitalization, punctuation, usage and sentence sense, spelling, and handwriting are measured at different levels of difficulty in the three tests comprising the series. The test content itself is compressed on the two inside pages of a four page folder for the elementary and intermediate tests. The advanced test requires three pages. A diagnostic profile chart and an analysis of learning difficulties represented by the items in the test occupy the first page of the folder. It is apparent that the analysis of skills is more valuable as a teaching aid than the profile chart due to the obviously inadequate sampling provided in each of the parts of the test. The spelling tests and the grammar test (in the advanced examination) are the only subtests composed of as many as thirty items.

The tests are described by the authors as "diagnostic tests keyed to the curriculum." The entire series of tests comprising the Progressive achievement battery is not extensive enough to function as a reliable diagnostic instrument, so it is apparent that the brevity of these language tests and the inadequate sampling of language skills they afford could not furnish a reliable diagnostic measure in written expression. While it is true that the capitalization and punctuation skills sampled may be those of high social significance, it is doubtful if ten or fifteen reactions in these fields constitute a sufficiently reliable sampling to provide meaningful results.

The evidence presented on the validity of the tests is not particularly conclusive. The use of the term diagnostic in connection with any brief four-page (or even longer) test is optimistic. The complexity of language expression is so great that brief cross-sections of isolated areas of skill can scarcely be taken as diagnostic evidence. The sampling of items covered in these tests would indicate a very narrow and limited curriculum.

The reliability of coefficients reported for the elementary or intermediate tests are adequate, but they are based upon talent ranging over two or three school grades. Thus, a reliability coefficient of .92 for the

elementary examination based on a three-grade range is not too convincing. Furthermore, the reliabilities reported are based on odd-even correlations stepped up by formula rather than the inter-correlation of the two forms of the test. No data of the extent of the population involved in the reliability computations are given.

Convincing norms based upon more than one hundred thousand cases are provided for both the elementary and intermediate tests. Grade and percentile norms based upon fifteen hundred cases are given for the advanced tests. Grades and percentile norms, taking into account differences in mental level, accompany the elementary and the intermediate tests.

Machine-scored editions of the intermediate and the advanced tests are available. The importance of this procedure in the case of such brief tests is not apparent. Furthermore, the numerous changes in the administration of the tests, and the somewhat unusual procedures in recording the answers on the separate answer sheets introduce factors which should necessitate separate norms for the machine-scored and the hand-scored tests.

J. Paul Leonard, Associate Professor of Education, Stanford University. All three batteries of the Progressive Language Tests are designed to diagnose for individual pupils their language proficiency. The items which the tests measure are the "skills and abilities which are included in the objectives of education" and are "based upon the results of scientific studies," selected from skills "which represent the essential elements of the basic skills now being taught . . . in recent courses of study." Just what courses or objectives or studies were used is not told the reader.

The test makers claim further that the tests will produce "a diagnostic profile which reveals graphically the pupil's actual achievement in relation to normal achievement for his particular grade placement" and reveal "which pupils are achieving satisfactorily," thus enabling the teacher to determine "the particular type of remedial work necessary for those who are experiencing one or more of the different types of learning difficulty." In these claims the makers place themselves in a position of criticism by modern students of language growth who believe the determination of general minimum language essentials to be a myth and the determination of satisfactory language growth by resort to norms based upon average achievement to be a fallacious method of diagnosis.



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All three batteries of the test deal with capitalization, punctuation, words and sentences, spelling and handwriting. The authors claim that "while the basic elements of these skills are the same on all levels, the increasing difficulty and complexity of the materials of instruction require a corresponding increase in tool mastery." They claim, therefore, to have increased the difficulty of these items in the three batteries and "selected test situations which reveal the extent to which tool mastery is adequate to the demands put upon it." If any language test could do these things adequately, curriculum workers would flock to it. The intermediate battery adds a section on parts of speech, while the advanced battery adds a section on grammar, to the basic four sections in all three batteries. Norms for the elementary and intermediate batteries are based upon 100,000 cases and for the advanced battery upon 1500 cases.

These tests offer a meagre survey of a few language uses and in the manual tend to over-emphasize by far the validity and diagnostic value of the tests. The number of items to cover the different usages are entirely too small. For instance, in the elementary battery 33 sentences are used to cover 17 different groups of language usage (counting such things as tense, good usage, case, and commas as one group); the intermediate battery used 36 sentences to cover 26 different groups and the advanced battery 80 sentences to cover 28 different groups. The advanced battery is the only one having enough items to warrant any reasonable claim to having diagnostic values. The tests may be fairly useful for general survey purposes but seem to be of very little value for individual diagnostic purposes. They are not nearly so diagnostic as the Gregory Diagnostic Tests in Language in the items covered by both tests.

## PROGRESSIVE ARITHMETIC TESTS

Grades, 2-3, 4-6, 7-9; 1933-39; 2 forms, 3 levels; 75¢ per 25; 2¢ per machine-scorable answer sheet; 15¢ per specimen set of any one battery; Ernest W. Tiege and Willis W. Clark; Los Angeles, Calif.: California Test Bureau.

- (a) PRIMARY BATTERY. Grades 2-3; 1933-37; 50(60) minutes.
- (b) ELEMENTARY BATTERY. Grades 4-6; 1933-37; 60(70) minutes; Machine Scoring Edition: 1933-39.
- (c) INTERMEDIATE BATTERY. Grades 7-9; 1933-37; 75(85) minutes; Machine Scoring Edition: 1933-39.

C. L. Thiele, Director of Exact Sciences, Public Schools, Detroit, Michigan. The Progressive Achievement Tests, of which the Progressive Arithmetic Tests are a part, are divided into three batteries, Primary, Elementary, and Intermediate, and aim to test the essential abilities which constitute the elementary school subjects. In the field of arithmetic, reasoning ability and skill in the fundamental processes are tested. There are two equivalent forms for each battery.

A complete manual accompanies the tests. It contains statements of purpose, data pertaining to the reliability, the validity, and to the norms and standards of the tests. The manual also provides time allotments and suggestions for administering, scoring, and interpreting the test results. Interpretation is facilitated by class data sheets and individual pupil profiles printed on each test form. When the forms have been properly filled out they reveal such things as chronological grade placement, educational quotient, and intelligence grade placement. From these figures, grade acceleration and retardation may be computed. This somewhat full description is offered to indicate the completeness of the test plan from the point of view of test construction.

It is significant to note that the authors suggest that the tests may be used both as group and as individual measures of arithmetical ability. Used as group tests, they are intended to reveal whether or not schools are keeping abreast of the times because it is claimed that the types of abilities measured--"are indicated as desirable educational objectives in recent courses of study and are in accordance with progressive educational practice."



Used as individual measures, the tests indicate not only grade, age, and intelligence placement in general arithmetical ability but also the particular skills in which a given pupil may need strengthening. In the words of the authors, "The test is intended to be primarily of immediate practical value to the teacher in revealing which pupils are achieving satisfactorily, and for determining the particular type of remedial work necessary for those who are experiencing one or more types of learning difficulty." The latter is facilitated by analyses of the larger skills into constituent elements of difficulty.

Whether or not the arithmetic tests will serve the school administrator, supervisor, or teacher, as claimed by the authors, is the question facing the reviewer. More specifically the reviewer may ask: Is the prospective user of the Progressive Arithmetic Tests, after reading the manuals and other advertising material, justified in concluding that these tests will give reliable information about such matters as: (a) the standing of the arithmetic program; (b) grade, chronological and educational age; and (c) individual and group weaknesses in the mastery of arithmetic.

In the first place, the criterion upon which arithmetic tests must be evaluated depends upon the purposes accepted for the teaching of the subject. Many leaders in arithmetic teaching believe that the facts of arithmetic, by the very nature of the number system, are related and should be studied from that point of view. There are those, on the other hand, who argue that if the facts of arithmetic are to be of service in everyday life, they must be recognized as unrelated and specific things, and therefore must be singled out and mastered, one more or less independent of the other. If the former outlook is accepted, arithmetic tests will necessarily deal with basic principles and generalizations of which the particular skills are outgrowths. On the other hand, if the acquisition of each minute skill is considered as the goal of instruction, reliable arithmetic tests should contain a proper sampling of all of the skills to indicate the extent to which the subject has been mastered.

A cursory examination of the Progressive Arithmetic Tests is sufficient to indicate that the tests are wholly inadequate as measures of the principles and generalizations of arithmetic. The records obtained from these tests would in no way indicate what concepts and generalizations of arithmetic have not been acquired and hence would be of little service for diagnostic and remedial purposes.

Whether or not the Progressive Arithmetic Tests

would serve those in sympathy with a mechanistic program of arithmetic teaching depends in a large measure upon the extent to which the tests contain an adequate sampling of both the topics of arithmetic and of the skills and abilities into which they are sometimes analyzed.

In the sections devoted to arithmetic fundamentals, the sampling devices employed by the authors may be questioned. As an illustration, almost one-half of the basic addition, subtraction, and multiplication combinations are included in the primary form to measure mastery of these fundamental facts. This sampling is more than adequate in contrast with that of long division, which is measured in the three forms, primary, elementary, and intermediate by exactly eight problems, one appearing in the primary form, four in the elementary, and three in the intermediate forms. The samplings made of the other fundamental processes are as meager as that of long division. It is on this basis that the authors claim that the tests will reveal "the particular type of remedial work necessary for those who are experiencing one or more types of learning difficulties."

The selection of the items included in the section of the test designed to test reasoning ability may also be questioned. In the primary form number and sequence knowledge of money value, telling time, recognizing signs and symbols, are combined with word problems to test reasoning ability. The word problems are assigned ten points credit and the other items mentioned above thirty.

By most authorities, telling time, knowledge of money values, and the recognition of signs and symbols are considered to be specific skills of arithmetic and hence have no place as such in a reasoning test. Actual problem solving likewise comprises only a small part of the reasoning tests in the elementary and intermediate forms.

In view of the sampling methods alone, it would be difficult to accept the tests as measures which indicate the educational status of a given arithmetic program, or the extent to which both groups and individuals have mastered larger topics and specific skills in arithmetic. The elaborate and imposing sets of norms and standards and record forms in the last analysis have little value unless the contents of the tests are adequate measures of that which they purport to measure.

Harry Grove Wheat, Professor of Education, West Virginia University. Each test has two parts--one on

Arithmetic Reasoning, and the other on Arithmetic Fundamentals--each of which is subdivided into three to five sections. The sections of the "reasoning" test deal in each case with the recognition of numerals, symbols, and rules, the written expression of quantities, and problem-solving. The sections of the "fundamentals" test deal in each case with the four operations on progressively higher levels of difficulty. In the primary test the operations are simple ones with whole numbers and in the intermediate test the operations are complex ones with whole numbers, fractions, decimals, and denominate numbers. The tests as a whole are largely informational and computational. The sections of each "reasoning" test other than the one in problem-solving are tests of the pupil's knowledge, not of his ability to reason or to recognize ideas of combination in practical situations. These sections are given values in the pupil's possible score two or three times the values that are given the sections on problem-solving, and the sections on computation are given four to five times the values accorded those on problem-solving. Ability to compute in relation to ability to determine what computation to use in any given case is given a progressively more important place in the objectives of instruction of the pupils as they move up through the grades of the school.

The tests are intended to be useful both for survey and diagnostic purposes. The administration of the tests provides opportunity for securing a measure of ability on each item of the content. Timing is such as to require attention to each section. For the purpose of diagnosis, each test may be given individually or as a group test. In either case the scores on the various sections are available for diagnosis. A feature of the tests is the Diagnostic Profile which shows at a glance the pupil's general successes and weaknesses. Another feature is the Analysis of Learning Difficulties. This analysis breaks down the requirements of each section into specifics. For example, the Problems section of the primary test is analyzed into "one step," "two step," "sharing and arranging," and "budgeting" problems; and the Number Concept section of the intermediate test is analyzed into the requirements of "writing numbers," "writing money," "Roman numbers," "concept of whole numbers," "concept of fractions and decimals," and "concept of negative numbers." Thus the teacher can resolve the pupil's total score into its constituents and note at a glance his special points of difficulty. At what points remedial instruction is needed is thus revealed. What the remedial instruction should be is not, of course, indicated, because the causes of disabilities are not revealed by the tests. Like the usual objective test these tests measure accuracy of response, but they give no hint as to how the pupil arrived at his responses.



## PROGRESSIVE READING TESTS

Grades 1-3, 3-6, 7-9, 9-13; 1934-39; identical to the reading tests in the battery Progressive Achievement Tests; 4 levels; 75¢ per 25; 15¢ per specimen set of any one level; 2¢ per machine-scorable answer sheets; Ernest W. Tiegs and Willis W. Clark; Los Angeles, Calif.: California Test Bureau.

- a) PRIMARY. Grades 1-3; 1934-37; 3 forms; 35(40) minutes.
- b) ELEMENTARY. Grades 3-6; 1934-39; 3 forms; 35(40) minutes; Machine Scoring Edition: 2 forms; 5¢ per test.
- c) INTERMEDIATE. Grades 7-9; 1934-39; 3 forms; 50(55) minutes; Machine Scoring Edition; 2 forms; 5¢ per test.
- d) ADVANCED. Grades 9-13; 1934-39; 2 forms; 50(55) minutes; Machine Scoring Edition: 2 forms; 5¢ per test.

Frederick B. Davis, Reading and Professional Education Editor, Cooperative Test Service, New York, New York; and Educational Psychologist and Head of the Remedial Department, Avon Old Farms, Avon, Connecticut. The Progressive Reading Tests appear to be well-planned and carefully constructed measures of reading ability. In each manual particular emphasis is placed upon the fact that subtest scores, valuable for individual diagnosis, may be obtained in addition to the total score. On the cover of each test booklet is printed a diagnostic profile for graphic presentation of the subtest scores and a classification of the test items. These are unquestionably useful, but it is unfortunate that the manual contains no warning of the inevitable unreliability of subtest scores based on only a small number of items.

The writer consulted the manual for the Advanced Battery and, using data concerning the reliabilities of the tests and distributions of the scores at the eleventh grade level, estimated the standard errors of measurement for the vocabulary test and its four subtests and for the reading-comprehension test and its three subtests. The results of these calculations are somewhat discouraging because it appears that only the total reading score may be regarded as reasonably accurate in individual measurement. Subtest scores near the median may readily vary as much as thirty percentile-rank points on the diagnostic profile by pure chance.

It is clear that such great inaccuracy in the subtest scores means that the profile chart should be regarded as merely suggestive of possible variations in an

individual pupil's reading skills. As such, it is of some value. Incidentally, the chart could be improved simply by relocating the percentile points in terms of the distances corresponding to standard deviation units.

The directions for all of the tests specify that pupils are to be stopped on each test when 90 per cent of the group has finished. Because the tests measure power rather than speed these directions are possible. However, the fact that the tests are often administered in schools where the practice of ability grouping is followed makes this kind of time limit undesirable. The better pupils in a low-ability group have an advantage over the poorer pupils in a high-ability group. For example, consider the case of two pupils of equal reading ability; one takes the test with a group of poor readers, the other takes the test with a group of good readers. The pupil in the group of poor readers is likely to obtain a higher score on the test simply because his companions take a longer time to finish.

Users of the Intermediate Battery should make sure that they have the proper norms. The most recent edition can be identified by the heading of the table on page 10, which should read: Norms (1937 Revision): Including revised extension of norms above 9.5 in 1939. One of the earlier editions, printed on pink paper, contained two misprints on page 10. At grade level 11.0 in the reading vocabulary norms, 99 should be read for 79; at grade level 15.0 in the age norms, 241 should be read for 214.

**SUMMARY.** The total reading test score derived from each of the four Progressive Reading Tests appears to be a valid and reliable index of reading ability. The Diagnostic Profile, however, is useful in individual measurement only to provide possible clues for remedial work or as the basis for further diagnostic testing.



A P P E N D I X    B

KEYS FOR PERCENTILE RANK

Table

1. Mental Maturity Non-Language
2. Mental Maturity Language
3. Mental Maturity Total Factors
4. Progressive Achievement Reading Vocabulary
5. Progressive Achievement Comprehension
6. Progressive Achievement Arithmetic Reasoning
7. Progressive Achievement Arithmetic Fundamentals
8. Progressive Achievement Language
9. Progressive Achievement Total

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Table 1 .--KEY FOR PERCENTILE RANK. MENTAL MATURITY  
NON-LANGUAGE  
Range 49-131

Score	Frequency	Rank	Percentile	Score	Frequency	Rank	Percentile
131	1	222	100.00	97	6	119	53.60
130	1	221	99.55	96	2	113	50.90
123	1	220	99.10	95	4	111	50.00
122	1	219	98.65	94	8	107	48.20
120	3	218	98.20	93	7	99	44.59
119	3	215	96.85	92	6	92	41.44
118	1	212	95.50	91	6	86	38.74
117	2	211	95.04	90	7	80	36.04
116	3	209	94.14	89	8	73	32.88
115	4	206	92.79	88	5	65	29.28
114	1	202	90.99	87	3	60	27.03
113	5	201	90.54	86	5	57	25.68
112	6	196	88.29	85	6	52	23.42
111	3	190	85.59	84	6	46	20.72
110	5	187	84.23	83	4	40	18.02
109	9	182	81.98	82	5	36	16.22
108	6	173	77.93	81	2	31	13.96
107	5	167	75.23	80	1	29	13.06
106	3	162	72.97	79	2	28	12.61
105	7	159	71.62	78	5	26	11.71
104	2	152	68.47	77	5	21	9.46
103	4	150	67.57	76	6	16	7.21
102	6	146	65.77	75	2	10	4.50
101	5	140	63.06	74	1	8	3.60
100	8	135	60.81	73	1	7	3.15
99	5	127	57.21	71	4	6	2.70
98	3	122	54.95	69	1	2	.90
				49	1	1	.45

Table 2.--KEY FOR PERCENTILE RANK. MENTAL MATURITY,  
LANGUAGE  
Range 61-143

Score	Frequency	Rank	Percentile	Score	Frequency	Rank	Percentile
143	1	222	100.00	104	10	92	41.44
139	1	221	99.55	103	8	82	36.94
134	2	220	99.10	102	3	74	33.33
133	2	218	98.20	101	6	71	31.98
132	1	216	97.30	100	5	65	29.28
131	2	215	96.85	99	2	60	27.03
130	3	213	95.95	98	3	58	26.13
128	1	210	94.59	97	4	55	24.77
127	4	209	94.14	96	4	51	22.97
126	1	205	92.34	95	5	47	21.17
125	4	204	91.89	94	3	42	18.92
124	4	200	90.09	93	5	39	17.57
123	4	196	88.29	92	2	34	15.32
122	5	192	86.49	91	5	32	14.41
121	1	187	84.23	90	2	27	12.16
120	2	186	83.78	89	1	25	11.26
119	8	184	82.88	88	1	24	10.81
118	4	176	79.28	87	3	23	10.36
117	2	172	77.48	86	2	20	9.01
116	1	170	76.58	85	2	18	8.11
115	8	169	76.13	84	3	16	7.21
114	7	161	72.52	83	1	13	5.86
113	6	154	69.37	82	2	12	5.41
112	7	148	66.67	81	1	10	4.50
111	8	141	63.51	80	1	9	4.05
110	8	133	59.91	79	1	8	3.60
109	11	125	56.31	78	2	7	3.15
108	9	114	51.35	76	1	5	2.25
107	3	105	47.30	72	1	4	1.80
106	4	102	45.95	70	1	3	1.35
105	6	98	44.14	69	1	2	.90
				61	1	1	.45

Table 3.--KEY FOR PERCENTILE RANK. MENTAL MATURITY  
Range 45 - 138

Score	Frequency	Rank	Percentile	Score	Frequency	Rank	Percentile
138	1	222	100.00	102	5	94	42.34
131	1	221	99.55	101	4	89	40.09
129	1	220	99.10	100	7	85	38.29
127	1	219	98.65	99	2	78	35.14
126	1	218	98.20	98	8	76	34.23
125	2	217	97.75	97	11	68	30.63
124	1	215	96.85	96	6	57	25.68
122	5	214	96.40	95	6	51	22.97
121	2	209	94.14	94	6	45	20.27
120	2	207	93.24	93	1	39	17.57
119	2	205	92.34	92	3	38	17.12
118	6	203	91.44	91	1	35	15.76
117	5	197	88.74	90	4	34	15.32
116	3	192	86.49	89	3	30	13.51
115	4	189	85.14	88	3	27	12.16
114	9	185	83.33	87	2	24	10.81
113	4	176	79.28	86	1	22	9.91
112	3	172	77.48	85	5	21	9.46
111	4	169	76.13	84	2	16	7.21
110	8	165	74.32	83	2	14	6.31
109	9	157	70.72	82	2	12	5.41
108	9	148	66.67	81	1	10	4.50
107	5	139	62.61	80	1	9	4.05
106	13	134	60.36	78	1	8	3.60
105	7	121	54.50	77	3	7	3.15
104	13	114	51.35	74	2	4	1.80
103	7	101	45.50	72	1	2	.90
				67	1	1	.45

Table 4.---KEY FOR PERCENTILE RANK. PROGRESSIVE  
ACHIEVEMENT, READING VOCABULARY  
Range 24 - 88

Score	Frequency	Rank	Percentile	Score	Frequency	Rank	Percentile
88	2	224	100.00	66	7	91	40.79
86	2	222	99.10	65	9	84	37.84
83	6	220	98.20	64	7	75	33.78
82	4	214	95.50	63	5	68	30.63
81	6	210	93.69	62	3	63	28.38
80	5	204	90.99	61	3	60	27.03
79	11	199	88.74	60	10	57	25.68
78	8	188	83.78	59	6	47	21.17
77	6	180	80.18	58	7	41	18.47
76	8	173	77.48	57	4	34	15.32
75	10	165	73.87	56	7	30	13.51
74	9	155	69.37	55	4	23	10.36
73	7	146	65.32	54	2	19	8.56
72	6	139	62.16	52	4	17	7.66
71	8	133	59.46	51	3	13	5.86
70	10	125	55.86	49	2	10	4.50
69	7	114	51.35	47	3	8	3.60
68	6	107	48.20	44	2	5	2.25
67	10	101	45.50	34	2	3	1.35
				24	1	1	.45



Table 5.---KEY FOR PERCENTILE RANK. PROGRESSIVE  
ACHIEVEMENT, READING COMPREHENSIONS  
Range 20 - 54

Score	Frequency	Rank	Percentile	Score	Frequency	Rank	Percentile
54	1	222	100.00	40	13	73	32.88
53	6	221	99.55	39	3	60	27.03
52	9	215	96.85	38	7	55	24.77
51	12	206	92.79	37	13	48	21.62
50	13	194	87.39	36	7	35	15.76
49	10	181	81.53	35	3	28	12.61
48	13	171	77.03	34	5	25	11.26
47	7	158	71.17	33	6	20	9.01
46	17	151	68.02	32	3	14	6.31
45	12	134	60.36	31	1	11	4.95
44	16	122	54.95	29	3	10	4.50
43	18	106	47.75	28	3	7	3.50
42	6	88	39.64	27	1	4	1.80
41	9	82	36.94	25	2	3	1.35
				20	1	1	.45

Table 6.--KEY FOR PERCENTILE RANK. PROGRESSIVE  
ACHIEVEMENT, ARITHMETIC REASONING  
Range 15-54

Score	Frequency	Rank	Percentile	Score	Frequency	Rank	Percentile
54	3	222	100.00	36	3	75	33.78
53	1	219	98.65	35	7	72	32.43
52	1	218	98.20	34	10	65	29.28
51	2	217	97.75	33	9	55	24.77
50	4	215	96.85	32	9	46	20.72
49	4	207	95.04	31	6	37	16.67
48	9	207	93.24	30	6	31	13.96
47	18	198	89.19	29	5	25	11.26
46	14	180	81.08	28	2	20	9.01
45	14	166	74.77	27	5	18	8.11
44	16	152	68.47	26	1	13	5.86
43	15	136	61.26	25	2	12	5.41
42	6	121	54.50	24	3	10	4.50
41	8	115	51.80	23	2	7	3.15
40	14	107	48.20	21	1	5	2.25
39	4	93	41.89	20	1	4	1.80
38	8	89	40.09	19	1	3	1.35
37	6	81	36.49	16	1	2	.90
				15	1	1	.45

Table 7.--KEY FOR PERCENTILE RANK. PROGRESSIVE  
ACHIEVEMENT, ARITHMETIC FUNDAMENTALS  
Range 15-79

Score	Frequency	Rank	Percentile	Score	Frequency	Rank	Percentile
79	1	222	100.00	59	7	57	25.68
78	2	221	99.55	58	5	50	22.52
77	6	219	98.65	57	3	45	20.27
76	10	213	95.95	56	9	42	18.92
75	9	203	91.44	55	3	33	14.86
74	7	194	87.39	54	3	30	13.51
73	9	187	84.23	53	2	27	12.16
72	8	178	80.18	52	1	25	11.26
71	13	170	75.68	51	5	24	10.81
70	10	157	70.72	50	3	19	8.56
69	9	147	66.22	49	1	16	7.21
68	10	138	62.16	48	2	15	6.76
67	5	128	57.66	47	4	13	5.86
66	14	123	55.41	45	2	9	4.05
65	13	109	49.10	42	1	7	3.15
64	10	96	43.24	41	1	6	2.70
63	10	86	38.74	35	1	5	2.25
62	6	76	34.23	33	1	4	1.80
61	3	70	31.53	29	1	3	1.35
60	10	67	30.18	27	1	2	.90
				15	1	1	.45

Table 8.--KEY FOR PERCENTILE RANK, PROGRESSIVE  
ACHIEVEMENT, LANGUAGE  
Range 41-104

Score	Frequency	Rank	Percentile	Score	Frequency	Rank	Percentile
104	2	222	100.00	77	4	61	27.48
103	2	220	99.10	76	3	57	25.68
102	1	218	98.20	75	3	54	24.32
101	5	217	97.75	74	5	51	22.97
100	4	212	95.50	73	4	46	20.72
99	7	208	93.69	72	4	42	18.92
98	5	201	90.54	71	3	38	17.12
97	3	196	88.29	70	1	35	15.76
96	9	193	86.94	69	3	34	15.32
95	11	184	82.88	68	4	31	13.96
94	6	173	77.93	67	2	27	12.16
93	8	167	75.23	66	2	25	11.26
92	9	159	71.62	65	4	23	10.36
91	7	150	67.57	64	4	19	8.56
90	10	143	64.41	63	1	15	6.76
89	12	133	59.91	62	1	14	6.31
88	5	121	54.50	60	1	13	5.86
87	7	116	52.25	59	1	12	5.41
86	9	109	49.10	58	2	11	4.95
85	3	100	45.04	57	1	9	4.05
84	3	97	43.69	56	2	8	3.60
83	4	94	42.10	55	1	6	2.70
82	7	90	40.54	52	1	5	2.25
81	6	83	37.39	51	1	4	1.80
80	5	77	34.68	50	1	3	1.35
79	1	72	32.43	42	1	2	.90
78	10	71	31.98	41	1	1	.45

Table 9.--KEY FOR PERCENTILE RANK. PROGRESSIVE  
ACHIEVEMENT, TOTAL SCORES  
Range 155-363

Score	Frequency	Rank	Percentile	Score	Frequency	Rank	Percentile
363	1	222	100.00	312	2	123	55.41
362	2	221	99.55	311	2	121	54.50
357	2	219	98.65	310	3	119	53.60
356	1	217	97.75	309	3	116	52.25
355	1	216	97.30	308	2	113	50.90
351	1	215	96.85	307	2	111	50.00
350	3	214	96.40	306	1	109	49.10
349	2	211	95.04	305	1	108	48.65
346	2	209	94.14	303	2	107	48.20
345	2	207	93.24	302	1	105	47.30
343	2	205	92.34	301	4	104	46.85
342	5	203	91.44	300	3	100	45.04
341	3	198	89.19	299	4	97	43.69
340	2	195	87.84	297	1	93	41.89
339	2	193	86.94	295	2	92	41.44
338	2	191	86.04	294	1	90	40.54
337	2	189	85.14	293	2	89	40.09
336	3	187	84.23	292	3	87	39.19
335	6	184	82.88	291	3	84	37.84
334	2	178	80.18	290	2	81	36.49
333	5	176	79.28	288	3	79	35.59
332	1	171	77.03	287	1	76	34.23
331	2	170	76.58	286	2	75	33.78
330	3	168	75.68	285	1	73	32.88
329	2	166	74.32	284	1	72	32.43
328	3	163	73.42	283	3	71	31.98
327	1	160	72.07	282	1	68	30.63
326	2	159	71.62	280	2	67	30.18
325	1	157	70.72	278	2	65	29.28
324	2	156	70.27	277	1	63	28.38
323	2	154	69.37	276	2	62	27.93
322	2	152	68.47	274	1	60	27.03
321	5	150	67.57	273	2	59	26.58
320	2	145	65.32	272	1	57	25.68
319	2	143	64.41	271	1	56	25.23
318	1	141	63.51	270	2	55	24.77
317	7	140	63.06	269	1	53	23.87
315	4	133	59.91	268	1	52	23.42
314	4	129	58.11	267	3	51	22.97
313	2	125	56.31	266	1	48	21.62



Table 9.--KEY FOR PERCENTILE RANK. PROGRESSIVE  
ACHIEVEMENT, TOTAL SCORES  
Range 155-363  
(Continued)

Score	Frequency	Rank	Percentile	score	Frequency	Rank	Percentile
265	1	47	21.17	243	1	20	9.01
264	2	46	20.72	242	1	19	8.56
261	1	44	19.82	240	2	18	8.11
260	2	43	19.37	239	1	16	7.21
259	1	41	18.47	235	2	15	6.76
258	2	40	18.02	232	1	13	5.86
257	3	38	17.12	230	1	12	5.41
256	1	35	15.76	228	1	11	4.95
253	3	34	15.32	227	1	10	4.50
252	4	31	13.96	222	1	9	4.05
251	1	27	12.16	215	2	8	3.60
250	3	26	11.71	205	2	6	2.70
249	1	23	10.36	200	1	4	1.80
248	1	22	9.91	181	1	3	1.35
246	1	21	9.46	164	1	2	.90
				155	1	1	.45

A P P E N D I X    C

## Table

10. Boys Scores and Percentile Rank  
on California Test of Mental  
Maturity and Progressive Achieve-  
ment Total.
  
11. Girls Scores and Percentile Rank  
on California Test of Mental  
Maturity and Progressive Achieve-  
ment Total.

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Table 10.--BOYS SCORES AND PERCENTILE RANK ON CALIFORNIA  
TEST OF MENTAL MATURITY AND PROGRESSIVE ACHIEVEMENT  
TOTAL.

CALIFORNIA MENTAL MATURITY					PROGRESSIVE ACHIEVEMENT		
Ident. No.	Non- lang.	Lang.	Total fact.	%ile	%ile	Total score	Gr. Pl. 1937 norms
B 1	119	132	126	98.2	42.1	297	9.2
B 2	90	78	82	5.3	9.9	248	7.8
B 3	95	122	113	18.9	96.3	351	10.7
B 4	101	91	94	20.1	24.2	270	8.3
B 5	109	102	105	54.2	43.0	299	9.2
B 6	94	87	89	13.4	10.3	249	7.9
B 7	83	112	104	54.2	46.1	301	9.3
B 8	102	112	109	70.4	77.5	333	10.1
B 9	115	119	117	88.7	91.3	343	10.4
B 10	86	96	93	17.4	16.1	257	8.2
B 11	113	95	100	38.1	54.6	311	9.5
B 12	131	143	138	10.0	100.0	363	11.0
B 13	119	125	122	96.4	87.3	340	10.2
B 14	103	124	117	88.7	65.9	321	9.8
B 15	85	108	102	42.1	33.2	286	8.8
B 16	118	101	110	73.9	48.4	303	9.3
B 17	109	127	118	91.4	49.3	305	9.4
B 18	105	130	120	92.8	92.7	346	10.5
B 19	78	103	95	22.8	14.3	253	8.0
B 20	99	93	96	25.5	30.5	282	8.7
B 21	93	103	100	38.1	6.2	235	7.5
B 22	80	113	103	45.2	46.1	301	9.3
B 23	113	127	121	94.1	86.4	339	10.3
B 24	97	109	106	60.0	56.9	314	9.4
B 25	101	104	104	50.6	50.1	307	9.3
B 26	108	119	114	82.9	80.6	335	10.0
B 27	93	94	94	20.1	8.9	243	7.8
B 28	107	114	111	75.7	72.5	328	10.1
B 29	94	98	97	30.4	10.8	250	7.9
B 30	109	125	118	91.4	65.9	321	9.8
B 31	88	91	90	15.2	23.3	268	8.3
B 32	92	108	103	45.2	86.4	339	10.3
B 33	94	117	103	45.2	53.3	310	9.5
B 34	93	127	114	82.9	98.1	357	10.8
B 35	103	92	95	22.8	4.0	222	7.2
B 36	102	95	97	30.4	18.8	260	8.1
B 37	117	106	110	73.9	12.1	251	7.9
B 38	77	93	88	12.1	6.2	235	7.5

Table 10.--BOYS SCORES AND PERCENTILE RANK ON CALIFORNIA  
TEST OF MENTAL MATURITY AND PROGRESSIVE ACHIEVEMENT  
TOTAL--Continued

Ident. No.	CALIFORNIA MENTAL MATURITY				PROGRESSIVE ACHIEVEMENT		
	Non- lang.	Lang.	Total fact.	%ile	%ile	Total score	Gr. Pl. 1937 norms
B 39	84	69	74	1.7	4.9	227	7.3
B 40	105	108	108	66.3	56.9	314	9.6
B 41	85	101	97	30.4	22.0	267	8.3
B 42	100	119	112	77.1	51.5	309	9.6
B 43	105	133	122	96.4	83.3	336	10.3
B 44	76	105	97	30.4	64.1	319	9.8
B 45	100	123	114	82.9	65.9	321	9.8
B 46	120	128	124	96.8	74.8	330	10.0
B 47	81	76	77	3.1	15.7	256	8.0
B 48	100	125	116	86.5	72.5	328	10.1
B 49	109	115	112	77.1	65.9	321	9.8
B 50	100	97	98	34.0	56.0	313	9.6
B 51	94	111	106	60.0	50.1	307	9.4
B 52	112	134	125	97.7	92.2	345	10.5
B 53	106	139	121	94.1	74.8	330	10.1
B 54	112	106	108	66.3	34.0	287	8.9
B 55	98	79	85	9.4	1.3	181	6.3
B 56	93	96	96	25.5	55.5	312	9.7
B 57	76	78	77	3.1	2.2	205	6.8
B 58	108	108	108	66.3	16.1	257	8.1
B 59	90	100	98	34.0	30.9	283	8.7
B 60	97	101	100	38.1	7.6	240	7.6
B 61	98	93	94	20.1	34.5	288	8.9
B 62	100	95	97	30.4	29.6	280	8.6
B 63	90	80	84	7.1	.4	155	5.7
B 64	91	109	104	50.6	8.5	242	7.7
B 65	123	115	118	91.4	79.7	334	10.1
B 66	112	120	116	86.5	88.2	341	10.3
B 67	111	112	111	25.7	38.5	292	9.0
B 68	113	118	116	86.5	47.9	302	9.3
B 69	109	101	104	50.6	36.2	290	9.0
B 70	90	117	108	66.3	80.6	335	10.2
B 71	115	127	122	96.4	65.9	321	9.8
B 72	84	123	110	73.9	94.0	349	10.5
B 73	89	82	84	7.1	14.3	253	8.0
B 74	100	122	114	82.9	69.4	324	9.9
B 75	78	94	89	13.4	12.5	252	7.9
B 76	106	108	107	62.8	91.3	343	10.4



Table 10.--BOYS SCORES AND PERCENTILE RANK ON CALIFORNIA  
TEST OF MENTAL MATURITY AND PROGRESSIVE ACHIEVEMENT  
TOTAL--Continued

Ident. No.	CALIFORNIA MENTAL MATURITY				PROGRESSIVE ACHIEVEMENT		
	Non- lang.	Lang.	Total fact.	%ile	%ile	Total score	Gr. Pl. 1937 norms
B 77	75	87	83	6.2	20.2	264	8.2
B 78	93	122	111	75.7	60.4	317	9.7
B 79	114	111	113	78.9	22.0	267	8.5
B 80	93	105	104	50.6	56.0	313	9.6
B 81	103	110	109	70.4	29.6	280	8.6
B 82	113	109	110	73.9	49.7	306	9.4
B 83	110	123	118	91.4	53.3	310	9.5
B 84	85	101	97	30.4	43.0	299	9.2
B 85	91	114	109	70.4	96.7	342	10.7
B 86	76	91	87	10.7	3.1	215	7.0
B 87	78	61	67	.4	.9	164	5.9
B 88	113	107	110	73.9	40.7	294	9.1
B 89	88	109	104	50.6	89.6	342	10.7
B 90	89	100	97	30.4	12.5	252	7.9
B 91	97	97	97	30.4	3.1	215	7.0
B 92	89	109	103	45.2	84.7	338	10.1
B 93	110	116	114	82.9	88.2	341	10.4
B 94	76	103	95	22.8	64.1	319	9.8
B 95	82	104	98	34.0	12.5	252	7.9
B 96	94	108	104	50.6	27.3	276	8.5
B 97	120	119	120	92.8	80.6	335	10.2
B 98	122	108	114	82.9	38.5	292	8.9
B 99	110	115	114	82.9	68.6	322	9.8
B100	90	100	97	30.4	9.4	247	7.8
B101	107	124	117	88.7	77.5	333	10.2
B102	130	133	131	99.5	86.0	338	10.4
B103	102	122	114	82.9	89.6	342	9.9
B104	110	103	105	54.2	39.8	293	9.1
B105	83	104	98	34.0	51.5	309	9.6
B106	99	109	107	62.3	14.3	253	8.0
B107	120	131	129	99.1	79.7	334	10.1

Table 11.--GIRLS SCORES AND PERCENTILE RANK ON CALIFORNIA  
TEST OF MENTAL MATURITY AND PROGRESSIVE ACHIEVEMENT  
TOTAL.

CALIFORNIA MENTAL MATURITY					PROGRESSIVE ACHIEVEMENT		
Ident. No.	Non- lang.	Lang.	Total fact.	%ile	%ile	Total score	Gr. Pl. 1937 norms
G 1	78	94	89	13.4	43.0	299	9.1
G 2	99	144	109	70.4	58.7	315	9.7
G 3	116	118	117	83.7	97.6	356	10.8
G 4	102	110	108	66.3	69.4	324	9.9
G 5	86	84	85	9.4	28.7	278	8.7
G 6	117	126	122	96.4	80.6	335	10.2
G 7	88	112	104	50.6	89.6	342	10.4
G 8	116	124	121	94.1	88.2	341	10.4
G 9	76	89	85	9.4	36.2	290	9.0
G 10	91	114	101	39.4	83.3	336	10.3
G 11	69	96	87	10.7	28.0	291	9.0
G 12	115	113	113	78.9	76.1	331	10.1
G 13	94	112	107	62.3	77.5	333	10.2
G 14	95	110	106	60.0	34.5	288	8.9
G 15	116	131	127	98.6	99.0	362	11.0
G 16	109	120	115	84.7	46.1	301	9.3
G 17	112	124	119	91.9	77.5	333	10.2
G 18	77	100	94	20.1	16.1	257	8.1
G 19	105	112	108	66.3	72.1	327	10.0
G 20	102	108	106	60.0	21.5	266	8.3
G 21	91	115	101	39.4	60.4	317	9.7
G 22	111	121	117	88.7	94.0	349	10.6
G 23	77	86	83	6.2	1.8	200	6.9
G 24	75	103	95	22.8	17.5	258	8.1
G 25	79	104	96	25.5	25.5	272	8.4
G 26	96	101	100	38.1	38.5	292	9.0
G 27	112	104	106	60.0	32.3	284	8.8
G 28	90	119	109	70.4	87.3	340	10.2
G 29	84	105	100	38.1	71.2	326	10.0
G 30	78	113	102	42.1	56.9	314	9.6
G 31	74	96	90	15.2	7.6	240	7.6
G 32	100	123	115	84.7	80.6	335	10.2
G 33	107	107	107	62.3	94.9	350	10.2
G 34	82	91	88	12.1	21.1	265	8.2
G 35	87	114	106	60.0	76.1	331	10.1
G 36	108	93	96	25.5	22.0	267	8.3
G 37	89	111	104	50.6	43.0	299	9.2
G 38	79	106	98	34.0	69	323	9.9

Table 11.--GIRLS SCORES AND PERCENTILE RANK ON CALIFORNIA  
TEST OF MENTAL MATURITY AND PROGRESSIVE ACHIEVEMENT  
TOTAL--Continued.

Ident. No.	CALIFORNIA MENTAL MATURITY				PROGRESSIVE ACHIEVEMENT		
	Non- lang.	Lang.	Total fact.	%ile	%ile	Total score	Gr. Pl. 1937 norms
G 39	109	134	125	97.7	99.0	362	11.0
G 40	71	81	77	3.1	32.8	285	8.8
G 41	73	109	98	34.0	84.7	337	10.3
G 42	111	104	106	60.0	44.8	300	9.3
G 43	92	87	88	12.1	17.5	278	8.1
G 44	100	103	102	39.4	34.5	288	8.9
G 45	87	109	103	45.2	7.2	239	7.6
G 46	101	93	95	22.8	27.3	276	8.5
G 47	108	102	105	54.2	51.0	308	9.4
G 48	91	115	108	66.3	65.0	320	9.8
G 49	86	118	108	66.3	71.2	326	10.0
G 50	83	114	105	54.2	70.3	325	10.0
G 51	82	97	92	17.0	19.7	261	8.2
G 52	89	122	111	75.7	77.5	333	10.2
G 53	84	115	106	60.0	53.3	310	9.5
G 54	119	111	115	84.7	37.1	291	9.0
G 55	106	109	109	70.4	60.4	317	9.7
G 56	81	103	97	30.4	63.6	318	9.8
G 57	104	99	101	39.4	10.8	250	7.9
G 58	92	108	104	50.6	60.4	317	9.7
G 59	98	104	103	45.2	80.6	335	10.2
G 60	89	103	99	34.9	44.2	295	9.0
G 61	88	114	106	60.0	48.4	303	9.3
G 62	93	105	102	42.1	44.8	300	9.3
G 63	82	106	96	25.5	26.0	273	8.4
G 64	97	98	91	15.6	23.7	269	8.3
G 65	104	119	114	82.9	73.9	329	10.1
G 66	109	102	104	50.6	51.5	309	9.3
G 67	96	110	106	60.0	69.0	323	9.9
G 68	105	104	105	54.2	68.6	322	9.9
G 69	105	90	94	20.1	30.9	283	8.7
G 70	84	85	85	9.4	10.8	250	8.0
G 71	92	84	86	9.8	25.1	271	8.4
G 72	102	104	104	50.6	56.9	314	9.3
G 73	92	110	105	54.2	60.4	317	9.7
G 74	112	119	118	91.4	58.7	315	9.7
G 75	92	113	109	70.4	34.7	337	10.3
G 76	101	107	105	54.2	60.4	317	9.7

Table 11.--GIRLS SCORES AND PERCENTILE RANK ON CALIFORNIA  
TEST OF MENTAL MATURITY AND PROGRESSIVE ACHIEVEMENT  
TOTAL--Continued.

Ident. No.	CALIFORNIA MENTAL MATURITY				PROGRESSIVE ACHIEVEMENT		
	Non- lang.	Lang.	Total fact.	%ile	%ile	Total score	Gr. Pl. 1937 norms
G 77	108	113	112	77.1	89.6	342	10.4
G 78	97	110	106	60.0	33.2	286	8.8
G 79	95	90	92	17.0	41.2	295	9.1
G 80	110	97	101	39.4	51.0	308	9.4
G 81	115	115	115	84.7	83.3	336	10.2
G 82	88	72	78	3.5	4.0	232	7.2
G 83	89	119	109	70.4	65.0	320	9.8
G 84	107	111	110	73.9	18.8	260	8.1
G 85	77	125	109	70.4	72.5	328	10.0
G 86	49	84	72	.8	12.5	252	7.9
G 87	76	105	96	25.5	55.5	312	9.6
G 88	71	83	80	4.0	37.1	291	8.9
G 89	85	104	100	38.1	46.1	301	9.3
G 90	97	109	106	60.0	74.8	330	10.1
G 91	71	86	82	5.3	18.4	259	8.1
G 92	82	112	102	42.1	92.2	345	10.5
G 93	91	100	97	30.4	58.7	315	9.6
G 94	95	111	107	62.3	28.2	277	8.5
G 95	86	85	85	9.4	28.7	278	8.7
G 96	108	115	113	78.9	94.9	350	10.6
G 97	109	130	122	96.4	98.1	357	10.9
G 98	89	111	104	50.6	73.9	329	10.1
G 99	108	88	94	20.1	5.8	230	7.1
G100	77	82	81	4.4	2.2	205	6.9
G101	99	130	118	91.4	92.7	346	10.5
G102	83	70	74	1.7	5.3	228	7.8
G103	97	98	98	34.0	60.4	317	9.7
G104	87	91	90	15.2	30.9	203	8.7
G105	85	92	90	15.2	39.8	293	8.9
G106	107	110	110	73.9	24.2	270	8.3
G107	90	113	106	60.0	77.1	332	10.1
G108	94	95	95	22.8	44.8	300	9.3
G109	105	109	108	66.3	58.7	315	9.7
G110	85	105	99	34.9	54.6	311	9.4
G111	94	118	110	73.9	94.9	350	10.6
G112	71	110	98	34.0	20.2	264	8.3
G113	101	99	100	38.1	26.0	273	8.4
G114	86	95	92	17.0	26.9	274	8.5
G115	84	111	103	45.2	97.2	355	10.8



A P P E N D I X    D

## Table

12. Scores, Grade Placements, and  
Percentile Ranks in Progressive Achievement Tests. BOYS
  
13. Scores, Grade Placements, and  
Percentile Ranks in Progressive Achievement Tests. GIRLS

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Table 12.--SCORES, GRADE PLACEMENTS, AND PERCENTILE RANKS  
IN PROGRESSIVE ACHIEVEMENT TESTS.

[G. P. indicates Grade Placement, norms (1937 Revision).  
%ile indicates rank in ninth grade class, Fort Collins  
Junior High School (222 frequencies).]

Ident. No.	Reading Vocabulary			Reading Comp.			Arithmetic Reas.			Arithmetic Fund.		
	Score	G. P.	%ile	Score	G. P.	%ile	Score	G. P.	%ile	Score	G. P.	%ile
B 1	81	10.6	93	53	13.5	99	46	10.9	81	66	9.0	55
B 2	52	7.4	7	37	8.4	21	37	9.5	36	63	8.6	38
B 3	78	10.3	83	43	9.8	47	46	10.9	81	68	9.3	62
B 4	58	8.0	18	43	9.8	47	39	9.9	41	60	8.3	30
B 5	60	8.2	25	37	8.4	21	42	10.3	54	65	8.9	49
B 6	55	7.7	10	29	6.9	4	34	9.0	29	67	9.1	57
B 7	70	9.5	55	43	9.8	47	41	10.2	51	63	8.6	38
B 8	78	10.3	83	46	10.4	68	41	10.2	51	73	9.9	84
B 9	82	10.7	95	43	9.8	47	49	12.0	95	74	10.2	87
B 10	57	7.9	15	37	8.4	21	37	9.5	36	59	8.2	25
B 11	67	9.2	45	43	9.8	47	40	10.1	48	64	8.8	43
B 12	79	10.4	88	53	13.5	99	54	14.5	100	76	10.6	95
B 13	82	10.7	95	50	11.0	87	47	11.0	89	70	9.5	70
B 14	78	10.3	83	51	12.0	92	41	10.2	51	65	8.9	49
B 15	75	10.0	73	42	9.6	39	45	10.8	74	60	8.3	30
B 16	71	9.6	59	42	9.6	59	47	11.0	89	60	8.3	30
B 17	77	10.2	80	50	11.0	87	38	9.7	40	59	8.2	25
B 18	83	10.9	98	50	11.0	87	47	11.0	89	77	10.8	98
B 19	64	8.8	33	36	8.1	15	27	8.0	8	51	7.3	10
B 20	65	8.9	37	44	10.0	54	43	10.5	61	65	8.9	49
B 21	57	7.9	15	37	8.4	21	30	8.4	13	60	8.3	30
B 22	69	9.4	51	41	9.4	36	43	10.5	61	65	8.9	49
B 23	81	10.6	93	53	13.5	99	46	10.9	81	66	9.0	55
B 24	75	10.0	73	43	9.8	47	41	10.2	51	59	8.2	25
B 25	70	9.5	55	43	9.8	47	41	10.2	51	59	8.2	25
B 26	78	10.3	83	50	11.0	87	46	10.9	81	65	8.9	49
B 27	58	8.0	18	28	6.7	3	36	9.3	33	61	8.4	31
B 28	83	10.9	98	46	10.4	68	47	11.0	89	62	8.5	34
B 29	58	8.0	18	34	7.7	11	24	7.6	4	56	7.9	18
B 30	68	9.3	37	51	12.0	92	45	10.8	74	69	9.4	66
B 31	70	9.5	55	42	9.6	39	31	8.6	16	52	7.4	11
B 32	80	10.5	90	46	10.4	68	44	10.6	68	72	9.8	80
B 33	75	10.0	73	46	10.4	68	44	10.6	68	71	9.6	75
B 34	81	10.6	93	47	10.5	71	54	14.5	100	78	11.0	99

Table 12.--SCORES, GRADE PLACEMENTS, AND PERCENTILE RANKS IN PROGRESSIVE ACHIEVEMENT TESTS--Cont.

✓ G. P. indicates Grade Placement, norms (1937 Revision).  
 %ile indicates rank in ninth grade class, Fort Collins Junior High School (222 frequencies). 7

Ident. No.	Language			Total		
	Score	G. P.	%ile	Score	G. P.	%ile
B 1	75	7.9	24	297	9.2	42.1
B 2	59	6.3	5	248	7.8	9.9
B 3	96	10.0	86	351	10.7	96.3
B 4	70	7.4	15	270	8.3	24.2
B 5	95	9.9	82	299	9.2	43.0
B 6	64	6.8	8	249	7.9	10.3
B 7	84	8.8	43	301	9.3	46.1
B 8	95	9.9	82	333	10.1	77.5
B 9	95	9.9	82	343	10.4	91.3
B 10	67	7.1	12	257	8.2	16.1
B 11	77	8.1	27	311	9.5	54.6
B 12	101	10.5	97	363	11.0	100.0
B 13	91	9.5	67	340	10.2	87.3
B 14	86	9.0	49	321	9.8	65.9
B 15	64	6.8	8	286	8.8	33.2
B 16	83	8.7	4	303	9.3	48.4
B 17	81	8.5	37	305	9.4	49.3
B 18	89	9.3	59	346	10.5	92.7
B 19	75	7.9	24	253	8.0	14.3
B 20	65	6.9	10	252	8.7	30.5
B 21	51	5.8	1	235	7.5	6.2
B 22	83	8.7	42	301	9.3	46.1
B 23	93	9.7	75	339	10.3	86.4
B 24	96	10.0	86	314	9.4	56.9
B 25	86	9.0	49	307	9.3	50.1
B 26	96	10.0	86	335	10.0	80.6
B 27	60	6.4	5	243	7.8	8.9
B 28	90	9.4	46	328	10.1	72.5
B 29	78	8.2	31	250	7.9	10.8
B 30	88	9.2	54	321	9.8	65.9
B 31	78	7.7	20	268	8.3	23.3
B 32	97	10.1	88	339	10.3	86.4
B 33	74	7.8	22	310	9.5	53.3
B 34	97	10.1	88	357	10.8	98.1

Table 12--SCORES, GRADE PLACEMENTS, AND PERCENTILE RANKS  
IN PROGRESSIVE ACHIEVEMENT TESTS.(continued)

[G. P. indicates Grade Placement, norms (1937 Revision).  
%ile indicates rank in ninth grade class, Fort Collins  
Junior High School (222 frequencies).]

Ident. No.	Reading Vocabulary			Reading Comp.			Arithmetic Reas.			Arithmetic Fund.		
	Score	G. P.	%ile	Score	G. P.	%ile	Score	G. P.	%ile	Score	G. P.	%ile
B 35	63	8.6	30	35	7.9	12	23	7.4	3	29	5.5	1
B 36	58	8.0	18	37	8.4	21	35	9.1	32	65	8.9	49
B 37	57	7.9	15	33	7.5	9	33	8.9	24	54	7.6	13
B 38	61	8.3	27	33	7.5	9	28	8.2	9	47	6.9	5
B 39	56	7.8	13	28	6.7	3	27	8.0	8	58	8.1	22
B 40	66	9.0	40	40	9.1	32	46	10.9	81	67	9.1	57
B 41	63	8.6	30	36	8.1	15	40	10.1	48	56	7.9	18
B 42	76	10.1	77	44	10.0	54	44	10.6	68	65	8.9	49
B 43	82	10.7	95	46	10.4	68	51	13.0	97	66	9.0	55
B 44	67	9.2	45	44	10.0	54	47	11.0	89	75	10.3	91
B 45	73	9.8	65	44	10.0	54	44	10.6	68	68	9.3	62
B 46	75	10.0	73	47	10.5	71	47	11.0	89	74	10.1	87
B 47	52	7.4	7	35	7.9	12	31	8.6	16	64	8.8	43
B 48	74	9.9	69	50	11.0	87	43	10.5	61	69	9.4	66
B 49	80	10.5	90	45	10.2	60	43	10.5	61	61	8.4	31
B 50	68	9.3	48	48	10.7	77	46	10.9	81	66	9.0	85
B 51	73	9.8	65	43	9.8	47	41	10.2	51	59	8.2	25
B 52	81	10.6	93	52	13.0	96	50	12.5	96	70	9.5	70
B 53	83	10.9	98	47	10.5	71	44	10.6	68	69	9.4	66
B 54	67	9.2	45	40	9.1	32	41	10.2	51	65	8.9	49
B 55	34	5.6	1	25	6.3	1	30	8.4	13	51	7.3	10
B 56	76	10.1	77	47	10.5	71	45	10.5	74	73	8.9	34
B 57	34	5.6	1	29	6.9	4	29	8.3	11	55	7.8	14
B 58	56	7.8	13	42	9.6	39	39	9.9	41	56	7.9	18
B 59	58	8.0	18	39	8.9	27	44	10.6	68	70	9.5	70
B 60	63	8.6	30	43	9.8	47	32	8.8	20	50	7.2	8
B 61	64	8.8	33	33	7.5	9	45	10.8	74	58	8.1	22
B 62	66	9.0	40	41	9.4	36	40	10.1	48	51	7.3	10
B 63	49	7.1	4	20	5.4	.4	16	6.4	1	15	4.6	.4
B 64	62	8.5	28	32	7.4	6	37	9.5	36	48	7.0	6
B 65	79	10.4	88	48	10.7	77	44	10.6	68	77	10.8	98
B 66	74	9.9	69	51	12.0	92	46	10.9	81	75	10.3	91
B 67	72	9.7	62	40	9.1	32	31	8.6	16	56	7.9	18
B 68	72	9.7	62	43	9.8	47	47	11.0	89	67	9.1	57



Table 12.--SCORES, GRADE PLACEMENTS, AND PERCENTILE RANKS IN PROGRESSIVE ACHIEVEMENT TESTS--Cont.

[G. P. indicates Grade Placement, norms (1937 Revision).  
%ile indicates rank in ninth grade class, Fort Collins Junior High School (222 frequencies).]

Ident. No.	Language			Total		
	Score	G. P.	%ile	Score	G. P.	%ile
B 35	72	7.6	18	222	7.2	4.0
B 36	65	6.9	10	260	8.1	18.8
B 37	74	7.8	22	251	7.9	12.1
B 38	66	7.0	11	285	7.5	6.2
B 39	58	6.2	4	227	7.3	4.9
B 40	95	9.9	82	314	9.6	56.9
B 41	72	7.6	18	267	8.3	22.0
B 42	80	8.4	34	309	9.6	51.5
B 43	91	9.5	67	336	10.3	83.3
B 44	86	9.0	49	319	9.8	64.1
B 45	92	9.6	71	321	9.8	65.9
B 46	87	9.1	52	330	10.0	74.8
B 47	74	7.8	22	256	8.0	15.7
B 48	92	9.6	71	328	10.1	72.5
B 49	92	9.6	71	321	9.8	65.9
B 50	85	8.9	45	313	9.6	56.0
B 51	91	9.5	67	307	9.4	50.1
B 52	92	9.6	71	345	10.5	92.2
B 53	87	9.1	52	330	10.1	74.8
B 54	74	7.8	22	287	8.9	34.0
B 55	41	5.0	.4	181	6.3	1.3
B 56	71	7.5	17	312	9.7	55.5
B 57	58	6.2	4	205	6.8	2.2
B 58	64	6.8	8	257	8.1	16.1
B 59	72	7.6	18	283	8.7	30.9
B 60	52	5.8	2	240	7.6	7.6
B 61	88	9.2	54	288	8.9	34.5
B 62	82	8.6	40	280	8.6	29.6
B 63	55	6.0	2	155	5.7	.4
B 64	63	6.7	6	242	7.7	8.5
B 65	86	9.0	49	334	10.1	79.7
B 66	95	9.9	82	341	10.3	88.2
B 67	93	9.7	75	292	9.0	38.5
B 68	73	7.7	20	302	9.3	47.9

Table 12.--SCORES, GRADE PLACEMENTS, AND PERCENTILE RANKS  
IN PROGRESSIVE ACHIEVEMENT TESTS.(continued)

✓ G. P. indicates Grade Placement, norms (1937 Revision).  
%ile indicates rank in ninth grade class, Fort Collins  
Junior High School (222 frequencies).✓

Ident. No.	Reading Vocabulary			Reading Comp.			Arithmetic Reas.			Arithmetic Fund.		
	Score	G. P.	%ile	Score	G. P.	%ile	Score	G. P.	%ile	Score	G. P.	%ile
B 69	65	8.9	37	45	10.2	60	38	9.7	40	64	8.8	43
B 70	86	11.5	99	44	10.0	54	43	10.5	61	63	8.6	38
B 71	80	10.5	90	49	10.9	81	40	10.1	48	63	8.6	38
B 72	81	10.6	93	54	14.0	100	45	10.8	74	77	10.8	98
B 73	56	7.8	13	33	7.5	9	36	9.3	33	63	8.6	38
B 74	77	10.2	80	44	10.0	54	42	10.3	54	68	9.3	62
B 75	56	7.8	13	33	7.5	9	25	7.7	5	55	7.8	14
B 76	73	9.8	65	50	11.0	87	48	11.5	93	76	10.6	95
B 77	62	8.5	28	39	8.9	27	33	8.9	24	62	8.5	34
B 78	83	10.9	98	53	13.5	99	35	9.1	32	60	8.3	30
B 79	68	9.3	48	39	8.9	27	40	10.1	48	49	7.1	7
B 80	69	9.4	51	44	10.0	54	47	11.0	89	66	9.0	55
B 81	74	9.9	69	41	9.4	36	40	10.1	48	66	7.9	18
B 82	66	9.0	40	43	9.8	47	42	10.3	54	66	9.0	55
B 83	73	9.8	65	49	10.9	81	44	10.6	68	66	9.0	55
B 84	66	9.0	40	40	9.1	32	50	12.5	96	66	9.0	55
B 85	82	10.7	95	48	10.7	77	47	11.0	89	74	10.1	87
B 86	47	6.9	3	27	6.6	1	32	8.8	20	47	6.9	5
B 87	24	4.9	.4	31	7.2	4	20	6.9	1	33	5.8	1
B 88	81	10.6	93	45	10.2	60	39	9.9	41	47	6.9	5
B 89	83	10.9	98	51	12.0	92	48	11.5	93	76	10.6	95
B 90	59	8.1	21	34	7.7	11	32	8.8	20	56	7.9	18
B 91	64	8.8	33	37	8.4	21	30	8.4	13	50	7.2	8
B 92	79	10.4	88	53	13.5	99	48	11.5	93	76	10.6	25
B 93	80	10.5	90	50	11.0	87	48	11.5	93	69	9.4	36
B 94	60	8.2	25	53	13.5	99	43	10.5	61	70	9.5	70
B 95	59	8.1	21	36	8.1	15	33	8.9	24	64	8.8	43
B 96	68	9.3	48	46	10.4	68	40	10.1	48	53	7.5	12
B 97	75	10.0	73	52	13.0	96	43	10.5	61	71	9.6	75
B 98	67	9.2	45	46	10.4	68	48	11.5	93	75	10.3	91
B 99	75	10.0	73	46	10.4	68	45	10.8	74	75	10.3	91
B100	60	8.2	25	36	8.1	15	27	8.0	8	51	7.3	10
B101	79	10.4	88	50	11.0	87	46	10.9	81	72	9.8	80
B102	81	10.6	93	51	12.0	92	47	11.0	89	70	9.5	70

Table 12--SCORES, GRADE PLACEMENTS, AND PERCENTILE  
RANKS IN PROGRESSIVE ACHIEVEMENT TESTS--Cont.

[G. P. indicates Grade Placement, norms (1937 Revision).  
%ile indicates rank in ninth grade class, Fort Collins  
Junior High School (222 frequencies).]

Ident. No.	Language			Total		
	Score	G. P.	%ile	Score	G. P.	%ile
B 69	78	8.2	31	290	9.0	36.2
B 70	99	10.3	93	335	10.2	80.6
B 71	89	9.3	59	321	9.8	65.9
B 72	92	9.6	71	349	10.5	94.0
B 73	65	6.9	10	253	8.0	14.3
B 74	93	9.7	75	324	9.9	69.4
B 75	83	8.7	42	252	7.9	12.5
B 76	96	10.0	86	343	10.4	91.3
B 77	66	7.2	13	264	8.2	20.2
B 78	86	9.0	49	317	9.7	60.4
B 79	71	7.5	17	267	8.5	22.0
B 80	87	9.1	52	313	9.6	56.0
B 81	69	7.3	15	280	8.6	29.6
B 82	89	9.3	59	306	9.4	49.7
B 83	78	8.2	31	310	9.5	53.3
B 84	77	8.1	27	299	9.2	43.0
B 85	91	9.5	67	342	10.7	96.7
B 86	62	6.6	6	215	7.0	3.1
B 87	56	6.1	3	164	5.9	.9
B 88	82	8.6	40	294	9.1	40.7
B 89	84	8.8	43	342	10.7	89.6
B 90	71	7.5	17	252	7.9	12.5
B 91	42	5.1	.9	215	7.0	3.1
B 92	82	8.6	40	338	10.1	84.7
B 93	94	9.8	77	341	10.4	88.2
B 94	93	9.7	75	319	9.8	64.1
B 95	50	7.7	1	252	7.9	12.5
B 96	69	7.3	15	276	8.5	27.3
B 97	94	9.8	77	335	10.2	80.6
B 98	56	6.1	3	292	8.9	38.5
B 99	81	8.5	37	322	9.8	68.6
B100	73	7.7	20	247	7.8	9.4
B101	86	9.0	49	333	10.2	77.5
B102	89	9.3	59	338	10.4	86.0

Table 12.--SCORES, GRADE PLACEMENTS, AND PERCENTILE RANKS  
IN PROGRESSIVE ACHIEVEMENT TESTS.(continued)

[G. P. indicates Grade Placement, norms (1937 Revision).  
%ile indicates rank in ninth grade class, Fort Collins  
Junior High School (222 frequencies).]

Ident. No.	Reading Vocabulary			Reading Comp.			Arithmetic Reas.			Arithmetic Fund.		
	Score	G. P.	%ile	Score	G. P.	%ile	Score	G. P.	%ile	Score	G. P.	%ile
B103	77	10.2	80	52	13.0	96	52	13.5	98	77	10.8	98
B104	70	9.5	55	40	9.1	32	39	9.9	41	64	8.8	43
B105	67	9.2	45	41	9.4	36	42	10.3	54	69	9.4	66
B106	67	9.2	45	25	6.3	1	28	8.2	9	57	8.0	10
B107	79	10.4	88	48	10.7	77	46	10.9	81	75	10.3	91



Table 12.--SCORES, GRADE PLACEMENTS, AND PERCENTILE  
RANKS IN PROGRESSIVE ACHIEVEMENT TESTS--Cont.

[G. P. indicates Grade Placement, norms (1937 Revision).  
%ile indicates rank in ninth grade class, Fort Collins  
Junior High School (222 frequencies).]

Ident. No.	Language			Total		
	Score	G.	%ile	Score	G.	%ile
B103	84	8.8	43	342	9.9	89.6
B104	80	8.4	34	293	9.1	39.8
B105	90	9.4	64	309	9.6	51.5
B106	76	8.0	25	253	8.0	14.3
B107	86	9.0	49	334	10.1	79.7

Table 13.--SCORES, GRADE PLACEMENTS, AND PERCENTILE RANKS  
IN PROGRESSIVE ACHIEVEMENT TESTS.

[G. P. indicates Grade Placement, norms (1937 Revision).  
%ile indicates rank in ninth grade class, Fort Collins  
Junior High School (222 frequencies).]

Ident. No.		Reading Vocabulary			Reading Comp.			Arithmetic Reas.			Arithmetic Fund.		
		Score	G. P.	%ile	Score	G. P.	%ile	Score	G. P.	%ile	Score	G. P.	%ile
G 1		71	9.6	59	38	8.7	24	35	9.1	32	64	8.8	43
G 2		70	9.5	55	48	10.7	77	40	10.1	48	70	9.5	70
G 3		79	10.4	88	50	11.0	87	49	12.0	95	78	11.0	99
G 4		77	10.2	80	45	10.2	60	36	9.3	33	66	9.0	55
G 5		61	8.3	27	40	9.1	32	33	8.9	24	66	9.0	55
G 6		74	9.9	69	49	10.9	81	46	10.9	81	71	9.6	75
G 7		74	9.9	69	50	11.0	87	47	11.0	89	73	9.9	84
G 8		78	10.3	83	46	10.4	68	47	11.0	89	72	9.8	80
G 9		60	8.2	25	38	8.7	24	33	8.9	24	66	9.0	55
G 10		76	10.1	77	52	13.0	96	42	10.3	54	68	9.3	62
G 11		65	8.9	37	40	9.1	32	38	9.7	40	60	8.3	30
G 12		70	9.5	55	43	9.8	47	45	10.8	74	73	9.9	84
G 13		79	10.4	88	51	12.0	92	48	11.5	93	62	8.5	34
G 14		74	9.9	69	39	8.9	27	35	9.1	32	55	7.8	14
G 15		88	12.5	100	51	12.0	92	48	11.5	93	71	9.6	75
G 16		70	9.5	55	41	9.4	36	38	9.7	40	64	8.8	43
G 17		79	10.4	88	51	12.0	92	40	10.1	48	68	9.3	62
G 18		73	9.8	65	38	8.7	24	31	8.6	16	45	6.7	4
G 19		75	10.0	73	48	10.7	77	44	10.6	68	71	9.6	75
G 20		60	8.2	25	38	8.7	24	32	8.8	20	50	7.2	8
G 21		71	9.6	59	52	13.0	96	45	10.8	74	71	9.6	75
G 22		86	11.5	99	49	10.9	81	41	10.2	51	72	9.8	80
G 23		60	8.2	25	34	7.7	11	15	6.2	.4	27	5.4	.9
G 24		47	6.9	3	37	8.4	21	30	8.4	13	63	8.6	38
G 25		51	7.3	5	44	10.0	54	38	9.7	40	71	9.6	75
G 26		70	9.5	55	44	10.0	54	31	8.6	16	65	8.9	49
G 27		69	9.4	51	40	9.1	32	37	9.5	36	60	8.3	30
G 28		72	9.7	62	43	10.7	77	45	10.8	74	71	9.6	75
G 29		71	9.6	59	49	10.9	81	44	10.6	68	65	8.9	49
G 30		56	7.8	13	40	9.1	32	53	14.0	98	73	9.9	84
G 31		55	7.7	10	32	7.4	6	34	9.0	29	54	7.6	13
G 32		72	9.7	62	50	11.0	87	43	10.5	61	75	10.3	91
G 33		75	10.0	73	49	10.9	81	49	12.0	95	74	10.1	87
G 34		60	8.2	25	37	8.4	21	29	8.3	11	58	8.1	22

Table 13.--SCORES, GRADE PLACEMENTS, AND PERCENTILE  
RANKS IN PROGRESSIVE ACHIEVEMENT TESTS--Cont.

[G. P. indicates Grade Placement, norms (1937 Revision).  
%ile indicates rank in ninth grade class, Fort Collins  
Junior High School (222 frequencies).]

Ident. No.	Language			Total		
	Score	G. P.	%ile	Score	G. P.	%ile
G 1	91	9.5	67	299	9.1	43.0
G 2	87	9.1	52	315	9.7	58.7
G 3	100	10.4	95	356	10.8	97.6
G 4	100	10.4	95	324	9.9	69.4
G 5	78	8.2	31	278	8.7	28.7
G 6	95	9.9	82	335	10.2	80.6
G 7	98	10.2	90	342	10.4	89.6
G 8	99	10.3	93	341	10.4	88.2
G 9	93	9.7	75	290	9.0	36.2
G 10	98	10.2	90	336	10.3	83.3
G 11	98	10.2	90	291	9.0	28.0
G 12	100	10.4	95	331	10.1	76.1
G 13	93	9.7	75	333	10.2	77.5
G 14	85	8.9	45	288	8.9	34.5
G 15	104	10.9	100	362	11.0	99.0
G 16	88	9.2	54	301	9.3	46.1
G 17	95	9.9	82	333	10.2	77.5
G 18	72	7.6	18	257	8.1	16.1
G 19	89	9.3	59	327	10.0	72.1
G 20	78	8.2	31	266	8.3	21.5
G 21	78	8.2	31	317	9.7	60.4
G 22	101	10.5	97	349	10.6	94.0
G 23	64	6.8	8	200	6.9	1.8
G 24	81	8.5	37	258	8.1	17.5
G 25	68	7.2	13	272	8.4	25.5
G 26	82	8.6	40	292	9.0	38.5
G 27	78	8.2	31	284	8.8	32.3
G 28	104	10.9	100	340	10.2	87.3
G 29	97	10.1	88	326	10.0	71.2
G 30	92	9.6	71	314	9.6	56.9
G 31	65	6.9	10	240	7.6	7.6
G 32	95	9.9	82	335	10.2	80.6
G 33	103	10.8	99	350	10.2	94.9
G 34	81	8.5	37	265	8.2	21.1

Table 13.--SCORES, GRADE PLACEMENTS, AND PERCENTILE RANKS  
IN PROGRESSIVE ACHIEVEMENT TESTS.(continued)

[G. P. indicates Grade Placement, norms (1937 Revision).  
%ile indicates rank in ninth grade class, Fort Collins  
Junior High School (222 frequencies).]

Ident. No.	Reading Vocabulary			Reading Comp.			Arithmetic Reas.			Arithmetic Fund.		
	Score	G. P.	%ile	Score	G. P.	%ile	Score	G. P.	%ile	Score	G. P.	%ile
G 35	73	9.8	65	46	10.4	68	44	10.6	68	73	9.9	84
G 36	51	7.3	5	40	9.1	32	35	9.1	32	60	8.3	30
G 37	69	9.4	51	47	10.5	71	34	9.0	29	72	9.8	80
G 38	69	9.4	51	45	10.2	60	47	11.0	89	71	9.6	75
G 39	88	12.5	100	53	13.5	99	54	14.5	100	77	10.8	98
G 40	61	8.3	27	37	8.4	21	34	9.0	29	71	9.6	75
G 41	70	9.5	55	51	12.0	92	47	11.0	89	71	9.6	75
G 42	67	9.2	45	45	10.2	60	44	10.6	68	64	8.8	43
G 43	55	7.7	10	33	7.5	9	30	8.4	13	60	8.3	30
G 44	64	8.8	33	47	10.5	71	45	10.8	74	56	7.9	18
G 45	58	8.0	18	34	7.7	11	21	7.1	2	48	7.0	6
G 46	66	9.0	40	45	10.2	60	30	8.4	13	58	8.1	22
G 47	65	8.9	37	42	9.6	39	44	10.6	68	68	9.3	62
G 48	67	9.2	37	52	13.0	96	34	9.0	29	68	9.3	62
G 49	78	10.3	83	48	10.7	77	37	9.5	36	74	10.1	87
G 50	65	8.9	37	45	10.2	60	46	10.9	81	76	10.6	95
G 51	65	8.9	37	45	10.2	60	33	8.9	24	42	6.5	3
G 52	76	10.1	77	48	10.7	77	43	10.5	61	76	10.6	95
G 53	72	9.7	62	43	9.8	47	43	10.5	61	62	8.5	34
G 54	67	9.2	45	43	9.8	47	35	9.1	32	68	9.3	62
G 55	71	9.6	59	37	8.4	21	40	10.1	48	69	9.4	66
G 56	75	10.0	73	44	10.0	54	34	9.0	29	71	9.6	75
G 57	52	7.4	7	34	7.7	11	27	8.0	8	59	8.2	25
G 58	65	8.9	37	44	10.0	54	49	12.0	95	70	9.5	70
G 59	68	9.3	48	50	11.0	87	43	10.5	61	72	9.8	80
G 60	74	9.9	69	43	9.8	47	32	8.8	20	54	7.6	13
G 61	59	8.1	21	48	10.7	77	46	10.9	81	62	8.5	34
G 62	68	9.3	48	44	10.0	54	34	9.0	29	59	8.2	25
G 63	59	8.1	21	39	8.9	27	32	8.8	20	63	8.6	38
G 64	55	7.7	10	36	8.1	15	33	8.9	24	62	8.5	34
G 65	76	10.1	77	46	10.4	68	46	10.9	81	72	9.8	80
G 66	60	8.2	25	40	9.1	32	45	10.8	74	65	8.9	49
G 67	71	9.6	59	42	9.6	39	43	10.5	61	71	9.6	75
G 68	66	9.0	40	38	8.7	24	46	10.9	81	73	9.9	84



Table 13.--SCORES, GRADE PLACEMENTS, AND PERCENTILE RANKS  
IN PROGRESSIVE ACHIEVEMENT TESTS--Cont.

[G. P. indicates Grade Placement, norms (1937 Revision).  
%ile indicates rank in ninth grade class, Fort Collins  
Junior High School (222 frequencies).]

Ident. No.	Language			Total		
	Score	G. P.	%ile	Score	G. P.	%ile
G 35	95	9.9	82	331	10.1	76.1
G 36	81	8.5	37	267	8.3	22.0
G 37	77	8.1	27	299	9.2	43.0
G 38	91	9.5	67	323	9.9	69.0
G 39	90	9.4	64	362	11.0	99.0
G 40	82	8.6	40	285	8.8	32.8
G 41	98	10.2	90	337	10.3	84.7
G 42	80	8.4	34	300	9.3	44.8
G 43	80	8.4	34	278	8.1	17.5
G 44	76	8.0	25	288	8.9	34.5
G 45	78	8.2	31	239	7.6	7.2
G 46	77	8.1	27	276	8.5	27.3
G 47	89	9.3	59	308	9.4	51.0
G 48	99	10.3	93	320	9.8	65.0
G 49	89	9.3	59	326	10.0	71.2
G 50	93	9.7	75	325	10.0	70.3
G 51	76	8.0	25	261	8.2	19.7
G 52	90	9.4	64	333	10.2	77.5
G 53	90	9.4	64	310	9.5	53.3
G 54	78	8.2	31	291	9.0	37.1
G 55	100	10.4	95	317	9.7	60.4
G 56	94	9.8	77	318	9.8	63.6
G 57	78	8.2	31	250	7.9	10.8
G 58	91	9.5	67	317	9.7	60.4
G 59	102	10.6	98	335	10.2	80.6
G 60	92	9.6	71	295	9.0	44.2
G 61	88	9.2	54	303	9.3	48.4
G 62	95	9.9	82	300	9.3	44.8
G 63	80	8.4	34	273	8.4	26.0
G 64	83	8.7	42	269	8.3	23.7
G 65	89	9.3	59	329	10.1	73.9
G 66	99	10.3	93	309	9.3	51.5
G 67	94	9.8	77	323	9.9	69.0
G 68	99	10.3	93	322	9.9	68.6

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Table 13.--SCORES, GRADE PLACEMENTS, AND PERCENTILE RANKS  
 IN PROGRESSIVE ACHIEVEMENT TESTS.(continued)

[G. P. indicates Grade Placement, norms (1937 Revision).  
 %ile indicates rank in ninth grade class, Fort Collins  
 Junior High School (222 frequencies).]

Ident. No.	Reading Vocabulary			Reading Compl			Arithmetic Reas.			Arithmetic Fund.		
	Score	G. P.	%ile	Score	G. P.	%ile	Score	G. P.	%ile	Score	G. P.	%ile
G 69	57	7.9	15	47	10.5	71	44	10.6	68	66	9.0	55
G 70	49	7.1	4	44	10.0	54	32	8.8	20	59	8.2	25
G 71	58	8.0	18	44	10.0	54	34	9.0	29	61	8.4	31
G 72	66	9.0	40	50	11.0	87	40	10.1	48	69	9.4	66
G 73	64	8.8	33	46	10.4	68	38	9.7	40	76	10.6	95
G 74	72	9.7	62	48	10.7	77	35	9.1	32	66	9.0	55
G 75	76	10.1	77	52	13.0	96	45	10.8	74	63	8.6	38
G 76	69	9.4	51	45	10.2	60	47	11.0	89	74	10.1	84
G 77	79	10.4	88	45	10.2	60	47	11.0	89	72	9.8	80
G 78	63	8.6	30	43	9.8	47	32	8.8	20	50	8.1	22
G 79	62	8.5	28	41	9.4	36	33	8.9	24	70	9.5	70
G 80	59	8.1	21	40	9.1	32	46	10.8	81	76	10.6	95
G 81	75	10.0	73	52	13.0	96	44	10.6	68	69	9.4	66
G 82	47	6.9	3	32	7.4	6	38	9.7	40	47	6.9	5
G 83	77	10.2	80	48	10.7	77	40	10.1	48	65	8.9	49
G 84	67	9.2	45	46	10.4	68	29	8.3	11	45	6.7	4
G 85	76	10.1	77	49	10.9	81	45	10.8	74	68	9.3	62
G 86	54	7.6	8	41	9.4	36	19	6.8	1	63	8.6	38
G 87	71	9.6	59	45	10.2	60	40	10.1	48	66	9.0	55
G 88	59	8.1	21	35	7.9	12	34	9.0	29	68	9.3	62
G 89	54	7.6	8	48	10.7	77	43	10.5	61	60	8.3	30
G 90	73	9.8	65	43	9.8	47	42	10.3	54	69	9.4	66
G 91	56	7.8	13	36	8.1	15	25	7.7	5	57	8.0	20
G 92	79	10.4	88	46	10.4	68	44	10.6	68	76	10.6	95
G 93	74	9.9	69	44	10.0	54	38	9.7	40	63	8.6	38
G 94	65	8.9	37	37	8.4	21	32	8.8	20	57	8.0	20
G 95	65	8.9	37	36	8.1	15	26	7.9	5	64	8.8	43
G 96	80	10.5	90	49	10.9	81	47	11.0	89	75	10.3	91
G 97	83	10.9	98	52	13.0	96	50	12.5	96	74	10.1	87
G 98	71	9.6	59	46	10.4	68	47	11.0	89	73	9.9	84
G 99	56	7.8	13	37	8.4	21	27	8.0	8	53	7.5	12
G100	51	7.3	5	28	6.7	3	23	7.4	3	35	6.0	2
G101	79	10.4	88	51	12.0	92	51	13.0	97	76	10.6	95
G102	44	6.6	2	29	6.9	4	24	7.6	4	64	8.8	43

Table 13.--SCORES, GRADE PLACEMENTS, AND PERCENTILE  
RANKS IN PROGRESSIVE ACHIEVEMENT TESTS.--Cont.

[G. P. indicates Grade Placement, norms (1937 Revision).  
%ile indicates rank in ninth grade class, Fort Collins  
Junior High School (222 frequencies).]

Ident. No.	Language			Total		
	Score	G. P.	%ile	Score	G. P.	%ile
G 69	69	7.3	15	283	8.7	30.9
G 70	66	7.0	11	250	8.0	10.8
G 71	74	7.8	22	271	8.4	25.1
G 72	89	9.3	59	314	9.3	56.9
G 73	93	9.7	75	317	9.7	60.4
G 74	94	9.8	77	315	9.7	58.7
G 75	101	10.5	97	337	10.3	34.7
G 76	82	8.6	40	317	9.7	60.4
G 77	99	10.3	93	342	10.4	89.6
G 78	90	9.4	64	286	8.8	33.2
G 79	89	9.3	59	295	9.1	41.2
G 80	87	9.1	52	308	9.4	51.0
G 81	96	10.0	86	336	10.2	83.3
G 82	68	7.2	13	232	7.2	4.0
G 83	90	9.4	64	320	9.8	65.0
G 84	73	7.7	20	260	8.1	18.8
G 85	90	9.4	64	328	10.0	72.5
G 86	75	7.9	24	252	7.9	12.5
G 87	90	9.4	64	312	9.6	55.5
G 88	95	9.9	82	291	8.9	37.1
G 89	96	10.0	86	301	9.3	46.1
G 90	103	10.8	99	330	10.1	74.8
G 91	85	8.9	45	259	8.1	18.4
G 92	101	10.5	97	345	10.5	92.2
G 93	96	10.0	86	315	9.6	58.7
G 94	86	9.0	49	277	8.5	28.2
G 95	87	9.1	52	278	8.7	28.7
G 96	99	10.3	93	350	10.6	94.9
G 97	98	10.2	90	357	10.9	98.1
G 98	92	9.6	71	329	10.1	73.9
G 99	57	6.2	4	230	7.1	5.3
G100	68	7.2	13	205	6.9	4.4
G101	89	9.3	59	346	10.5	92.7
G102	67	7.1	12	228	7.8	5.3

Table 13--SCORES, GRADE PLACEMENTS, AND PERCENTILE  
RANKS IN PROGRESSIVE ACHIEVEMENT TESTS--Cont.

[G. P. indicates Grade Placement, norms (1937 Revision).  
%ile indicates rank in ninth grade class, Fort Collins  
Junior High School (222 frequencies).]

Ident. No.	Reading Vocabulary			Reading Comp.			Arithmetic Reas.			Arithmetic Fund.		
	Score	G. P.	%ile	Score	G. P.	%ile	Score	G. P.	%ile	Score	G. P.	%ile
G103	50	8.2	25	46	10.4	68	50	12.5	96	75	10.3	91
G104	60	8.2	25	38	8.7	24	29	8.3	11	67	9.1	57
G105	64	8.8	33	40	9.1	32	45	10.8	74	56	7.9	18
G106	74	9.9	69	41	9.4	36	24	7.6	4	41	6.4	2
G107	77	10.2	80	46	10.4	68	43	10.5	61	70	9.5	70
G108	52	7.4	7	49	10.9	81	40	10.1	48	65	8.9	49
G109	76	10.1	77	41	9.4	36	33	8.9	24	73	9.9	84
G110	70	9.5	55	51	12.0	92	34	9.0	29	75	10.3	91
G111	78	10.3	83	49	10.9	81	48	11.5	93	79	11.5	100
G112	64	8.8	33	38	8.7	24	29	8.3	11	51	2.3	10
G113	44	6.6	2	43	9.8	47	37	9.5	36	70	9.5	70
G114	63	8.6	30	37	8.4	21	31	8.6	16	56	7.9	18
G115	78	10.3	83	51	12.0	92	48	11.5	93	77	10.8	98



Table 13.--SCORES, GRADE PLACEMENTS, AND PERCENTILE  
RANKS IN PROGRESSIVE ACHIEVEMENT TESTS--Cont.

[G. P. indicates Grade Placement, norms (1937 Revision).  
%ile indicates rank in ninth grade class, Fort Collins  
Junior High School (222 frequencies).]

Ident. No.	Language			Total		
	Score	G. P.	%ile	Score	G. P.	%ile
G103	86	9.0	49	317	9.7	60.4
G104	89	9.3	59	203	8.7	30.9
G105	88	9.2	54	293	8.9	39.8
G106	90	9.4	64	270	8.3	24.2
G107	96	10.0	86	332	10.1	77.1
G108	94	9.8	77	300	9.3	44.8
G109	92	9.6	71	315	9.7	58.7
G110	81	8.5	37	311	9.4	54.6
G111	96	10.0	86	350	10.6	94.9
G112	82	8.6	40	264	8.3	20.2
G113	79	8.3	32	273	8.4	26.0
G114	87	9.1	52	274	8.5	26.9
G115	101	10.5	52	355	10.8	97.2

A P P E N D I X    E.

## Tables

14. Computation of Discrepancy  
Classification (Progressive  
Achievement Total Score and  
Mental Maturity Total. BOYS
  
15. Computation of Discrepancy  
Classification (Progressive  
Achievement Total Score and  
Mental Maturity Total. GIRLS

- - - - -

Table 14.-- COMPUTATION OF DISCREPANCY CLASSIFICATION

$M - \bar{M}$  is individual score in California Mental Maturity Test minus the mean score for the group.

$r \frac{\sigma_A}{\sigma_M}$  is correlation times standard deviation of the Progressive Achievement Test divided by the standard deviation of the Mental Maturity Test.  
 Est. A is Estimated Achievement of the individual.  
 A- Est. A is the individual's achievement score minus the estimated achievement.  
 B indicates boys.

Ident. No.	$M - \bar{M}$	$r \frac{\sigma_A}{\sigma_M}$	Est. A	A- Est. A	Discrep- ancy Class.
B 1	22.2	49.73	347.41	50.41	1
B 2	21.8	48.83	248.85	.85	0
B 3	9.2	20.61	318.29	32.71	1
B 4	9.8	21.95	275.73	5.73	0
B 5	1.2	2.69	300.37	1.37	0
B 6	14.8	33.15	264.53	15.53	0
B 7	.2	.45	298.13	2.87	0
B 8	5.2	11.65	309.33	23.67	0
B 9	13.2	29.57	327.25	15.75	0
B 10	10.8	24.19	273.49	16.49	0
B 11	3.8	8.51	289.17	21.83	0
B 12	34.2	75.61	373.29	10.29	0
B 13	18.2	39.77	337.45	2.55	0
B 14	13.2	29.57	327.25	6.25	0
B 15	1.8	4.03	293.65	7.65	0
B 16	6 .2	13.89	311.57	8.57	0
B 17	14.2	31.81	329.49	24.49	0
B 18	16.2	36.29	333.97	12.03	0
B 19	8.8	19.71	277.97	24.97	0
B 20	7.8	17.47	280.21	1.79	0
B 21	3.8	8.51	289.17	54.17	1
B 22	.8	1.79	295.89	5.11	0
B 23	17.2	38.53	336.21	2.79	0
B 24	2.2	4.93	302.61	11.39	0
B 25	.2	.45	298.13	8.87	0
B 26	10.2	22.85	320.53	14.47	0
B 27	9.8	21.95	275.73	32.73	1
B 28	7.2	16.13	313.81	14.19	0
B 29	6.8	15.23	282.45	32.45	1
B 30	14.2	31.81	329.49	8.49	0
B 31	13.8	30.91	266.77	.23	0
B 32	.8	1.79	295.89	43.11	1



Table 14.-- COMPUTATION OF DISCREPANCY CLASSIFICATION  
--Continued

$M - \bar{M}$  is individual score in California Mental Maturity Test minus the mean score for the group.

$r \frac{\sigma A}{\sigma M}$  is correlation times standard deviation of the

Progressive Achievement Test divided by the standard deviation of the Mental Maturity Test.

Est. A is Estimated Achievement of the individual.

A- Est. A is the individual's achievement score minus the estimated achievement.

B indicates boys.

Ident. No.	$M - \bar{M}$	$r \frac{\sigma A}{\sigma M}$	Est. A	A- Est. A	Discrep- ancy Class.
B 33	.8	1.79	295.89	14.11	0
B 34	10.2	22.85	320.53	36.47	1
B 35	8.8	12.99	284.69	62.69	2
B 36	6.8	15.23	282.45	22.45	0
B 37	6.2	13.89	311.57	60.57	2
B 38	15.8	35.39	262.29	27.29	0
B 39	29.8	66.75	230.93	3.93	0
B 40	4.2	9.41	307.09	6.91	0
B 41	6.8	15.23	282.45	15.45	0
B 42	8.2	18.37	316.05	7.05	0
B 43	18.2	40.77	338.45	2.45	0
B 44	6.8	15.23	282.45	36.55	1
B 45	10.2	22.85	320.58	.47	0
B 46	20.2	45.25	342.93	12.98	0
B 47	26.8	60.03	237.65	18.35	0
B 48	12.2	27.33	325.01	2.99	0
B 49	8.2	18.37	316.05	4.95	0
B 50	5.8	12.99	284.69	28.31	1
B 51	2.2	4.93	302.61	4.39	0
B 52	21.2	47.49	345.17	.17	0
B 53	17.2	38.53	336.21	6.21	0
B 54	4.2	9.41	307.09	20.09	0
B 55	18.8	42.11	255.57	74.57	2
B 56	7.8	17.47	280.21	31.79	1
B 57	26.8	60.03	237.65	32.65	1
B 58	4.2	9.41	307.09	50.09	1
B 59	5.8	12.99	284.69	1.69	0
B 60	3.8	8.51	289.17	49.17	1
B 61	9.8	21.95	275.73	12.27	0
B 62	6.8	15.23	282.45	2.45	0
B 63	19.8	44.35	253.33	98.33	3
B 64	.2	.45	298.13	56.13	2



Table 14.-- COMPUTATION OF DISCREPANCY CLASSIFICATION--  
Continued

$\bar{M}-\bar{M}$  is individual score in California Mental Maturity Test minus the mean score for the group.

$r \frac{\sigma_A}{\sigma_M}$  is correlation times standard deviation of the Progressive Achievement Test divided by the standard deviation of the Mental Maturity Test.

Est. A is Estimated Achievement of the individual.

A- Est. A is the individual's achievement score minus the estimated achievement.

B indicates boys.

Ident. No.	$\bar{M}-\bar{M}$	$r \frac{\sigma_A}{\sigma_M}$	Est. A	A- Est. A	Discrep- ancy Class.
B 65	14.2	31.81	329.49	4.51	0
B 66	12.2	27.31	324.99	16.01	0
B 67	7.2	16.13	313.81	21.81	0
B 68	12.2	27.33	325.01	23.01	0
B 69	.2	.45	298.13	8.13	0
B 70	4.2	9.41	307.09	27.91	0
B 71	18.2	40.77	338.45	17.45	0
B 72	6.2	13.89	311.57	37.43	1
B 73	19.8	44.35	263.33	.33	0
B 74	10.2	22.85	320.53	3.47	0
B 75	14.8	33.15	264.53	12.53	0
B 76	3.2	7.17	304.85	38.15	1
B 77	20.8	46.59	251.09	12.91	0
B 78	7.2	16.13	313.81	3.19	0
B 79	9.2	20.61	318.29	51.29	1
B 80	.2	.45	298.13	14.87	0
B 81	5.2	11.65	309.33	29.33	1
B 82	6.2	13.89	311.57	5.57	0
B 83	14.2	31.81	329.49	19.49	0
B 84	6.8	15.23	282.45	16.55	0
B 85	5.2	11.65	309.33	32.67	1
B 86	16.8	37.63	260.05	45.05	1
B 87	36.8	82.43	215.25	51.25	1
B 88	6.2	13.89	311.57	17.57	0
B 89	.2	.45	298.13	43.87	1
B 90	6.8	15.23	282.45	30.45	1
B 91	6.8	15.23	282.45	67.45	2
B 92	.8	1.79	295.89	42.11	1
B 93	10.2	22.85	320.53	20.47	0
B 94	8.8	19.71	277.97	41.03	1
B 95	5.8	12.99	284.69	32.69	1
B 96	.2	.45	298.13	22.13	0



Table 14.-- COMPUTATION OF DISCREPANCY CLASSIFICATION--  
Continued

$\bar{M}-\bar{M}$  is individual score in California Mental Maturity Test minus the mean score for the group.

$r \frac{\sigma_A}{\sigma_M}$  is correlation times standard deviation of the Progressive Achievement Test divided by the standard deviation of the Mental Maturity Test.

Est. A is Estimated Achievement of the individual.

A- Est. A is the individual's achievement score minus the estimated achievement.

B indicates boys.]

Ident. No.	$\bar{M}-\bar{M}$	$r \frac{\sigma_A}{\sigma_M}$	Est. A	A- Est. A	Discrepancy Class.
B 96	.2	.45	298.13	22.13	0
B 97	16.2	36.29	333.97	1.03	0
B 98	10.2	22.85	320.53	28.53	1
B 99	10.2	22.85	320.53	1.47	0
B100	6.8	15.23	282.45	35.45	1
B101	13.2	29.57	327.25	5.75	0
B102	27.2	60.93	358.61	20.61	0
B103	10.2	22.85	320.53	21.47	0
B104	1.2	2.69	300.37	7.37	0
B105	5.8	12.99	284.69	24.31	1
B106	3.2	7.17	304.85	51.85	1
B107	25.2	56.45	354.13	20.13	0



Table 15.-- COMPUTATION OF DISCREPANCY CLASSIFICATION

$M - \bar{M}$  is individual score in California Mental Maturity Test minus the mean score for the group.

$r \frac{\sigma_A}{\sigma_M}$  is correlation times standard deviation of the Progressive Achievement Test divided by the standard deviation of the Mental Maturity Test.

Est. A is Estimated Achievement of the individual.

A- Est. A is the individual's achievement score minus the estimated achievement.

G indicates girls.]

Ident. No.	$M - \bar{M}$	$r \frac{\sigma_A}{\sigma_M}$	Est. A	A- Est. A	Discrep- ancy Class.
G 1	14.8	33.15	264.53	34.47	1
G 2	5.2	11.65	309.33	5.67	0
G 3	13.2	29.57	327.19	28.81	1
G 4	4.2	9.4	307.08	16.92	0
G 5	18.8	42.1	255.58	22.42	0
G 6	18.2	40.77	338.45	3.45	0
G 7	.2	.45	298.13	43.87	1
G 8	17.2	38.52	336.20	4.80	0
G 9	18.8	42.11	255.57	34.43	1
G 10	2.8	6.27	291.41	44.59	1
G 11	16.8	37.63	260.05	30.95	1
G 12	9.2	20.61	318.29	12.71	0
G 13	3.2	7.17	304.85	28.15	1
G 14	2.2	4.93	302.61	14.61	0
G 15	23.2	51.97	349.65	12.35	0
G 16	11.2	25.09	322.77	21.77	0
G 17	15.2	34.05	331.73	1.27	0
G 18	9.8	21.95	275.73	18.73	0
G 19	4.2	9.41	307.09	19.91	0
G 20	2.2	4.93	302.61	36.61	1
G 21	2.8	6.27	291.41	25.59	0
G 22	13.2	29.57	327.25	21.75	0
G 23	20.8	46.59	251.09	51.09	1
G 24	8.8	19.71	277.97	19.97	0
G 25	7.8	17.47	280.21	8.21	0
G 26	3.8	8.51	289.17	2.83	0
G 27	2.2	4.93	302.61	18.61	0
G 28	5.2	11.65	309.33	30.67	1
G 29	3.8	8.51	289.17	36.83	1
G 30	1.8	4.03	293.65	20.35	0
G 31	13.8	30.91	266.77	26.77	0
G 32	11.2	25.09	322.77	12.23	0
G 33	3.2	7.17	304.85	45.15	1



Table 15.-- COMPUTATION OF DISCREPANCY CLASSIFICATION  
(CONTINUED)

$\bar{M}-\bar{M}$  is individual score in California Mental Maturity Test minus the mean score for the group.

$r \frac{\sigma A}{\sigma M}$  is correlation times standard deviation of the

Progressive Achievement Test divided by the standard deviation of the Mental Maturity Test.

Est. A is Estimated Achievement of the individual.

A- Est. A is the individual's achievement score minus the estimated achievement.

G indicates girls.]

Ident. No.	$\bar{M}-\bar{M}$	$r \frac{\sigma A}{\sigma M}$	Est. A	A- Est. A	Discrep- ancy Class.
G 34	15.8	35.39	262.29	2.71	0
G 35	2.2	4.93	302.61	28.39	1
G 36	7.8	17.47	280.21	13.21	0
G 37	.2	4.48	302.16	3.16	0
G 38	5.8	12.99	284.69	38.31	1
G 39	21.2	47.49	345.17	16.83	0
G 40	26.3	60.03	237.65	47.35	1
G 41	5.8	12.99	284.69	52.31	1
G 42	2.2	4.93	302.61	2.61	0
G 43	15.3	35.39	262.29	4.29	0
G 44	1.8	4.03	293.65	5.65	0
G 45	.8	1.79	295.89	56.89	2
G 46	8.8	19.71	277.97	1.97	0
G 47	1.2	2.69	300.37	7.63	0
G 48	4.2	9.41	307.09	12.91	0
G 49	4.2	9.41	307.09	18.91	0
G 50	1.2	2.69	300.37	24.63	0
G 51	11.3	26.43	271.25	10.25	0
G 52	7.2	16.13	313.31	19.19	0
G 53	2.2	4.93	302.61	7.39	0
G 54	11.2	25.09	322.77	31.77	1
G 55	5.2	11.65	309.33	7.67	0
G 56	6.8	15.23	282.45	35.55	1
G 57	2.8	6.27	291.41	41.41	1
G 58	.2	.45	298.13	18.87	0
G 59	.8	1.79	295.89	39.11	1
G 60	4.8	10.75	286.93	9.07	0
G 61	2.2	4.93	302.61	.39	0
G 62	1.8	4.03	293.65	6.35	0
G 63	7.8	17.47	280.21	7.21	0
G 64	12.8	28.67	269.01	.01	0
G 65	10.2	22.85	320.53	8.47	0
G 66	.2	.45	298.13	10.87	0



Table 15.-- COMPUTATION OF DISCREPANCY CLASSIFICATION  
(CONTINUED)

$\bar{M}-\bar{M}$  is individual score in California Mental Maturity Test minus the mean score for the group.

$r \frac{\sigma A}{\sigma M}$  is correlation times standard deviation of the

Progressive Achievement Test divided by the standard deviation of the Mental Maturity Test.

Est. A is Estimated Achievement of the individual.

A- Est. A is the individual's achievement score minus the estimated achievement.

G indicates girls. ]

Ident. No.	$\bar{M}-\bar{M}$	$r \frac{\sigma A}{\sigma M}$	Est. A	A- Est.A	Discrep- ancy Class.
G 67	2.2	4.93	302.61	20.39	0
G 68	1.2	2.69	300.37	21.63	0
G 69	9.8	21.95	275.73	7.27	0
G 70	18.8	42.11	255.57	5.57	0
G 71	17.8	39.87	257.81	13.19	0
G 72	.2	.45	298.13	15.87	0
G 73	1.2	2.69	300.37	16.63	0
G 74	14.2	31.81	329.49	14.49	0
G 75	5.2	11.65	309.33	27.67	0
G 76	1.2	2.69	300.37	16.63	0
G 77	8.2	18.37	316.05	25.95	0
G 78	2.2	4.93	302.61	16.61	0
G 79	11.8	26.43	271.25	23.75	0
G 80	2.8	6.27	291.41	16.59	0
G 81	11.2	25.09	322.77	13.23	0
G 82	25.8	57.79	239.89	7.89	0
G 83	5.2	11.65	309.33	10.67	0
G 84	6.2	13.39	311.57	51.57	1
G 85	5.2	11.65	309.33	18.67	0
G 86	31.8	71.23	226.45	25.55	0
G 87	7.8	17.47	280.21	31.79	1
G 88	23.8	53.31	244.37	46.63	1
G 89	3.8	8.51	289.17	11.83	0
G 90	2.2	4.93	302.61	27.39	0
G 91	21.8	48.83	248.85	10.15	0
G 92	1.8	4.03	293.65	51.35	1
G 93	6.8	15.23	282.45	32.55	1
G 94	3.2	7.17	304.85	27.85	0
G 95	18.8	42.11	255.57	22.43	0
G 96	9.2	20.61	318.29	31.71	1
G 97	18.2	40.77	338.45	17.55	0
G 98	.2	.45	298.13	30.87	1
G 99	9.8	21.95	275.73	45.73	1



Table 15.-- COMPUTATION OF DISCREPANCY CLASSIFICATION  
(CONTINUED)

[  $M - \bar{M}$  is individual score in California Mental Maturity Test minus the mean score for the group.

$r \frac{\sigma A}{\sigma M}$  is correlation times standard deviation of the

Progressive Achievement Test divided by the standard deviation of the Mental Maturity Test.

Est. A is Estimated Achievement of the individual.

A- Est. A is the individual's achievement score minus the estimated achievement.

G indicates girls.]

Ident. No.	$M - \bar{M}$	$r \frac{\sigma A}{\sigma M}$	Est. A	A- Est. A	Discrep- ancy Class.
G 100	2.28	51.07	246.61	41.61	1
G 101	14.2	31.81	329.49	16.51	0
G 102	29.8	66.75	230.93	2.93	0
G 103	5.8	12.99	284.69	32.31	1
G 104	13.8	30.91	266.77	16.23	0
G 105	13.8	30.91	266.77	26.23	0
G 106	6.2	13.89	311.57	41.57	1
G 107	2.2	4.93	302.61	29.49	1
G 108	8.8	19.71	277.97	22.03	0
G 109	4.2	9.41	307.09	7.91	0
G 110	4.8	10.75	286.93	24.07	0
G 111	6.2	13.89	311.57	38.43	1
G 112	5.8	12.99	284.69	20.69	0
G 113	3.8	8.51	289.17	16.17	0
G 114	11.8	26.43	271.25	2.75	0
G 115	.8	1.79	295.89	59.11	2

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A P P E N D I X   F

Table

16. Computation of Discrepancy  
Classification, Reading  
Vocabulary. BOYS
  
17. Computation of Discrepancy  
Classification, Reading  
Vocabulary. GIRLS



Table 16.--Computation of Discrepancy Classification  
Reading Vocabulary

Ident. No.	M L	M L	(M <sub>L</sub> - $\bar{M}$ ) L	$r_{OML}^{OAV}$	(M <sub>L</sub> - $\bar{M}$ ) L L	Est. A <sub>V</sub>	A <sub>V</sub>	A <sub>V</sub> - Est. A <sub>V</sub>	Discr. Class.
B 1	132		24.54		12.12	82.06	69	13.06	1
B 2	78		29.46		14.55	55.39	52	3.39	0
B 3	122		14.54		7.18	77.12	78	.88	0
B 4	91		16.46		8.13	61.81	58	3.81	0
B 5	102		5.46		2.70	67.24	60	7.24	0
B 6	89		18.46		9.12	60.82	29	31.82	3
B 7	104		3.46		1.71	68.23	43	25.23	3
B 8	109		1.54		.76	70.70	46	24.70	2
B 9	117		9.54		4.71	74.65	43	31.65	3
B 10	96		11.46		5.66	64.28	57	7.28	0
B 11	85		22.46		11.10	58.84	67	8.16	1
B 12	143		35.54		17.56	87.50	79	8.50	1
B 13	125		17.54		8.66	78.60	82	3.40	0
B 14	124		16.54		8.17	78.11	78	.11	0
B 15	108		.54		.27	70.21	75	4.79	0
B 16	101		6.46		3.19	66.75	71	4.25	0
B 17	127		19.54		9.65	79.59	77	2.59	0
B 18	130		22.54		11.13	81.07	83	3.93	0
B 19	103		4.46		3.19	66.75	64	2.75	0
B 20	93		14.46		7.14	62.80	65	2.20	0
B 21	103		4.46		3.19	66.75	57	9.75	1
B 22	113		5.54		2.74	72.68	69	3.68	0
B 23	127		19.54		9.65	79.59	81	1.41	0
B 24	109		1.54		.76	70.70	75	4.30	0
B 25	104		3.46		1.71	68.23	70	1.77	0
B 26	119		11.54		5.70	75.64	78	2.36	0
B 27	94		13.46		6.65	63.29	58	5.29	0
B 28	114		6.54		3.23	73.17	83	9.83	1
B 29	98		9.46		4.67	65.27	58	7.27	0
B 30	125		17.54		8.66	78.60	68	10.60	1
B 31	91		16.46		8.13	61.81	70	1.19	0
B 32	108		.54		.27	70.21	80	9.79	1
B 33	117		9.54		4.71	74.65	75	.35	0
B 34	127		19.54		9.65	79.59	81	1.41	0
B 35	92		15.46		7.64	62.30	63	.70	0
B 36	95		12.46		6.16	63.78	58	5.78	0
B 37	106		1.46		.72	69.22	57	12.22	1
B 38	93		14.46		7.14	62.80	61	1.80	0
B 39	69		38.46		19.00	50.94	56	5.06	0
B 40	108		.54		.27	70.21	66	4.21	0
B 41	101		6.46		3.19	66.75	63	3.75	0
B 42	119		11.54		5.70	75.64	76	.36	0
B 43	133		25.54		12.62	82.56	82	.56	0
B 44	105		2.46		1.22	68.72	67	1.72	0
B 45	123		15.54		7.68	77.62	73	4.62	0
B 46	128		20.54		10.15	80.09	75	5.09	0



Table 16.--Computation of Discrepancy Classification  
Reading Vocabulary.--Cont.

Ident. No.	M L	M L	$(\bar{M}-\bar{M})$ L L	$r_{\text{OVL}}^{\text{OAV}}$	$(\bar{M}-\bar{M})$ L L	Est. A <sub>V</sub>	A <sub>V</sub> -A <sub>V</sub> -Est. A <sub>V</sub>	Discr. Class.
B 47	76		31.46	15.54	54.40	52	2.40	0
B 48	125		17.54	8.66	78.60	74	4.60	0
B 49	115		7.54	3.72	73.66	80	6.34	0
B 50	97		10.46	5.17	64.77	68	3.23	0
B 51	111		3.54	1.75	71.69	73	1.31	0
B 52	134		26.54	13.11	83.05	81	2.05	0
B 53	139		31.54	15.58	83.52	83	2.52	0
B 54	106		1.46	.72	69.22	67	2.22	0
B 55	79		28.46	14.06	55.88	34	21.88	2
B 56	96		11.46	5.66	64.28	76	11.72	1
B 57	78		29.46	14.55	55.39	34	21.39	2
B 58	108		.54	.27	70.21	56	14.21	0
B 59	100		7.46	3.69	66.25	58	8.25	1
B 60	101		6.46	3.19	66.75	63	3.75	0
B 61	93		14.46	7.14	62.80	64	1.20	0
B 62	95		12.46	6.16	63.78	66	2.22	0
B 63	80		27.46	13.57	56.37	49	7.37	0
B 64	109		1.54	.76	70.70	62	8.70	1
B 65	115		7.54	3.72	73.66	79	5.34	0
B 66	120		12.54	6.19	76.13	74	2.13	0
B 67	112		4.54	2.24	72.18	72	.18	0
B 68	118		10.54	5.21	75.15	72	3.15	0
B 69	101		6.46	3.19	66.75	65	1.75	0
B 70	117		9.54	4.71	74.65	86	11.35	1
B 71	127		19.54	9.65	79.59	80	.41	0
B 72	123		15.54	7.68	77.62	81	3.38	0
B 73	82		25.46	12.58	57.36	56	1.36	0
B 74	122		14.54	7.18	77.12	77	.12	0
B 75	94		13.46	6.65	63.29	56	7.29	0
B 76	108		.54	.27	70.21	73	2.79	0
B 77	87		20.46	10.11	59.83	62	2.17	0
B 78	122		14.54	7.18	77.12	83	5.88	0
B 79	111		3.54	1.75	71.69	68	3.69	0
B 80	105		2.46	1.22	68.72	69	.28	0
B 81	110		2.54	1.25	71.19	74	2.81	0
B 82	109		1.54	.76	70.70	66	4.70	0
B 83	123		15.54	7.68	77.62	73	4.62	0
B 84	101		6.46	3.19	66.75	66	.75	0
B 85	114		6.54	3.23	73.17	82	8.83	1
B 86	91		16.46	8.13	61.81	47	14.81	1
B 87	61		46.46	22.95	46.99	24	22.99	2
B 88	107		.46	.23	69.71	81	11.29	1
B 89	109		1.54	.76	70.70	83	12.30	1
B 90	100		7.46	3.69	66.25	59	7.25	0
B 91	97		10.46	5.17	64.77	64	.77	0
B 92	109		1.54	.76	70.70	79	8.30	1

Table 16.--Computation of Discrepancy Classification  
Reading Vocabulary--Cont.

Ident. No.	M L	$(M_L - \bar{M}_L)$	$r \frac{\sigma_{AV}}{\sigma_{M_L}}$	$(M_L - \bar{M}_L)$	Est. $A_V$	$A_V$	$A_V - \text{Est. } A_V$	Discr. Class.
B 93	116	8.54	4.22	74.16	80	5.84	0	
B 94	103	4.46	3.19	66.75	60	6.75	0	
B 95	104	3.46	1.71	68.23	59	9.23	1	
B 96	108	.54	.27	70.21	68	2.21	0	
B 97	119	11.54	5.70	75.64	75	2.64	0	
B 98	108	.54	.27	70.21	67	3.21	0	
B 99	115	7.54	3.72	73.66	75	1.34	0	
B 100	100	7.46	3.69	66.25	60	6.25	0	
B 101	124	16.54	8.17	78.11	79	.89	0	
B 102	133	25.54	12.62	82.56	81	1.56	0	
B 103	122	14.54	7.18	77.12	77	.12	0	
B 104	103	4.46	3.19	66.75	70	3.25	0	
B 105	104	3.46	1.71	68.23	67	1.23	0	
B 106	109	1.54	.76	70.70	67	3.70	0	
B 107	131	23.54	11.63	81.57	79	2.57	0	



Table 17.--Computation of Discrepancy Classification  
Reading Vocabulary

Ident. No.	M L	M L	$(M - \bar{M})$ L	$r \frac{\sigma_{AV}}{\sigma_{ML}}$	$(M - \bar{M})$ L	Est. $A_V$	$A_V$	$A_V - \text{Est. } A_V$	Discr. Class.
G 1	94		13.46	6.65	63.29	71	7.71	0	
G 2	114		6.54	3.23	73.17	70	3.17	0	
G 3	118		10.54	5.21	57.15	79	3.85	0	
G 4	110		2.54	1.25	71.19	77	5.81	0	
G 5	84		23.46	11.59	58.35	61	2.65	0	
G 6	126		18.54	9.16	79.10	74	5.10	0	
G 7	112		4.54	2.24	72.18	74	1.82	0	
G 8	124		16.54	8.17	78.11	78	.11	0	
G 9	89		18.46	9.12	60.82	60	.82	0	
G 10	114		6.54	3.23	73.17	76	2.83	0	
G 11	96		11.46	5.66	64.28	65	.72	0	
G 12	113		5.54	2.74	72.68	70	2.68	0	
G 13	112		4.54	2.24	72.18	79	6.82	0	
G 14	110		2.54	1.25	71.19	74	2.81	0	
G 15	131		23.54	11.63	81.57	88	6.43	0	
G 16	120		12.54	6.19	76.13	70	6.13	0	
G 17	124		16.54	8.17	78.11	79	.89	0	
G 18	100		7.46	3.69	66.25	73	6.75	0	
G 19	112		4.54	2.24	72.18	75	2.82	0	
G 20	108		.54	.27	70.21	60	10.21	1	
G 21	115		7.54	3.72	73.66	71	2.66	0	
G 22	121		13.54	6.69	76.63	86	9.37	1	
G 23	86		21.46	10.60	59.34	60	.66	0	
G 24	103		4.46	2.20	67.74	47	20.74	2	
G 25	104		3.46	1.71	68.23	51	17.23	2	
G 26	101		6.46	3.19	66.75	70	3.25	0	
G 27	104		3.46	1.71	68.23	69	.77	0	
G 28	119		11.54	5.70	75.64	72	3.64	0	
G 29	105		2.46	1.22	68.72	71	2.28	0	
G 30	113		5.54	2.74	72.68	56	16.68	2	
G 31	96		11.46	5.66	64.28	55	9.28	1	
G 32	123		15.54	7.68	77.62	72	5.62	0	
G 33	107		.46	.23	69.71	75	5.29	0	
G 34	91		16.46	8.13	61.81	60	1.81	0	
G 35	114		6.54	3.23	73.17	73	.17	0	
G 36	93		14.46	7.14	62.80	51	11.80	1	
G 37	111		3.54	1.75	71.69	69	2.69	0	
G 38	106		1.46	.72	69.22	69	.22	0	
G 39	134		26.54	13.11	83.05	88	4.95	0	
G 40	81		26.46	13.07	56.87	61	4.13	0	
G 41	109		1.54	.76	70.70	70	.70	0	
G 42	104		3.46	1.71	68.23	67	1.23	0	
G 43	87		21.46	10.60	59.34	55	4.34	0	
G 44	103		4.46	2.20	67.74	64	3.74	0	
G 45	109		1.54	.76	70.70	58	12.70	1	
G 46	93		14.46	7.14	62.80	66	3.20	0	



Table 17.--Computation of Discrepancy Classification  
Reading Vocabulary--Cont.

Ident. No.	M M L	(M <sub>L</sub> - $\bar{M}$ ) L	$r \frac{\sigma_{AV}}{\sigma_{ML}}$	(M <sub>L</sub> - $\bar{M}$ ) L	Est.A <sub>V</sub>	A <sub>V</sub>	A <sub>V</sub> -Est.A <sub>V</sub>	Discr. Class.
G 47	102	5.46	2.70	67.24	65	2.24	0	
G 48	115	7.54	3.72	73.66	67	6.66	0	
G 49	118	10.54	5.21	75.15	78	2.85	0	
G 50	114	6.54	3.23	73.17	65	8.17	1	
G 51	97	10.46	5.17	64.77	65	.23	0	
G 52	122	14.54	7.18	77.12	76	1.12	0	
G 53	115	7.54	3.72	73.66	72	1.66	0	
G 54	111	3.54	1.75	71.69	67	4.69	0	
G 55	109	1.54	.76	70.70	71	.30	0	
G 56	103	4.46	2.20	67.74	75	7.26	0	
G 57	99	8.46	4.18	65.76	52	13.76	1	
G 58	108	.54	.27	70.21	65	5.21	0	
G 59	104	3.46	1.71	68.23	68	.23	0	
G 60	103	4.46	2.20	67.74	74	6.26	0	
G 61	114	6.54	3.23	73.17	59	14.17	1	
G 62	105	2.46	1.22	68.72	68	.72	0	
G 63	106	1.46	.72	69.22	59	10.22	1	
G 64	98	9.46	4.67	65.27	55	10.27	1	
G 65	119	11.54	5.70	75.64	76	.36	0	
G 66	102	5.46	2.70	67.24	60	7.24	0	
G 67	110	2.54	1.25	71.19	71	.19	0	
G 68	104	3.46	1.71	68.23	66	2.23	0	
G 69	90	17.46	8.63	61.31	57	4.31	0	
G 70	85	22.46	11.10	58.84	49	9.84	1	
G 71	84	23.46	11.59	58.35	58	.35	0	
G 72	104	3.46	1.71	63.23	66	2.23	0	
G 73	110	2.54	1.25	71.19	64	7.19	0	
G 74	119	11.54	5.70	75.64	72	3.64	0	
G 75	113	5.54	2.74	72.68	76	3.32	0	
G 76	107	.46	.23	69.71	69	.71	0	
G 77	113	5.54	2.74	72.68	79	6.32	0	
G 78	110	2.54	1.25	71.19	63	8.19	1	
G 79	90	17.46	8.63	61.31	62	.69	0	
G 80	97	10.46	5.17	64.77	59	5.77	0	
G 81	115	7.54	3.72	73.66	75	1.34	0	
G 82	72	35.46	17.51	52.43	47	5.43	0	
G 83	119	11.54	5.70	75.64	77	1.36	0	
G 84	111	3.54	1.75	71.69	67	4.69	0	
G 85	125	17.54	8.66	78.60	76	2.60	0	
G 86	84	23.46	11.59	58.35	54	4.35	0	
G 87	105	2.46	1.22	68.72	71	2.28	0	
G 88	83	24.46	12.08	57.86	59	1.14	0	
G 89	104	3.46	1.71	68.23	54	14.23	1	
G 90	109	1.54	.76	70.70	73	2.30	0	
G 91	86	21.46	10.60	59.34	56	3.34	0	
G 92	112	4.54	2.24	72.18	79	6.82	0	
G 93	100	7.46	3.69	66.25	74	7.75	0	
G 94	111	3.54	1.75	71.69	65	6.69	0	



Table 17.--Computation of Discrepancy Classification  
Reading Vocabulary--Cont.

Ident. No.	M L	M L	(M <sub>L</sub> -M <sub>L</sub> ) L	r	$\frac{\sigma_{AV}}{\sigma_{ML}}$	(M <sub>L</sub> -M <sub>L</sub> ) L	Est.A <sub>V</sub>	A <sub>V</sub>	A <sub>V</sub> -Est.A <sub>V</sub>	Discr. Class.
G 95	85		22.46		11.10		58.84	65	6.16	0
G 96	115		7.54		3.72		73.66	80	6.34	0
G 97	130		22.54		11.13		81.07	83	1.93	0
G 98	111		3.54		1.75		71.69	71	.69	0
G 99	88		19.46		9.61		60.33	56	4.33	0
G 100	82		25.46		12.58		57.36	51	6.36	0
G 101	130		22.54		11.13		81.07	79	2.07	0
G 102	70		37.46		18.51		51.43	44	7.43	0
G 103	98		9.46		4.67		65.27	60	5.27	0
G 104	91		16.46		8.13		61.81	60	1.81	0
G 105	92		15.46		7.64		62.30	64	1.70	0
G 106	110		2.54		1.25		71.19	74	2.81	0
G 107	113		5.54		2.74		72.68	77	4.32	0
G 108	95		12.46		6.16		63.78	52	11.78	1
G 109	109		1.54		.76		70.70	76	5.30	0
G 110	105		2.46		1.22		68.72	70	1.28	0
G 111	118		10.54		5.21		75.15	78	2.85	0
G 112	110		2.54		1.25		71.19	64	7.19	0
G 113	99		8.46		4.18		65.76	44	21.76	2
G 114	95		12.46		6.16		63.78	63	.78	0
G 115	111		3.54		1.75		71.69	78	6.31	0

A P P E N D I X    G

## Table

18. Computation of Discrepancy  
Classification, Reading Com-  
prehension. BOYS

19. Computation of Discrepancy  
Classification, Reading Com-  
prehension. GIRLS

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Table 18.--Computation of Discrepancy Classification  
Reading Comprehension

Ident. No.	M L	M L	$(M_L - \bar{M}_L)$	$r^{AC} \frac{(M_L - \bar{M}_L)}{\sigma_{MC}}$	Est. $A_C$	$A_C$	$A_C - \text{Est. } A_C$	Discr. Class.
B 1	132		24.54	8.10	51.63	44	7.63	1
B 2	78		29.46	9.72	33.81	37	3.19	0
B 3	122		14.54	4.80	48.33	43	5.33	1
B 4	91		16.46	5.43	38.10	43	4.90	1
B 5	102		5.46	1.80	41.73	37	4.73	1
B 6	89		18.46	6.09	37.44	34	3.44	0
B 7	104		3.46	1.14	42.39	41	1.39	0
B 8	109		1.54	.51	44.04	41	3.04	0
B 9	117		9.54	3.15	46.68	49	2.32	0
B 10	96		11.46	3.78	39.75	37	2.75	0
B 11	85		22.46	7.41	36.12	43	6.88	1
B 12	143		35.54	11.73	55.26	53	2.26	0
B 13	125		17.54	5.79	49.32	50	.68	0
B 14	124		16.54	5.46	48.99	51	2.01	0
B 15	108		.54	.18	43.71	42	1.71	0
B 16	101		6.46	2.13	41.40	42	.60	0
B 17	127		19.54	6.45	49.98	50	.02	0
B 18	130		22.54	7.44	50.97	50	.97	0
B 19	103		4.46	2.13	41.40	36	5.40	1
B 20	93		14.46	4.77	38.76	44	5.24	1
B 21	103		4.46	2.13	41.40	37	4.40	1
B 22	113		5.54	1.83	45.36	41	4.36	1
B 23	127		19.54	6.45	49.98	53	3.02	0
B 24	109		1.54	.51	44.04	43	1.04	0
B 25	104		3.46	1.14	42.39	43	.61	0
B 26	119		11.54	3.81	47.34	50	2.34	0
B 27	94		13.46	4.44	39.09	28	11.09	2
B 28	114		6.54	2.16	45.69	46	.31	0
B 29	98		9.46	3.12	40.41	34	6.41	1
B 30	125		17.54	5.79	49.32	51	.68	0
B 31	91		16.46	5.43	38.10	42	3.90	0
B 32	108		.54	.18	43.71	46	2.29	0
B 33	117		9.54	3.15	46.68	46	.68	0
B 34	127		19.54	6.45	49.98	47	2.98	0
B 35	92		15.46	5.10	38.43	35	3.43	0
B 36	95		12.46	4.11	39.42	37	2.42	0
B 37	106		1.46	.48	43.05	33	10.05	2
B 38	93		14.46	4.77	38.76	33	5.76	1
B 39	69		38.46	12.69	30.84	28	2.84	0
B 40	108		.54	.18	43.71	40	3.71	0
B 41	101		6.46	2.13	41.40	36	5.40	1
B 42	119		11.54	3.81	47.34	44	3.34	0
B 43	133		25.54	8.43	51.96	46	5.96	1
B 44	105		2.46	.81	42.72	44	1.28	0
B 45	123		15.54	5.13	48.66	44	4.66	1
B 46	128		20.54	6.78	50.31	47	3.31	0



Table 18.--Computation of Discrepancy Classification  
Reading Comprehension--Cont.

Ident. No.	M L	M (M <sub>L</sub> -M̄ <sub>L</sub> )	r <sup>OA</sup> OMC	(M-M̄) L L	Est.A <sub>C</sub>	A <sub>C</sub>	A <sub>C</sub> -Est.A <sub>C</sub>	Discr. Class.
B 47	76	31.46	10.38		33.15	35	1.85	0
B 48	125	17.54	5.79		49.32	50	.68	0
B 49	115	7.54	2.49		46.02	45	1.02	0
B 50	97	10.46	3.45		40.08	48	7.92	1
B 51	111	3.54	1.17		44.70	43	1.70	0
B 52	134	26.54	8.76		52.29	52	.29	0
B 53	139	31.54	10.41		53.94	47	6.94	1
B 54	106	1.46	.48		43.05	40	3.05	0
B 55	79	28.46	9.13		34.14	25	9.14	2
B 56	96	11.46	3.78		39.75	47	7.25	1
B 57	78	29.46	9.72		33.81	29	4.81	1
B 58	108	.54	.18		43.71	42	1.71	0
B 59	100	7.46	2.46		41.07	39	2.07	0
B 60	101	6.46	2.13		41.40	43	1.60	0
B 61	93	14.46	4.77		38.76	33	5.76	1
B 62	95	12.46	4.11		39.42	41	1.58	0
B 63	80	27.46	9.06		34.47	20	14.47	3
B 64	109	1.54	.51		44.04	32	12.04	2
B 65	115	7.54	2.49		46.02	48	1.98	0
B 66	120	12.54	4.14		47.67	51	3.33	0
B 67	112	4.54	1.50		45.03	40	5.03	1
B 68	118	10.54	3.48		47.01	43	4.01	0
B 69	101	6.46	2.13		41.40	45	3.60	0
B 70	117	9.54	3.15		46.68	44	2.68	0
B 71	127	19.54	6.45		49.98	49	.98	0
B 72	123	15.54	5.13		48.66	54	5.34	1
B 73	82	25.46	8.40		35.13	33	2.13	0
B 74	122	14.54	4.80		48.33	44	4.33	1
B 75	94	13.46	4.44		39.09	33	6.09	1
B 76	108	.54	.18		43.71	50	6.29	1
B 77	87	20.46	6.75		36.78	39	2.22	0
B 78	122	14.54	4.80		48.33	53	4.67	1
B 79	111	3.54	1.17		44.70	39	5.70	1
B 80	105	2.46	.81		42.72	44	1.28	0
B 81	110	2.54	.84		44.37	41	3.37	0
B 82	109	1.54	.51		44.04	43	1.04	0
B 83	123	15.54	5.13		48.66	49	.34	0
B 84	101	6.46	2.13		41.40	40	1.40	0
B 85	114	6.54	2.16		45.69	48	2.31	0
B 86	91	16.46	5.43		38.10	27	11.10	2
B 87	61	46.46	15.33		28.20	31	2.80	0
B 88	107	.46	.15		43.38	45	1.62	0
B 89	109	1.54	.51		44.04	51	6.96	1
B 90	100	7.46	2.46		41.07	34	7.07	1
B 91	97	10.46	3.45		40.08	37	3.08	0
B 92	109	1.54	.51		44.04	53	8.96	2



Table 18.--Computation of Discrepancy Classification  
Reading Comprehension--Cont.

Ident. No.	M L	M L	$(M_L - \bar{M}_L)$	$r \frac{\sigma_{AC}}{\sigma_{MC}}$	$(M_L - \bar{M}_L) \text{Est. } A_C$	$A_C$	$A_C - \text{Est. } A_C$	Discr. Class.
B 93	116		8.54	2.82	46.35	50	3.65	0
B 94	103		4.46	2.13	41.40	53	11.60	2
B 95	104		3.46	1.14	42.39	36	6.39	1
B 96	108		.54	.18	43.71	46	2.29	0
B 97	119		11.54	3.81	47.34	52	4.66	1
B 98	108		.54	.18	43.71	46	2.29	0
B 99	115		7.54	2.49	46.02	46	.02	0
B 100	100		7.46	2.46	41.07	36	5.07	1
B 101	124		16.54	5.46	48.99	50	1.01	0
B 102	133		25.54	8.43	51.96	51	.96	0
B 103	122		14.54	4.80	48.33	52	3.67	0
B 104	103		4.46	2.13	41.40	40	1.40	0
B 105	104		3.46	1.14	42.39	41	1.39	0
B 106	109		1.54	.51	44.04	25	19.04	4
B 107	131		23.54	7.77	51.30	48	3.30	0

Table 19.--Computation of Discrepancy Classification  
Reading Comprehension

Ident. No.	M L	M L	$(M_L - \bar{M}_L)$	$r \frac{\sigma_A}{\sigma_{MC}}$	$(M_L - \bar{M}_L) \text{Est. } A_C$	$A_C$	$A_C - \text{Est. } A_C$	Discr. Class.
G 1	94		13.46	4.44	39.09	38	1.09	0
G 2	114		6.54	2.16	45.69	48	2.31	0
G 3	118		10.54	3.48	47.01	50	2.99	0
G 4	110		2.54	.84	44.37	45	.63	0
G 5	84		23.46	7.74	35.79	40	4.21	1
G 6	126		18.54	6.12	49.65	49	.65	0
G 7	112		4.54	1.50	45.03	50	4.97	1
G 8	124		16.54	5.46	48.99	46	2.99	0
G 9	89		18.46	6.09	37.44	38	.56	0
G 10	114		6.54	2.16	45.69	52	6.31	1
G 11	96		11.46	3.78	39.75	40	.25	0
G 12	113		5.54	1.83	45.36	43	2.36	0
G 13	112		4.54	1.50	45.03	51	5.97	1
G 14	110		2.54	.84	44.37	39	5.37	1
G 15	131		23.54	7.77	51.30	51	.30	0
G 16	120		12.54	4.14	47.67	41	6.67	1
G 17	124		16.54	5.46	48.99	51	2.01	0
G 18	100		7.46	2.46	41.07	38	3.07	0
G 19	112		4.54	1.50	45.03	48	2.97	0
G 20	108		.54	.18	43.71	38	5.71	1
G 21	115		7.54	2.49	46.02	52	5.98	1
G 22	121		13.54	4.47	48.00	49	1.00	0
G 23	86		21.46	7.08	36.45	34	2.45	0
G 24	103		4.46	1.47	42.06	37	5.06	1
G 25	104		3.46	1.14	42.39	44	1.61	0
G 26	101		6.46	2.13	41.40	44	2.60	0
G 27	104		3.46	1.14	42.39	40	2.39	0
G 28	119		11.54	3.81	47.34	48	.66	0
G 29	105		2.46	.81	42.72	49	6.28	1
G 30	113		5.54	1.83	45.36	40	5.36	1
G 31	96		11.46	3.78	39.75	32	7.75	1
G 32	123		15.54	5.13	48.66	50	1.34	0
G 33	107		.46	.15	43.38	49	5.62	1
G 34	91		16.46	5.43	38.10	37	1.10	0
G 35	114		6.54	2.16	45.69	46	.31	0
G 36	93		14.46	4.77	38.76	40	1.24	0
G 37	111		3.54	1.17	44.70	47	2.30	0
G 38	106		1.46	1.46	43.05	45	1.95	0
G 39	134		26.54	8.76	52.29	53	.71	0
G 40	81		26.46	8.73	34.80	37	2.20	0
G 41	109		1.54	.51	44.04	51	6.96	1
G 42	104		3.46	1.14	42.39	45	2.61	0
G 43	87		21.46	7.08	36.45	33	3.45	0
G 44	103		4.46	1.47	42.06	47	4.94	1
G 45	109		1.54	.51	44.04	34	10.04	2
G 46	93		14.46	4.77	38.76	45	6.24	1



Table 19.--Computation of Discrepancy Classification  
Reading Comprehension--Cont.

Ident. No.	M L	$(M_L - \bar{M}_L)$	$r \frac{\sigma_{AC}}{\sigma_{MC}}$	$(M_L - \bar{M}_L)$	Est. $A_C$	$A_C$	$A_C - \text{Est. } A_C$	Discr. Class.
G 47	102	5.46	1.80	41.73	42	.27	0	
G 48	115	7.54	2.49	46.02	52	5.98	1	
G 49	118	10.54	3.48	47.01	48	.99	0	
G 50	114	6.54	2.16	45.69	45	.69	0	
G 51	97	10.46	3.45	40.08	45	4.92	1	
G 52	122	14.54	4.80	48.33	48	.33	0	
G 53	115	7.54	2.49	46.02	43	3.02	0	
G 54	111	3.54	1.17	44.70	43	1.70	0	
G 55	109	1.54	.51	44.04	37	7.04	1	
G 56	103	4.46	1.47	45.00	44	1.00	0	
G 57	99	8.46	2.79	40.74	34	6.74	1	
G 58	108	.54	.18	43.71	44	.29	0	
G 59	104	3.46	1.14	42.39	50	7.61	1	
G 60	103	4.46	1.47	42.06	43	.94	0	
G 61	114	6.54	2.16	45.69	48	2.31	0	
G 62	105	2.46	.81	42.72	44	1.28	0	
G 63	106	1.46	.48	43.05	39	4.05	0	
G 64	98	9.46	3.12	40.41	36	4.41	1	
G 65	119	11.54	3.81	47.34	46	1.34	0	
G 66	102	5.46	1.80	41.73	40	1.73	0	
G 67	110	2.54	.84	44.37	42	7.37	0	
G 68	104	3.46	1.14	42.39	38	4.39	1	
G 69	90	17.46	5.76	37.77	47	9.23	2	
G 70	85	22.46	7.41	36.12	44	7.88	1	
G 71	84	23.46	7.74	35.79	44	8.21	1	
G 72	104	3.46	1.14	42.39	50	7.61	1	
G 73	110	2.54	.84	44.37	46	1.63	0	
G 74	119	11.54	3.81	47.34	48	.66	0	
G 75	113	5.54	1.83	45.36	52	6.64	1	
G 76	107	.46	.15	43.38	45	1.62	0	
G 77	113	5.54	1.83	45.36	45	.36	0	
G 78	110	2.54	.84	44.37	43	1.37	0	
G 79	90	17.46	5.76	37.77	41	3.23	0	
G 80	97	10.46	3.45	40.08	40	.08	0	
G 81	115	7.54	2.49	46.02	52	5.98	1	
G 82	72	35.46	11.70	31.83	32	.17	0	
G 83	119	11.54	3.81	47.34	48	.66	0	
G 84	111	3.54	1.17	44.70	46	1.30	0	
G 85	125	17.54	5.79	49.32	49	.32	0	
G 86	84	23.46	7.74	35.79	41	5.21	1	
G 87	105	2.46	.81	42.72	45	2.28	0	
G 88	83	24.46	8.07	35.46	35	.46	0	
G 89	104	3.46	1.14	42.39	48	5.61	1	
G 90	109	1.54	.51	44.04	43	1.04	0	
G 91	86	21.46	7.08	36.45	36	.45	0	
G 92	112	4.54	1.50	45.03	46	.97	0	

Table 19.--Computation of Discrepancy Classification  
Reading Comprehension--Cont.

Ident. No.	M M L	(M <sub>L</sub> - $\bar{M}_L$ )	$r \frac{\sigma_{AC}}{\sigma_{MC}}$	(M <sub>L</sub> - $\bar{M}_L$ )	Est. A <sub>C</sub>	A <sub>C</sub>	A <sub>C</sub> -Est.A <sub>C</sub>	Discr. Class.
G 93	100	7.46	2.46	41.07	44	2.93	0	
G 94	111	3.54	1.17	44.70	37	7.70	1	
G 95	85	22.46	7.41	36.12	36	.12	0	
G 96	115	7.54	2.49	46.02	49	2.98	0	
G 97	130	22.54	7.44	50.97	52	1.03	0	
G 98	111	3.54	1.17	44.70	46	1.30	0	
G 99	88	19.46	6.42	37.11	37	.11	0	
G 100	82	25.46	8.40	35.13	28	7.13	1	
G 101	130	22.54	7.44	50.97	51	.03	0	
G 102	70	37.46	12.36	31.17	29	2.17	0	
G 103	98	9.46	3.12	40.41	46	5.59	1	
G 104	91	16.46	5.43	38.10	38	.10	0	
G 105	92	15.46	5.10	38.43	40	1.57	0	
G 106	110	2.54	.84	44.37	41	3.37	0	
G 107	113	5.54	1.83	45.36	46	.64	0	
G 108	95	12.46	4.11	39.42	49	9.58	2	
G 109	109	1.54	.51	44.04	41	3.04	0	
G 110	105	2.46	.81	42.72	51	8.28	1	
G 111	118	10.54	3.48	47.01	49	1.99	0	
G 112	110	2.54	.84	44.37	38	6.37	1	
G 113	99	8.46	2.79	40.74	43	2.26	0	
G 114	95	12.46	4.11	39.42	37	2.42	0	
G 115	111	3.54	1.17	44.70	51	6.30	1	



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