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of
Committee on Thesis

The undersigned, acting as a Committee of the Graduate School, have read the accompanying thesis submitted by Judith Alymer Jacobs for the degree of Master of Arts.

They approve it as a thesis meeting the requirements of the Graduate School of the University of Minnesota, and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts.

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This is to certify that we the undersigned, as a committee of the Graduate School, have given Judith Alymer Jacobs final oral examination for the degree of Master of Arts . We recommend that the degree of Master of Arts be conferred upon the candidate.

Minneapolis, Minnesota

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**Relation of Achievements in Army Tests
to Achievements in University subjects.**

**A thesis submitted to the
Faculty of the Graduate School of the
University of Minnesota**

by

Judith A. Jacobs

**In partial fulfillment of the requirements
for the degree of
Master of Arts**

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Relation of Achievements in Army Tests to Achievements in University Subjects.

Section I

Review of Previous Investigations

Army Tests

During recent years considerable agitation on the part of psychologists has resulted in the increased use of mental tests for diagnostic purposes. The present war has given an added impetus to this field of work, so that in the army the psychologist has prestige almost akin to the physician in the selection and analysis of the various mental types. Because of the general popularity of these tests among educators, and because of their success in the army, it becomes my purpose to study these tests in relation to University grades, in order to determine their usefulness in indicating the abilities required in scholastic work.

A surprisingly small amount of literature has been published on these army tests. No doubt the materials used in the tests had to be kept very secret in order to keep them effective. Government Bulletins are issued to those primarily interested in the giving of the tests. (1)

An article in *School and Society* gives the personnel and a brief review of the work accomplished by the National Committee of Psychologists, in connection with the Alpha Scale. (2) Professor W.V. Bingham (3) gives the two-fold purpose of the test as follows: (1) Military - to furnish commanding officers with a list of the rating

1) Army Mental Tests, Washington, D.C. Nov. 22, 1918. Edition 5000.

2) "Educational Events"- Psychological Examination of Recruits;
School and Society, 6:432- Oct. 13, 1917.

3) W.V. Bingham, Psychological Examination at the Army Canton-
ments, School and Society, 1917-6, Oct. 27, 1917, pp. 494-495.

of each man in his command, so that he may be aided in selecting for special duty those of more than average quickness and mental ability." (2) "Medical - to find men so low as to demand discharge, medical care, or to be given work as laborers."

E. L. Thorndike (4) presents an interesting discussion of "The Scientific Personnel Work in the Army". This personnel work is of two kinds: (a) Mass work which deals in the main with the classification of men according to their mental capacity: (b) Analytic work which deals with fewer cases and represents more careful measurements and relationships. In this article Mr. Thorndike gives a correlation of .4 (5) between a test devised for investigation and the success in the ground school of the navy. This ground school gives the theoretical and practical studies needed for navy training. In a second study which deals with the effect of practice on the resulting correlation, Mr. Thorndike finds a correlation between the Alpha test and school grades of .45 for both before and after practice. A score of .41 and .48 respectively expresses the relationship between two trials of a modified form of Alpha in which two-thirds of the tests were non-verbal. This test was given to 46 students. (6)

Although there is a dearth in material which might throw light on the relationship between the army tests and school grade, there have been any number of investigations which show interesting relationships between various mental tests or groups of mental tests and school grade.

4) Thorndike, E. L. Scientific Personnel Work in the Army.
Science V. Jan. 17, 1919, pp. 53-61.

5) Ibid, pp. 59.

6) Thorndike, E. L. Army Tests. School and Society, vol. IX,
Feb. 17, 1919, pp. 189-195.

We will review a few of the most helpful studies made in connection with the mental study of elementary, high school and university group. The purpose of such a review is to indicate those mental tests which show a high or low correlation with the grades in elementary schools, secondary schools, and colleges or university, also to indicate those tests which have a high or low correlation with specific subjects and vocations. A preliminary summary will point out some of the relationships which are shown. A complete bibliography for each fact presented is given in the following pages (4-15) where they are discussed in detail. Tests found to correlate markedly with elementary school grades are Cancellation, Memory, Completion, Association and Construction tests. For the secondary school, Sister St. Helene Guthrie has found the highest correlations between the Haggerty Vocabulary (.15-.37), the Reading tests (.31-.61), the Trabue Language (.09-.39) and the Thorndike Reading tests (.02-.54) and the school grades. The Omnibus test showed a low correlation (-.14-.26). For the college group Waugh found a marked correlation between class standing and tests for Opposites, .54; Range of Information .47; Retention of Ideas, .40, and motor control, .43. There was a low correlation, .24, with the Substitution test. Irving King found most marked correlations between the Curtis Arithmetic tests (.32-.54) and school grade, but practically no correlation between the Kansas Silent Reading tests and school grade. Bell found that tests for Reaction time, naming colors, auditory memory gave low correlations with University grades (less than .17) and Marguerite Calfee found the same thing true of Alphabet Sorting and Mirror Testing.

Completion tests correlate .31 with English, this being the highest correlation between a series of tests given by J. Carleton Bell, and school subjects. Tests for addition, association, recognition, select judgment, and directions do not show a marked correlation with any high school subject.

Dr. Haggerty has found that the quality of reading and the Omnibus tests show a high correlation with medical school marks, while Dr. Riborg Mann has found a series of tests which correlate so high with the rank of engineering students that they may be given as a substitute for entrance examinations. The most marked correlations are between rank and Arithmetical problems, Graphs, Geometric Proof, Completing sentences and Completion tests. The lowest correlations are between rank and Paragraph Reading, .447, Laboratory Problems, .253, Construction test, .180 and Matching diagrams, .309. A more detailed account of these investigations is given in the following discussion.

Mental Tests and Elementary School Grade.

A group of English experimenters, Burt (7), Jones (8), Gilby (9), and Waite (10) find on the whole a comparatively high correlation between estimated intelligence and school grades. Schuster (11) finds a correlation of $(r) = .22$ between the McDougall's spot pattern test of concentration and the possession of scholarship. Lewis M. Terman (12) and his co-workers report a correlation of $(r) = .45$ between the IQ and the quality of school marks as judged by the teach-

- 7) Burt, Cyril. Experimental Tests of General Intelligence, British Journal of Psychology, vol. 3, pp. 94-177.
- 8) Jones, Gertrude. The Value of the Teacher's Opinion of the General Intelligence of School Children. Biometrika, 7: 1910, pp. 542-548.
- 9) Gilby, W.H., assisted by K. Pearson, On the Significance of the Teacher's Appreciation of General Intelligence. Biometrika, 8: 1911-8, 94-108.
- 10) Waite, H. Teacher's Estimate of General Intelligence of School Children, Biometrika, 8:1911-12, 78-93.
- 11) Schuster, E. First Results from the Oxford Anthropometric Laboratory. Biometrika, 8: 1911, 8-40.
- 12) Terman, J.M. Stanford Revision of the Binet-Simond Scale and some Results from Application. Journal of Educational Psychology, Nov. 1915, 551-562.

er. H.T.Wolley(13) claims that a devised scale (1915) consisting of cancellation, memory, completion, association and construction tests for various ages show a marked positive correlation with school grade. A coefficient of $R=.33$ (Spearman's formula) expresses the relationship between the average of 18 mental tests and school grade in an experiment conducted by E.S.Jones (14) with 100 fourteen year old boys.

Mental Tests and Secondary School Grades.

For statistics upon the correlation between the various high school subjects and the abilities involved, Weglein no doubt presents the best material in his monograph on the Correlation of Ability of High School Subjects.(15) For our special problem, however, we find a Master's Thesis by Sister St.Helene Guthrie(16) most helpful. This thesis, written at the University of Minnesota in 1917, on the Mental and Educational Diagnosis of the Derham Hall High School Pupils. gives us the most careful investigation of the relationship between mental tests and secondary school grades. As an introduction to her thesis, she gives a chapter on Previous Investigators. She then describes her problem, methods of work, and the resulting relationship. The tests were given to over 100 pupils. The Pearson Product Moments formula was used.

Tables XV and XVI found on pages 41 and 42 of her thesis are reproduced in the following tables 1 and 2.

Table I gives the coefficients of correlation between the scores made in the various tests and the average of the school subjects for each year.

- 13) Wolley, H.T. A New Scale of Mental and Physical Measurements for Adolescents and Some of its Uses. Journal of Educational Psychology, 1915-16, 521-550.
- 14) Jones, E.S. Psychological Bulletin 1916, vol. 13, page 98.
- 15) Weglein, D.E. The Correlation of Abilities of High School Pupils. John Hopkin University, Studies in Education No.2, 1917, pp. 97-100.
- 16) See Text.

Table I

r-General Average, First Semester:

	1st Year	PE	2nd Year	PE	3rd Year	PE	4th Year	PE
Omnibus	.22	.11	-.14	.10	.25	.11	.26	.11
H. Voc.	.15	.12	.26	.00	.32	.11	.37	.09
H. Read.	.36	.10	.45	.02	.31	.11	.61	.09
Thorndike R.	.02	.12	.37	.02	.16	.12	.54	.09
Trabue L	.44	.09	.37	.01	.09	.12	.39	.11
Trabue M	.01	.12	.37	.01	.35	.12	.33	.11
Voc.R & T	.17	.11	.48	.08	.52	.09	.59	.08
Trabue L & M	.25	.11	.26	.00	.32	.11	.41	.01
All the Tests	.23	.11	.46	.08	.52	.09	.55	.09

Table 2 represents the correlations between the grades for the year 1917-1918, for each class and the scores made in the mental tests.

Table II

Correlation between Grades for Year 1917-1918. With:

	4th Year	PE	3rd Year	PE	2nd Year	PE	1st Year	PE
Omnibus	.26	.11	.05	.12	-.02	.00	.09	.12
H. Voc.	.21	.11	.20	.00	.45	.02	.38	
H. Read.	.44	.09	.19	.12	.58	.03	.38	
Thorndike	.20	.12	.09	.12	.66	.04	.046	
Trabue L	.32	.10	.08	.12	.54	.03	.44	
Trabue M	.29	.10	.06	.13	.55	.03	-.004	
Voc.R & T	.37	.10	.19	.12	.63	.04	.30	
Trabue h M&O	.41	.10	.036	.13	.44	.02	.20	
All the tests	.42	.09	.15	.12	.62	.04	.69	
1st Sem. Maths.	.47	.09	.69	.07	.82	.07	.99	

From the study of these values presented in tables 1 and 2, Sister St. Helene Guthrie presents the following conclusions (pages 43-44).

"These tests with the exception of the omnibus test show a fairly good correlation with the semester marks received in the high school work.

By giving mental tests before assigning pupils to classes in September, those of nearly the same mental ability might be placed in the same group.

These tests pick out those of inferior mental ability as well as those of superior ability.

These tests are valuable in determining whether a pupil was failing through lack of ability, or for some reason which it was possible to control.

The correlations between the marks for the first semester and for the year is high."

The above tables are of particular value to the psychologist who is about to select tests in order to diagnose the mental abilities required of secondary school children. The Haggerty vocabulary test, the Haggerty reading tests and the Trabue tests are the best tests for such a purpose as indicated by these results.

Mental Tests and College Grades.

There has been more demand for mental tests to aid in diagnosing the abilities of college students (especially freshmen) than in any other field of educational work. This is due in a large measure to the fact that psychologists in the past have been limited to the higher institutions and consequently they have carried on their investigations with the group immediately accessible.

This activity is also in part due to the increasing disapproval of entrance examinations of a pedagogical type. There is a

feeling on the part of many college teachers that a series of mental tests would give more information about the student's ability to do college work than such examinations.

The first mental tests of any importance were given to college students by J. McKeen Cattell to freshmen at Columbia College in 1896. (17) The chief tests given to this group were Reaction time, Cancellation of A's, Association time, Naming of Colors, Logical Memory and Auditory Memory.

The data from these tests were carefully tabulated by Clark Wissler (1901). (18) The correlations between some of these tests with class standing were worked out. The correlations were low, the highest being .19, indicating the relationship between class standing and score in Logical Memory. These low correlations indicate that the tests are unsatisfactory for diagnostic purposes in this particular field.

Marguerite Calfee (1913) (19) gave four intelligence tests to college freshmen at the University of Texas, and makes several interesting comparisons. The four tests selected were Burt's card dealing, card sorting, alphabet, and mirror drawing. Some of these were modified slightly. Card sorting gave the highest correlations with college grades. University grades correlated .66 with each other. Spearman's foot-rule method was used. The R values were converted into r values by use of table 6 in Whipple. Manual of Mental and Physical Tests. Part I, page 44.

- 17) Cattell, J. McKeen. Physical and Mental Measurements of Students at Columbia University. Psychological Review 3: 1896, pp. 618-648.
- 18) Wissler, Clark. The Correlation of Mental and Physical Tests. Psychological Review, Monograph Supplement, 3: 1901, No. 6, 1-61.
- 19) Calfee, Marguerite. College Freshmen and Four General Intelligence Tests. Journ. Educ. Psych. vol. 4, March 1913, pp. 223-331.

Table III gives Calfee's R & W Coefficients of correlation between:

		Boys	Girls
Card Sorting	Grades	.29	.28
Card Dealing	"	.28	.13
Alphabet Sorting	"	-.06	.25
Mirror Test	"	-.07	.19

This experiment was particularly interesting in that it showed that the type of learning required in Alphabet sorting and mirror testing is not the type of ability required in class work.

Truman Lee Kelly (20) of Columbia University correlates certain association reactions with school grades in mathematics, science and foreign language. His group is very small, however, and unless the correlations are marked they cannot be considered. Because he indicates some of the abilities involved in college practice, we have summarised his results thus:

- 1) "The Alpha group (synonyms coordinations and contrast)" correlates .37 with mathematics and science and .19 with foreign language.
- 2) Capability of recalling particular situations correlate .60 with foreign language, .25 with mathematics and 0 with science.

Frequency of visual imagery and the Beta Group ("Association, Subject Relation, Object Relation and Causality) showed for the most part marked negative correlations with school standing.

20) Kelly, Truman Lee. Association Experiment, Individual Differences and Correlations. Psychological Review, vol. 20: pp. 479-504.

An experiment of considerable importance and interest was conducted by Waug (21) in Beloit College in the years 1912 and 1915. Waug, in 1912 gave a series of mental tests individually to freshmen in Beloit College with the resulting correlations of table IV. Pearson's Coefficient of Correlation was used.

Table IV. The Relation between Class Standing and:

Quickness of Association (Opposites)	.54
Speed of Learning (Substitution)	.24
Range of Information (Whipple's list)	.47
Retention of Ideas- Reproduction of story read	.40
Motor Control (Steadiness)	.43

It must be noted that these are somewhat higher than those given by Wissler. J. Carleton Bell (22), however, in a discussion of these conclusions cannot explain whether it is this difference on account of the differences in the tests themselves or in the method of giving the tests. A study of considerable value is described by J. Carleton Bell (23) in his report on Mental Tests and College Freshmen. As an introduction to his report, he presents a historical survey, mentioning in particular the work of Cattell, Wissler, Waug, and Brigham. After giving the mental tests to about 700 freshmen, and after carefully correlating the relationships he drew the following general conclusions:

1) School subjects correlated with each other rather high.

Science - History 59. English - History 34.

21) Waug, Karl T. A New Mental Diagnosis of the College Student. New York Times, Magazine Supplement, Jan. 2, 1916, pp. 12-13.

22) Bell, J.C. Mental Tests and College Freshmen. Journal of Educational Psychology, vol. 7, 1916, pp. 381-399.

23) Ibid.

2) The correlations between University marks with test scores are uniformly low, the highest being English Completion .31. The following table gives some of the figures which justify his conclusions. The r in this case is the Pearson's Coefficient.

Table V.

A part of Table VIII page 395, showing correlations between University Freshmen and Grades in University subjects.

	English	Mathe- matics	History	Science	Foreign Language	Educa- tion.
Triangles	.01	.13	.00	.04	-.03	.02
Addition	.11	.23	.13	.25	.25	.12
Association	.20	.76	.12	.12	.15	.02
Recognition	.17	.14	.18	.19	.14	.08
Select Judgment	.00	.07	.06	.06	.06	.04
Directions No. I	.26	.13	.19	.12	.19	.03
Directions NO. II	.27	.12	.06	.15	.18	.04
Alternatives	.24	.18	.15	.13	.11	.25
Completion	.31	.22	.16	.17	.20	.16

Irving King of Iowa University has been much interested in this phase of the psychological work and has (with the assistance of his co-workers) worked out several interesting relationships. In a study made in the year 1917 on the Relationship of Abilities in Certain Mental Tests to Ability as Estimated by the Teachers (24), he gave a series of tests to a group of 36 students, the results of which are re-tabulated in Table VI.

The relationship between: R

- 1) Curtis Arithmetic (total attempts) and class rank - .54
- 2) Curtis Arithmetic(% of accuracy) and class rank - .32

24) King, Irving. Relationship of Abilities in Certain Mental Tests to Ability as Estimated by the Teachers. School and Society, vol. 5: Feb. 17, 1917, pp. 204-209.

(Table VI continued)

	R
3) Curtis Arithmetic (total right) and class rank -	.38
4) Hard Opposites with Scholastic rank -	.26
5) "Half Cube" " " " -	.30
6) Kansas Silent Reading test with Scholastic rank -	.04
7) All the tests combined with Scholastic rank -	.27

Mr. King concludes, "If the $R = .41$, it seems that in the tests we have measures of ability which should be considered valuable to the advisory officers of the University."

A somewhat later study by Irving King and James M. Crory entitled Freshmen Tests at the State University of Iowa, appeared in the Journal of Educational Psychology January 1918, pp. 32-46. (25) These men again reiterated the statement that the tests should be helpful to advisors of the students in estimating their ability. The following table compiled from parts of the several tables given in their article, would indicate a fairly high correlation with academic work for the first semester.

Table VII.

Relation between mental tests and Freshman grades for 1916.		Girls	Boys
r between:			
University grades-	with Arithmetic (Speed)	.31	.36 (p.35)
"	" " " (Accuracy)	.40	.36 (p.36)
"	" " Completion	.22	.41 (p.36)
"	" " Opposites	.45	.84 (p.38)
"	" " Logical Memory	.35	.40 (p.40)
"	" " Visual Imagery	.32	.21 (p.41)
"	" " Analogies	.14	.40 (p.41)
"	" " Information	.41	.44 (p.43)

25) King, Irving and Crory, J.M. Freshmen Tests at the State University of Iowa, Journal of Educational Psychology, January 1918, pp. 32-46.

A more recent article by Irving King and T. B. Howard entitled Logical Memory and School Grades is found in the Journal of Educational Psychology (pages 262-269) Vol.9, No. 5, May 1917. (26) The authors present the results of memory tests given to 64 pupils in the 5th and 8th grades of the University of Iowa Elementary School, 72 pupils at the University High School and 110 Junior and Senior students at the College of Liberal Arts. These men found the coefficients between the college and the tests were so marked as to merit the conclusion that "a Logical Memory Test may be considered a fair measure of general scholastic standing of the individual student."

A more pertinent study is the Tests of Applicants for Admission to the University of Minnesota Medical School by M. E. Haggerty, which appeared in the Journal of Educational psychology May, 1918, pages 278-287. Dr.Haggerty is of the opinion that "an entrance examination board can determine by three hours' work the fitness of one hundred applicants for the work in the medical school more exactly than they can derive such information from the laborious examinations of academic records often hard to obtain and equivocal in memory." (27) He justifies this conclusion through a research which actually gave him a numerical basis for such statement.

In addition to the academic grades for each student, Dr.Haggerty secured the scores for ability of each student in Thorndike's Alpha Scale for Reading Ability, and an Omnibus test.

- 26) King, Irving and Howard T.B. Logical Memory and School Grades, Journ.of Educ.Psych.,vol,9, May 1917, pp.262-269.
- 27) Haggerty, M.E. Tests for Admission to the University of Minnesota Medical School. Journal of Educational Psych., May, 1918, pp. 278-287.

In Table VIII we have recorded a few of the correlations secured by Dr. Haggerty, Trabue from a table given on page 280.

Table VIII. Correlations between: (Pearson's Coefficient)

	S.L.A. marks	Medical School marks
Medical School Marks	.49	--
Quality of Reading	.46	.62
Time of Reading	-.14	.24
Omnibus Test (Row time)	.39	.51
Omnibus Test (Weighted time)	.35	.60
Omnibus Test (errors)	.36	.29

Medical school marks, on the whole, correlate higher with the mental tests than the science, literature and the arts marks. We must observe that most of these tests correlate higher with the medical school mark than the grades for the academic work of the students, hence, we can say with Dr. Haggerty that these "tests were a better indication of ability to do the work of the school than were all the academic records of these applicants." Page 282.

Charles Riborg Mann, in A Study of Engineering Education, (Bulletin No.11, Carnegie Foundation for the Advancement of Teaching) (28) proposes, in a chapter (pages 47-53) on "Admission" to abolish entrance examinations to engineering colleges, and to substitute a series of tests which have been carefully worked out by psychologists.

With the assistance of Professor E.L.Thorndike, a series of especially devised tests were given to freshmen engineers at Columbia University, Massachusetts Institute of Technology, the University of Cincinnati, and the Wentworth Institute.

The Columbia group gave a correlation coefficient (Pearson's) of .84 between massed totals for the tests and the I.G. This I.G. includes in the combination the:

1. Rank according to high school record.
2. " " to English, Mathematics, Physics.
3. " " to Regents examinations.
4. " " to College record for scholarship in English, Mathematics and Physical Training during the Freshman year.

Table IX. The following is a reproduction of relationship between the I. G. and the various tests. (28 a)

Relation between I.G. and:

M ₁ *	Arithmetical problems	.625
M ₂ *	" "	.796
M ₃ *	" Computations	.625
M ₄ *	Graph. Test	.614
M ₅ *	Geometric Proof	.531
E ₁	Paragraph Reading	.447
E ₂	Range of Vocabulary	.652
E ₃ *	Completing Sentence	.547
E ₄	Giving Opposites	.438
P ₁	Laboratory Problems	.253
P ₂	Describe "	.531
P ₃	Matching Diagrams	.309
P ₄	Completing Statements	.654
P ₅	" Diagrams	.416
C	Constructive Test	.180

The relative weighing of these tests was carried out by Dr. Truman Kelley, by the method of partial correlations. He found that the starred tests were the best tests for admission into the Engineering schools.

The starred numbers correlate .87 with the I. G. when taken as a group as against the .82 when all the tests are taken. These seven tests require only five hours of testing as against 25 hours required by the entrance requirements. In respect to this Mr. Mann says: "When we think of the fact that we can predict what a person will do in a period of five hours' testing just as well as if we gave him the 25 hours' examination, besides looking very carefully into his previous records, we can appreciate the usefulness of this scale to Engineering Colleges or to any college who is successful in securing a group of tests to successfully measure the abilities which are necessary to become successful."

This has by no means exhausted the list of investigations, but it is hoped that these few cases may be kept in mind, when the following sections are read. The correlations presented in this introduction are not, strictly speaking, comparable with those secured in this study, as the material and conditions have not been the same.

Section II.

Problems and Method.

The general problem of this study is the relationship between the army tests and University grades. Upon careful analysis, however, this general problem assumes a four-fold purpose, namely:

1. To discover the relationship between the army tests (singly or as a group) and the average of the grades of Freshmen women in the University of Minnesota for each semester of the year 1917-1918, and for the first quarter of the year 1918-1919.

2. To show the relationship which exists between the University grades given during one semester with those of another semester for the above mentioned years.

3. To study the effect of age-grouping upon the relationship expressed between the University grades and between University grades and the army tests.

4. To show the relation between the tests and the tests through inter-correlations.

The scores for army tests E group examinations A and B given to about 300 Freshmen women during the year 1917, together with the scores for army test Alpha Form 6, given to almost 110 students of the same group, were available for this study.

From the first group it was necessary to eliminate:

1. All Freshmen women who were over 24 years old, because of their variation from the group in maturity and experience.

2. Those who failed to remain two semesters of their Freshmen years since no comparative records between semesters could be secured.

3. Repeaters who were reviewing some or all of their work and therefore would do better than if they were taking the work for

the first time.

4. Students who had begun their Freshman work in 1916, for such students were taking Sophomore work during the second semester of 1917-18.

5. Those who were carrying a sub-normal amount of work as these students could devote more time to these subjects and secure higher grades than they would secure under normal conditions.

6. Those who had incompletes in two or more subjects, since incompletes simply mean unfinished work. In some cases the work is never satisfactorily completed and results in failure; in a great many cases the work is made up and various passing grades are secured.

The remaining 233 cases were divided into age groups, the young group consisting of students from 16 to 18, the middle group including those from 18 to 20, and the older which represented students between the ages 20 to 24.

The difficulty of having University grades represented by the letters A, B, C, D, E and F, was overcome by assigning to the letters the following values.

1) A= 95, B= 85, C= 75, D= 65, E= 55, F= 45. The average numerical mark for each semester was then determined. These values were found to give the highest correlations in the correlations of one semester's grade with another, although we experimented with other values before arriving at such a decision. For instance, assigning the values A= 95, B= 80, C= 65, D= 50, E= 35, F= 20, gives a correlation of .70 between the average of the grades for the middle group for two semesters as against a correlation of .785 when the first mentioned values were assigned.

The following formulae were used in the computations of this study. The coefficients of correlation were found by Pearson's

product-moment formula.

$$r = \frac{\sum (E.N) - n d_a d_b}{n \sqrt{\frac{\sum e^2}{n} - d_a^2} \sqrt{\frac{\sum e^2}{n} - d_b^2}}$$

We determine the probable error of the coefficients of correlation by the formula P.E. = .6745 $\frac{1-r^2}{\sqrt{n}}$

The correction of the correlation-coefficients for attenuation was obtained by applying the formula:

$$r_{p q} = \frac{\sqrt{(r_{p_1 q_2}) (r_{p_2 q_1})}}{\sqrt{(r_{p_1 q_2}) (r_{q_1 q_2})}}$$

Section III

Description of the Tests.

The Army Test, Form E, Group a, b is made up of ten distinct tests. The Army Test Alpha, Form 6 is made up of eight tests corresponding to eight of the tests found in Army Test E. Aside from number two and ten of Form E, the tests of this form correspond with the tests of Alpha, Form 6 in this fashion:

Army test a, b, Form E; 1-3-4-5-6-7-8-9

Army test Alpha, Form 6; 1-5-2-8-4-3-6-7

Although the purposes of the tests are identical for the two groups there are changes in the content. The problem is the same in all cases but the wording of the exercises or the numbers which make up the exercises are changed in the various Forms in order to provide duplicate tests.

The problems in the individual tests are on the whole, arranged in the order of increasing difficulty. They are so constituted as to limit as far as possible the influence of school training even to the extent of eliminating hand writing. The answers may be indicated by a cross or by underscoring, or by numbers if a numerical answer is expected. In the analogies tests, for instance, several possible words are given, one of which would show the correct relationship, instead of supplying it.

The following description will deal with the individual tests of Form E, Group Examinations a and b, making references to the tests in Group Examination Alpha, Form 6, only when there are changes in the length or methods of the problems.

Army Test I, Form E. Directions.

This test consists of ten parts arranged in the order of increasing difficulty. Each test involves the ability to grasp and

follow directions. No. I, Part 1 consists in placing a mark in the largest square in a row of squares. Number I, Part 10 is more difficult and reads something like this. At the command "Go", cross out the letter before O and draw a circle around the third letter before G. Group Examination Alpha, Form 6, Test I, gives two additional tests as a substitute for Test I, Part 1.

Army Test II, Form E. Memory Span.

In this test the examiner reads aloud several sets of figures, two of each series from three to nine figures. After the reading of a set the students were allowed ten or fifteen seconds (7 to 9 were given 15 seconds, 3 to 6 were given 10 seconds) in which to write down the set as they remembered it. This test is omitted in Group Examination Alpha, Form 6.

Army Test III, Form E. Disarranged Sentences.

Test III consists of twenty disarranged sentences. The examinees are asked to read these sentences and to indicate whether the words when correctly arranged would make a false or true statement. The first and last of these series of samples are:

- 1) Men makes marching tired. true, false.
- 20) to aid deep great snow a military manoeuvre is. true, false.

The corresponding test in the Alpha Group, Form 6 has four additional sentences.

Army Test IV, Form E. Arithmetical Problems.

A group of twenty examples of varying difficulty constitutes the material for this test. None of these examples require much computation, although several require the most careful insight and analysis. These problems are arranged in their order of difficulty, the first and the last of which read as follows:

- 1) How many are 40 and 6 guns?

20) A commission house which had already supplied 1,897 barrels of apples to a cantonment delivered the remainder of its stock to 28 mess halls. Of this remainder each mess hall received 47 barrels. What was the total number of barrels supplied?

Army Test V, Form E. Information.

This test is made up of forty uncompleted sentences. After each sentence there are four words suggested as possible concluding words. The test of information consists in choosing the one word from these four, which makes the statement correct. The following are examples of the test.

- 1) The number of dog's legs is four, six, eight, ten.
- 13) Edison is the most famous in religion, invention, war, literature.
- 31) "World's Work" is published by Doubleday, Page, McClure's, Munseys, Harpers.

Army Test VI, Form E. Synonyms and Antonyms.

Test VI is based on pairs of words which have the same or opposite meanings. The examinee is asked to underscore the word opposite, if the words are opposite in meaning, or the word same, if such is the relationship. There are forty pairs of words to be judged. Two specimens of these tests are:

- 1) alive-dead same, opposite.
- 40) carnivorous-herbivorous same, opposite.

Army Test VII, Form E. Practical Judgment.

To test practical judgment ten questions are asked. Each of these questions have four possible answers printed underneath. The problem consists in choosing the best answer from this set of four answers and indicating this decision by a cross in the square. The time is limited to one and a half minutes. The following is an il-

illustration of this group.

8) Why are high mountains covered with snow?

they are near the clouds

the sun seldom shines on them

they shed the rain

the air at great heights is always cold

The corresponding test in Army Test Alpha, Group 6 consists of sixteen questions with three possible answers for each group. The procedure is the same as in Army Test 7, Form E.

Army Test VIII, Form E. Number Completion.

As the title would indicate this test consists in the completion of sixteen numerical series of which part is given. From the arrangement of the numbers given the subject is to determine the order in which the series advance, thus:

32, 30, 29, 27, 26 ----?

In Army Test Alpha, Form 6 there are twenty rows of numbers, each row representing six numerical values, with blanks for the two following numbers in each of the series. A specimen of this group will indicate the changes.

21 18 16 13 11 8 ? ?

Army Test IX, Form E. Analogies.

This test for Analogies consists in the observing of the relationship between two words and selecting from four possible words the one which expresses the same relationship with a given third word. Forty such relationships constitute the problem. To illustrate:

1) finger - hand; toe - (foot, knee, arm, nail)

28) peace - happiness; war - (sorrow, fight, battle, Europe)

The last test of this group has listed columns of numbers. There are ten columns of ten rows each of two place figures, six

columns, ten rows each of three place figures, and six columns, ten rows each of four place figures. The subjects are asked to draw lines under the largest and smallest numbers in each column. This test is not given in Army Test Alpha, Form 6.

Section IV.

Results.

In the preceding sections this study has concerned itself with a survey of previous investigations, a discussion of the problem and the methods of work, together with a description of the tests. This section will deal primarily with the treatment of the data bearing upon the four aspects of the problems already discussed in section II.

The Relation Between University Grades and Test Scores.

The correlations between University marks and test scores are relatively low. The range of these correlations is shown in table I, page 26, which presents the coefficients of correlation between the University grades of the middle group, (women students 18 to 20 years of age) and their scores in Army test, form E.

The correlations between the two semesters of 1917-18 and the tests for Directions, Disarranged Sentences, Practical Judgment and Number Cancellation are practically negligible when we consider the probable error; that is, the coefficient of correlation is less than three times the P.E. of the coefficient in each case. It is improbable that the individual scores in these tests would be at all indicative of the grades one would get in college work. The tendency toward a negative correlation in many of these cases may indicate that an opposite ability is being measured. However, the correlations are too small to be of prophetic value in this direction.

Table I shows a correlation of only .392 between the un-weighted totals and the average grades of the first semester, 1917-18, while the highest correlation between the individual test and the average of the grades for the first semester, 1917-18, is only

Table I.

All women students between 18-20 in attendance during both first and second semesters of the years 1917-18, including those who returned this year as sophomores, those who would be sophomores but failed to return, and those who failed in their work and returned as freshmen. 139 cases constituted this group. The possible unweighted scores which each test may receive reads as follows: I-10 points, II-12, III-20, IV-20, V-40, VI-40, VII-10, VIII-15, IX-40, X-40. The weighted totals for each test were obtained by multiplying the unweighted score by some number thus: Test I may receive a score 3×10 or 30, II- 2×12 or 24, III- 2×20 or 40, IV- 3×20 or 60, V- 2×40 or 80, VI- 1×40 or 40, VII- 3×10 or 30, VIII- 2×15 or 30, IX- 1×40 or 40, X- 1×40 or 40.

Army Test Form E.	Average of First Semester Grades 1917-18.	P. E. + -	Average of Second Semester Grades 1917-18.	P. E. - +
Weighted Totals	.385	.048	.311	.051
Unweighted Totals	<u>.392</u>	.047	.356	.049
Tests of Form E.				
I. Directions	-.002	.056	.02	.056
II. Memory Span	.289	.051	.333	.049
III. Disarranged Sentences	.122	.056	.159	.055
IV. Arithmetic Problems	.272	.053	.266	.053
V. Information	.333	.049	.249	.053
VI. Synonym- Antonym	.354	.049	.352	.049
VII. Practical Judgment	.111	.056	-.128	.056
VIII. Number Com- pletion	.179	.055	.177	.055
IX. Analogies	.263	.052	.212	.054
X. Number Can- cellation	-.005	.056	-.005	.056
II, IV, V, VI, VIII, IX.	+.425	.046		

Table I reads thus:- The correlation between the weighted total Army Test, Form E, and the averages of the 1st Semester Grades for 1917-18 is .385. The correlation between the weighted total of Army 1917-18 is .311. The first Test Form E and averages of 2nd Semester grades is .311. The first column of co-efficients indicates the relationship between the various tests of the Army Test and the first semester grades; the 2nd column indicates the relationships between the various tests of the Army test and the second semester grades.

.354 (see test VI). This low correlation between the test as a whole and the average grades may be due in part to the effect of some one of the following factors or even the combination of all of them:

(1) To such disturbing factors as differences in interests, differences in degrees of diligence, in amounts of time devoted to outside work, and differences in requirements in different courses.

(2) To the unreliability of grades as a measure of ability in scholastic work.

(3) To the unreliability of the tests used as a measure of the abilities tested.

(4) To a measurement of only a part of the abilities involved in scholastic work and a measurement of some abilities probably not involved in scholastic work.

For the first possibility there is much to be said. It is commonly observed that lack of interest and application may give poor grades, even if there is marked native ability. On the other hand, an individual of mediocre ability may through diligence and constant effort secure a fairly good average grade.

The correlation of less than .80 indicates that either there may have been a change in the status of the student in some cases, or there may have been changes in the judgment of the teachers in rating the work of these students. Also as the student passes from one instructor to another, there are likely to be differences in the standards by which the work of the student is judged.

Moreover, the tests themselves are, of course, not by any means, perfect measures of the abilities involved. They may be of too narrow a range or contain tasks that are not wholly representative tasks, or may not even be arranged in correct sequence or in an order of difficulty. Direct evidence of such deficiencies in the tests is discussed in connection with tables VII, page 39, VIII, page 41, and IX, page 43, under the topic, "Relationships Between Tests."

Perhaps the greatest reason why these tests do not correlate well with University grades is the fact that these tests were not intended to measure the abilities of a college group, but rather groups of every degree of mental ability. These tests served their purpose admirably when they were given to a non-selected group. Our college women, however, with some exceptions, come from the higher portion of the group.

The soldiers who rank A, B, or C in the Army tests are not necessarily of the same degree of intelligence as the students who rank A, B or C in their college work. In fact, recent research has found that approximately 80% of the college freshman group are in the A and B groups of the Army tests (1).

In reading the correlations given in these tables it must be kept in mind that the tests were designed for the purpose of selecting a large group of men from every walk of life and classifying them according to their ability. In college, however, much of the selection has been already done, and the use of the Army test is largely for the purpose of classifying this selected group as well as for the purpose of determining the value of the Army test as a factor in making this selection.

Inasmuch as the tests were given by trained psychologists according to standardized directions, little or no attention need be given to the possibility of variation due to variabilities in methods of giving and scoring the tests.

Considering the relationships found by correlating the weighted and unweighted totals, respectively, with the average grades of each semester, we may conclude that the use of the weighted totals

(1) Dr. M. J. Van Wagenen - The University Student as Revealed by the Army Test. Minnesota Alumni Weekly, vol. XVIII, March 10, 1919, pp. 7-11.

offers no advantage. In fact, it seems slightly inferior in its correlation with school grades, when compared with the unweighted totals.

The tests which show the highest relationships with school grades are the memory span test, the arithmetic problems test, the range of information test, the synonym-antonym test, the number completion test and the analogies test. These correlations are much lower than one would desire in tests used for diagnostic purposes. As a group these six tests gave a correlation of .425 with the average of the grades of the first semester. Irving King and James M. Crory formed a correlation between analogies and university grades of .40 for boys and .14 for girls. They also found a correlation of .44 (boys) and .41 (girls) between an information test and school grades. (2)

Table II, page 30, duplicates table I except that all comparisons are made between the average of the grades for university women who returned as sophomores during the year 1918-19. The correlations are not changed materially as the result of combining these various age groups. They are slightly lower with the exception of tests IV and V (that is, the correlation between the tests and the grades for the first or second semester.)

The correlations between the tests and the average grades of the third quarter (3rd column, table II) are considerably lower than the correlations between the tests and the average grades of the first and second semesters. This is due in part at least to the lower correlation between the grades for either the first or second semester and the grades of the first quarter of the sophomore year. (See table V, page 35).

(2) Irving King and James M. Crory - Freshmen Tests at the State University of Iowa. Journal of Educational Psychology. January 1918, pp. 32-46.

Table II

This section represents all women students, regardless of age, who were in attendance during both the first and second semesters of 1917-18, who returned as sophomores in 1918-19. 135 cases constitute this group.

Army Test, Form E.	Av. of 1st Semester Grades 1917-18.	P.E. +	Av. of 2nd Semester Grades 1917 - 18.	P.E. +	Av. of 1st Quarter Grades 1917- 18.	P.E. +
Unweighted Totals	.346	.050			.128	.056
Test of Form E.						
I. Directions	+.001	.058	-.031	.058	-.002	.058
II. Memory Span	.029	.058	.121	.057	.051	.058
III. Disarranged Sentences	.15	.056	.132	.056	.077	.057
IV. Arithmetic Problems	.356	.050	.387	.049	.217	.056
V. Information	.372	.049	.324	.051	.147	.056
VI. Synonym- Antonym	.284	.053	.223	.054	.171	.056
VII. Practical Judgment	-.06+	.057	-.130	.056	-.02	.058
VIII. Number Com- pletion	.083	.057	.099	.057	.15	.056
IX. Analogies	.252	.053	.236	.054	.225	.054
X. Number Com- pletion	+.22	.055	.101	.057	.051	.058

Table II reads thus: The correlation between the unweighted total and the first semester grade for 1917-18 is .346; the correlation with the second semester grades, 1917-18 is -----; and the correlation for the third semester grade is .128.

The tests which gave low correlations with the first and second semester grades also gave low correlations with the average grades for the first quarter, while those which gave the highest correlations with the average grades of the first or second semesters retain their higher relative position among the coefficients of correlation.

Table III, page 32, shows the same relationships for a group of 105 students. This table was prepared primarily for the computation of the correction for attenuation, and is placed here merely to corroborate the previous results.

To further check the results of the Army test, Form E, the Alpha group, Form 6, was given to 105 of the subjects who had also taken Army test E. (See table IV, page 33). Table IV indicates that the test for arithmetic problems, the synonym-antonym test, the number series completion test and the analogies test correlate higher with the average grades of each semester than do the other tests. Practical judgment which has shown negative correlations in Army test, Form E, shows positive relationship in form 6. The probable error is so large, however, as to make the relationship quite negligible.

The Relationship between Grades

Table V, page 35, presents the relation between the averages of grades for each group. The averages of the grades for the first semester show a marked correlation with the averages of the second semesters grades. Considering the fact that so many freshmen retain their same instructors throught the year in English, history and science, we would expect a higher correlation. How much of this low correlation between the two sets of averages of the grades for the two semesters is due to changes in the status of the students, and how much to the inaccuracies, due to a subjective system of rating

Table III.

Relation between the Army test E and Semester Grades for the year 1917-18.

This table includes 105 women students who took the first Army test, form E, who completed the freshman work, who took the Second Army test, Alpha, form 6.

Army Test E and	Average of grades for Semester I 1917-18.	P.E. \pm	Army test E and ...	Average of grades for Semester II 1917-18.	P.E. \pm
I. Directions	-.003	.066		+.065	.065
III. Disarranged Sentences	.256	.061		.351	.057
IV. Arithmetic Problems	.413	.054		.447	.052
V. Information	.357	.057		.269	.060
VI. Synonym- Antonym	.243	.061		.169	.064
VII. Practical Judgment	-.141	.065		-.211	.062
VIII. Number Com- pletion	.278	.060		.128	.064
IX. Analogies	.319	.058		.214	.062
Army E Total.....	.422	.053		.368	.056

Table III should read: The correlations between directions test and the averages of the grades for Semester I is $-.003$ with a P.E. value of $\pm .066$. The correlations between directions test and the average of the grades for Semester II is $+.065$ with a P.E. value of $\pm .065$.

Table IV.

Relation between the Army Test Alpha, Form 6 and the grades for Semester I and Semester II for the year 1917-18.

This table includes the same group of women students described in table III.

Army test 6 and....	Average of grades for Semester I 1917-18.	P.E. + -	Army test 6 and ...	Average of grades for Semester II 1917-18	P.E. + -
I. Directions	+.025	.066		+.110	.064
II. Arithmetic Problems	.429	.053		.383	.056
III. Practical Judgment	.295	.060		.145	.064
IV. Synonym- Antonym	.335	.058		.371	.057
C. Disarranged Sentences	.260	.061		.213	.062
VI. Number Com- pletion	.365	.057		.257	.061
VII. Analogies	.300	.059		.293	.060
VIII. Information	.216	.062		.250	.061
Total.....	.405	.054		.431	.053

Note:- This test is to be read as in test III, p. 32.

students, is of course impossible to determine from any material presented here. That the latter plays no small part is hardly to be doubted.

These correlations are somewhat higher than those found by Marguerite Calfee (1) from Texas University. Miss Calfee found a correlation of .66 between the grades for the first semester and the grades for the second semester of the same year. (1)

The relationship between the first quarter grade of the year 1918-19 with the average of each semester grades for 1917-18 is surprisingly low. One might attempt to explain this low correlation by the entire change in teachers and in subjects studied in addition to the two factors previously mentioned.

The effect of the change in teachers and in subjects might, of course, explain the further decrease in the size of the coefficient, but in view of the fact that this year the instructors had practically only eight weeks during the first quarter in which to classify their students, to estimate their ability, and to rate them with respect to their accomplishments, leads us to think that the factor of subjective standards is by no means an unimportant one. During the year 1917-18 each instructor had at least four months in each semester to do exactly the same thing. Eight weeks' acquaintance undoubtedly does not enable the instructor to judge as accurately as does sixteen weeks' acquaintance.

Effect of Age Grouping on Correlations between University Grades.

In Table V, page 35, we may observe the effect of grouping the students in age groups. The correlation between the grades for the

(1) Calfee, Marguerite. College Freshman Four General Intelligence Tests. *Journal of Educational Psychology*, vol. iv, March, 1913, pp. 223-33.

Table V.

Relation between Averages of Grades.

	Grades for	Grades for	Grades for	No of Cas es			
	1st Semes- ter with 2nd Semes- ter 1917-18.	1st Semes- ter with 1st Quar- ter P. E. 1918-19.	2nd Semes- ter with 1st Quar- ter P. E. 1918-19.		P.E.		
All women students between 18-20....	.785	†.021		139			
All women between 18-20 now here as sophomres.....	.770	†.029		85			
Women between 18- 20 who would be sophomores if re- turned, plus those who are here as sophomores.....	.779	†.024		115			
All women students between 16-18....	.640	†.051		59			
All women students between 20-24....	.713	†.053		37			
All women students who returned as sophomores in 1918- 1919.....	.79-	†.021	.507	†.043	.518	†.042	135
Women students who took Army Test Form E; also Form 6.....	.776	†.026					105

The first column of coefficients indicates the relationship for the averages of the grades for Semester I, and those of Semester II. The second column indicates the relationship between the average first semester grades and the averages of the first quarter grades. The third column indicates the relationship between the averages of the second semester grades and the first quarter. The fourth column gives the number of cases represented.

first semester for the 18-20 year group is .785. The correlation between the grades for the older group is .713. When the averages of the grades for the younger group are used the correlation coefficients become .640.

In each case, then, is a decrease of correlation when the older or the younger of the age groups are given. As a tentative explanation of this decrease in correlation we might suggest that some of the younger students are failing to take their work seriously and are not doing as well as they are able to do. If they have low grades one semester they may apply themselves somewhat and secure fairly high grades the next semester. There is also the possibility of older students being more serious in their purpose and more constant in their application, hence, securing for a part of time, at least, grades comparable to those who have less perseverance, but greater ability.

Table VI, page 37, presents the distribution of the passing and failing groups (failing groups are those who fail to become sophomores.) They are arranged according to the raw total score they received in the Army test, Form E. The median for the total of the passing group is 162.70. Super-imposing this median on the other groups we find that 55% of the younger group, 49% of the middle group, and 44% of the older group fall above this median. Of the failing group only 25% of the younger group, 35% of the middle group, and 50% of the older group fall above this median. Because of the few cases in each of the failing groups, it is perhaps more reliable to say that of 34 cases in the failing group 32% of them fell above the median of the total passing group, i.e., 162.70.

Table VI.

Distribution of Passing and Failing Group.---
Raw Totals of Army Test, Form E, for 235 cases.

	Passing Group.				Failing Group.			
	Younger	Middle	Elder	Total	Younger	Middle	Elder	Total
215-219.99								
210-214.99			1	1				
205-209.99			1	1				
200-204.99	3	1	1	5				
195-199.99	2	2	1	5				
190-194.99	4	4	1	9				
185-189.99	3	2	4	9				
180-184.99	8	8	1	17		1		1
175-179.99	2	5	2	9	1	2		3
170-174.99	2	11	0	13		2		2
165-169.99	5	19	2	26		3	1	4
160-164.99	<u>2</u>	<u>10</u>	<u>2</u>	14		1	1	<u>2</u>
155-159.99	<u>5</u>	<u>3</u>	<u>1</u>	9	1	2		<u>3</u>
150-154.99	4	9	4	17	2	4		6
145-149.99	1	11	1	13		2	1	3
140-144.99	2	5	3	10				
135-139.99	7	10	1	18		2		2
130-134.99	1	2	1	4		1		1
125-129.99	1	7	1	9		2		2
120-124.99	1	4	1	6	1	1		2
115-119.99	1	2	2	5				
110-114.99			1	1		1		1
105-109.99								
100-104.99								
95- 99.99			2	2				
90- 94.99								
	<u>54</u>	<u>115</u>	<u>34</u>	<u>203</u>	<u>5</u>	<u>24</u>	<u>3</u>	<u>32</u>
	55% or cases a- bove me- dians in Army test.	49% or cases above.	44% above median for the total.		25%	35%	50%	34%

Relation Between Tests.

A test is reliable to the extent to which it correlates with a similar test. A part of the lack of correlation between the army tests and school grade is due to the defects of the tests within the group. To substantiate this statement the correlations between the tests in Form E, and its equivalent test in Form 6, have been computed. (See table VII, page 39).

As tests II and X of Form E were eliminated in Form 6, no relationship could be worked out for these two tests. The tests do not correlate as high as one might expect. Tests for Directions, Disarranged Sentences and Practical Judgment are surprisingly low. There are several disturbing factors which have tended to lower these correlations.

The tests Form E and Alpha Form 6 were given one year apart. An increased maturity on the part of the subject, together with a former experience with the test, no doubt has a slight effect on the result. The conditions of the subjects could not be controlled by the experimenter, although external conditions were kept constant. The ability in some cases was too complex to be measured by the short amount of material given. I would say that this was probably true of the test for practical judgment, the test for directions and that for disarranged sentences, as these tests were very short. In several of the tests the test material varied slightly when given in Form 6. I am referring particularly to the tests for Directions, Practical Judgment, and Disarranged Sentences. These differences in content have been fully discussed in section II, and are, I believe, of enough weight to influence the correlation somewhat.

The raw totals for Army Test E correlated with the raw totals for Form 6 to the extent of .823. This result is somewhat higher

Table VII.

Relation between Tests of Form E and their equivalent test in Form 6.

This table represents 105 women students who took both the Army test, form E and the Army test, Alpha, form 6.

<u>Army Test E.</u>	<u>Army Test 6</u>	<u>r</u>	<u>P. E. value</u>
Directions.....(E ₁ 6 ₁)		.34	+-.058
Disarranged Sentences.....(E ₃ 6 ₅)		.38	+-.057
Arithmetic Problems.....(E ₄ 6 ₂)		.70	+-.032
Information.....(E ₅ 6 ₈)		.58	+-.043
Synonym-Antonym.....(E ₆ 6 ₄)		.60	+-.041
Practical Judgment.....(E ₇ 6 ₃)		.22	+-.061
Number Completion.....(E ₈ 6 ₆)		.50	+-.049
Analogies.....(E ₉ 6 ₇)		.64	+-.039
Total E Total S	_____	.823	+-.021

This table should read:- Directions test in Form E correlated .38 with Directions test in Form 6. The P. E. value for Directions test is +- .058

than that obtained when the relationship was found between the average of the grades for one semester and the average of the grades for the following semester. From these results it is safe to say that we may prophesy more accurately from the scores received in one army group test what the student will do in a similar test than we can prophesy what a student can do in a second semester's work of the same year (and for the most part with the same instructors) from the standing he receives for one semester's work. (See Table I, page 26).

While the two tests were not given under identical conditions (being given 14 months apart) and while the grades for the two semesters were not assigned under the same identical conditions, nevertheless, the coefficients when corrected for attenuation (see table VIII, page 41) probably give a closer approximation to the true relation between the traits involved in the tests and those involved in the subject studied, than do the raw correlations. Because of the negative correlations the correction for "Attenuation" could not be determined for test VII (Practical Judgment).

The corrected coefficients are thus not very high, even when chance inaccuracies are accounted for. The correlation of .58 for Disarranged Sentences would indicate that the type of test is a fairly good means of detecting traits essential for success in scholastic work, even though the tests correlate poorly with itself and low with the average grades. (See tables VII, page 39. I page 26 and II page 30). Tests for Arithmetic Problems and Disarranged Sentences show the highest correlations, while the Information test, The Synonym-Antonym test, the Number Completion test and the Analogies test show only a fair relationship.

Table VIII.

Corrections for Attenuation.

Correlations between the tests, the tests and the semester grades, the tests and the tests, and the grades and the grades for a group of 105 women students of the College of Science, Literature and the Arts gave the material for these corrections. The formula used is that given by Thorndike on page 179 of Mental and Social Measurements.

Directions.....	.078
Disarranged Sentences.....	.54
Information.....	.36
Synonym-Antonym.....	.35
Number Completion.....	.34
Analogies.....	.35
Arithmetic Problems,.....	.59
 Total for all Tests.....	 .48

Several of these tests show higher correlations with other tests in the group than they do with supposedly identical tests. Table IX, page 43, presents the computed relationships between the tests of Form 6, while table X, page 44, is a reproduction of the interrelationships between the tests of Form E. (1).

Practical Judgment, which correlated only .22 with its similar test, correlates .44 with tests for Disarranged Sentences and .47 with the Synonym-Antonym test of Form 6. A coefficient of .76 brings out the fact that there is considerable relationship between the test for Disarranged Sentences and all the tests in Form 6. The Information test, the Analogies test, and the Synonym-Antonym test also show marked correlations with total tests of the groups.

In comparing the results of table IX with table X we find the most marked differences in the results in the correlation between tests for Directions and Practical Judgment and the remaining tests. In Form 6, table IX, page 43, we find Practical Judgment correlating .33 with Arithmetic Problems, .38 with Disarranged Sentences, .51 with Number Completion, and .42 with Analogies. In table X, page 44 (Army test E) we find Practical Judgment correlating .053 with Arithmetic Problems, .246 with Disarranged Sentences, .236 with Number Completion, and .133 with Analogies. The higher correlation for Form 6 is in part due to the improvement made in the tests. Tests for Directions and Disarranged Sentences show similar tendencies to differ when combined with the tests in its respective group. Apart from the improvement made in the tests low correlations which these tests made with their identical tests explain this difference in the results found in tables IX and X.

(1) Table X. Reproduced from Unpublished report on Form E for 1917-18 by Dr. M. J. Van Wagenen.

Table IX.

Relation between Tests of the Alpha Scale 6. Number of Cases is 105.

Pearson product -- Moments coefficients of correlation for 105 cases of freshman women students in the Science, Literature and the Arts College of the University of Minnesota.

In each case I represents the Directions Test; II, the Arithmetic Problems Test; III, the Practical Judgment Test; IV, the Synonym-Antonym Test; V, the Disarranged Sentences Test; VI, the Number Completion Test; VII, the Analogies Test, VIII, the Information Test; and IX, the Total.

	I	P.E.	II	P.E.	III	P.E.	IV	P.E.	V	P.E.	VI	P.E.	VII	P.E.	VIII	P.E.	IX	P.E.
	+ -		+ -		+ -		+ -		+ -		+ -		+ -		+ -		+ -	
I			.38		.14		.11		.33		.28		.25		.18		.39	
II	.38			.056	.33		.17		.38		.51		.42		.13		.53	
III	.14	.056	.33			.058	.47		.44	.057	.15	.048	.30	.055	.23	.064	.55	.047
IV	.11	.064	.17	.058	.47			.051	.59	.053	.24	.064	.37	.059	.23	.062	.67	.045
V	.33	.064	.38	.064	.44	.051	.59			.043	.17	.062	.47	.056	.45	.052	.76	.036
VI	.28	.058	.51	.057	.15	.053	.24	.17		.043		.064	.52	.051	.20	.052	.60	.027
VII	.25	.060	.42	.048	.30	.064	.37	.47	.064		.52		.047		.38	.062	.75	.041
VIII	.18	.061	.13	.055	.23	.059	.45	.45	.051	.047	.20	.047			.38	.057	.71	.028
IX	.39	.063	.53	.064	.55	.062	.67	.67	.052	.052	.60	.062	.38	.057				.032
		.056		.047		.045		.036	.027	.036		.041		.028	.71	.032		

This table should be read: Directions Test I of Army Test Alpha, Form 6 correlates .38 +-.057 with Arithmetic problems; .14 +-.064 with Practical Judgment, etc.

Table I.

Pearson Product -- Moments coefficients of Correlation for 209 cases of Freshman women of the Science, Literature and the Arts College of the University of Minnesota.

In each case I represents the Directions Test; II, the Arithmetic Problem Test; III, the Practical Judgment Test; IV, the Synonym-Antonym Test; V, Disarranged Sentences Test; VI, the Number Completion Test; VII, the Analogies Test; VIII, the Information Test; IX, the Memory Span Test; X, the Number Completion Test; XI, the correlation of each test with the raw total.

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI
I		.094	.119	.162	.172	.262	.133	.049	.301	.021	.260
II	.094		.053	.147	.246	.236	.136	.146	.076	.262	.332
III	.119	.052		.042	.044	.042	.099	.176	.035	.119	.193
IV	.162	.147	.042		.377	.135	.486	.504	.128	.001	.682
V	.172	.246	.044	.377		.317	.350	.248	.248	.148	.576
VI	.262	.236	.042	.135	.317		.302	.117	.154	.152	.472
VII	.133	.136	.099	.486	.350	.302		.450	.199	.237	.421
VIII	.049	.146	.176	.504	.248	.117	.450		.049	.190	.675
IX	.301	.076	.035	.128	.248	.154	.199	.049		.00	.409
X	.021	.262	.119	.001	.148	.152	.237	.190	.00		.455

Probable Error of Various Values of r for 207 cases:

r -	.1	.2	.3	.4	.5	.6	.7	.8	.9
P.E.-	.047	.045	.049	.039	.035	.028	.033	.016	.009

This table should read: Test I of the Army Examination Form E, correlates with the test for Arithmetic Problems +.049 with Practical Judgment .119, etc.

Summary of Conclusions.

(1) The correlations between the Army tests and the average of the University grades are low - - (less than .40).

(2) The Analogies test, the test for Memory Span, the Arithmetic Problem test, the Synonym-Antonym test, the Number Completion and the Information test constitute as good a measure of all the abilities required in college work as all the tests of the group. These four tests correlating over .4 with the grades for the first semester of 1917-18.

(3) The unweighted totals correlated higher with the University grades than the weighted totals. The correlations between the unweighted totals and the grades for the first and second semester being .392 and .356 respectively. The correlations between the weighted total and the grades for the first and second semester being .385 and .311 respectively (see table I, page 26). Thus there seems to be no advantage in using the weighted totals.

(4) The tests for Directions and Practical Judgment as they are can very well be eliminated from the group since they do not diagnose the abilities required of a college student. These tests correlated -.002 and 111 respectively with the University grades for the first semester (see table I, page 26 .)

(5) The tests for Directions and Practical Judgment are inadequate measures of the abilities they are intended to measure since they show a correlation of only .34 and .22 with nearly identical tests.

(6) The tests as a whole correlate fairly well with each other (above .80). This coefficient is higher than the correlations between the averages of the grades.

(7) The low correlations from .50 to .79 between the averages of the semester grades would indicate considerable variability on the part of the pupil or on the part of the judgment of the teachers or a combination of these factors.

(8) It is our opinion that if the better of the Army tests are carefully revised and extended to meet the requirements of a University group, they can be very helpful in diagnosing the abilities required of freshmen students.

(9) Such a series of tests carefully devised for University students will be of great value to the institution. They may be substituted for entrance examinations (this would save considerable time). They may be given as a check on the previous records of the student's work - they may select the student more suited for a particular field of work than any other. In fact, there is no limit to the uses to which adequate tests may be put. After conducting several such investigations with other mental tests, as was made in the case of the Army test, the most suitable tests will soon be selected for the purpose of further diagnosis, until we finally will have complete and conclusive measures of the abilities involved in college work.

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FORM E

GROUP EXAMINATIONS a AND b

GROUP NO. _____

Name _____ Age _____

Company _____ Battalion _____ Regiment _____ Division _____

In what country born? _____ Years in U. S.? _____ Race _____

Occupation _____ Weekly Wages _____

Schooling: Grades, 1. 2. 3. 4. 5. 6. 7. 8.: High or prep. School, Year 1. 2. 3. 4.: College, Year 1. 2. 3. 4.

TEST 1

1.



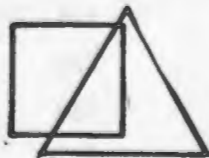
2.



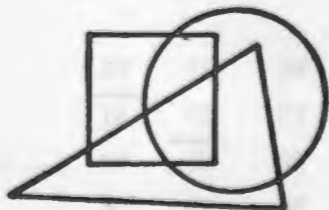
3.



4.



5.



6.

34-79-56-87-68-25-82-47-27-31-64-93-71-41-52-99

7.

MILITARY - GUN - CAMP

8.



9.

Yes No

10.

ABCDEFGHIJKLMN OP

TEST 10

Draw a line under the largest number and also under the smallest number in every column on the page.

Samples		Begin Here								
34	31	45	79	26	59	24	78	63	37	
79	48	98	21	69	62	81	23	96	41	
87	66	38	48	54	25	79	51	42	80	
68	26	67	85	23	40	66	30	95	46	
25	60	74	37	71	21	30	97	51	28	
82	98	84	97	63	26	88	75	98	63	
27	33	96	42	99	77	33	92	86	25	
30	23	39	62	37	64	25	39	45	52	
19	52	53	23	82	63	37	24	76	89	
24	78	89	52	46	38	52	66	67	74	

414	113	821	846	377	432
377	441	388	961	645	716
522	690	977	273	215	388
997	688	377	740	586	286
885	724	681	209	859	873
285	916	994	668	233	661
926	162	702	214	910	749
767	269	498	812	788	238
241	385	891	447	968	928
627	707	587	405	449	519
4267	4602	2096	2002	2143	4536
1612	8863	8869	6926	1612	3732
7871	3540	5371	5039	9001	6937
3316	6690	6063	2391	3168	3241
8120	1358	4798	1648	3040	7545
2478	9588	2474	7280	7679	2848
6533	6423	9400	8295	2615	2158
5025	7913	9645	3563	1776	6450
4819	1117	8437	1837	1744	4854
9994	2678	5854	1794	7557	5263

TEST 2

This is a test to see how many figures you can remember and write down after they are spoken.

In the first row of empty squares write the first set of figures you hear, as shown in the samples; in the second row write the second set you hear, and so on.

Sample one - - - - - - - -

4	7	5
---	---	---

Sample two - - - - - - - -

8	1	4
---	---	---

Three figures: First set - - - -

--	--	--

“ “ Second set - - - -

--	--	--

Four figures: First Set - - - -

--	--	--	--

“ “ Second set - - - -

--	--	--	--

Five figures: First set - - - -

--	--	--	--	--

“ “ Second set - - - -

--	--	--	--	--

Six figures: First set - -

--	--	--	--	--	--

“ “ Second set - -

--	--	--	--	--	--

Seven figures: First set - -

--	--	--	--	--	--	--

“ “ Second set - -

--	--	--	--	--	--	--

Eight figures: First set - -

--	--	--	--	--	--	--	--

“ “ Second set -

--	--	--	--	--	--	--	--

Nine figures: First set -

--	--	--	--	--	--	--	--	--

“ “ Second set

--	--	--	--	--	--	--	--	--

TEST 9

SAMPLES { sky—blue : grass—(grow, green, cut, dead)
 fish—swims : man—(boy, woman, walks, girl)
 day—night : white—(red, black, clear, pure)

In each of the lines below, the first two words have a certain relation. Notice that relation and draw a line under the *one* word in the parenthesis which has that particular relation to the third word. Begin with No. 1 and mark as many sets as you can before time is called.

-
- | | | |
|----|-------------------------------------------------------------------------|----|
| 1 | finger—hand : toe—(foot, knee, arm, nail) | 1 |
| 2 | December—Christmas : November—(month, Thanksgiving, December, early) .. | 2 |
| 3 | above—top : below—(above, bottom, sea, hang) | 3 |
| 4 | sit—chair : sleep—(bed, rest, wake, snore) | 4 |
| 5 | spoon—soup : fork—(knife, plate, meat, cup) | 5 |
| 6 | bird—song : man—(speech, woman, boy, work) | 6 |
| 7 | skirts—girl : trousers—(boy, hat, vest, coat) | 7 |
| 8 | corn—horse : bread—(daily, flour, man, butter) | 8 |
| 9 | officer—private : command—(army, general, obey, regiment) | 9 |
| 10 | Edison—phonograph : Columbus—(America, Washington, Spain, Ohio) | 10 |
| 11 | cold—heat : ice—(cream, frost, refrigerator, steam) | 11 |
| 12 | wolf—sheep : cat—(fur, kitten, dog, mouse) | 12 |
| 13 | sweet—sugar : sour—(sweet, bread, man, vinegar) | 13 |
| 14 | hunter—gun : fisherman—(fish, bold, wet, net) | 14 |
| 15 | uncle—nephew : aunt—(niece, brother, sister, cousin) | 15 |
| 16 | giant—large : dwarf—(jungle, small, beard, ugly) | 16 |
| 17 | rafters—house : skeleton—(bones, skull, grace, body) | 17 |
| 18 | cannon—rifle : big—(small, bullet, gun, army) | 18 |
| 19 | engineer—engine : driver—(horse, harness, passenger, man) | 19 |
| 20 | breeze—cyclone : shower—(bath, flood, winter, spring) | 20 |
| 21 | pitcher—milk; vase—(flowers, pitcher, table, pottery) | 21 |
| 22 | blonde—brunette : light—(heavy, electricity, dark, girl) | 22 |
| 23 | abundant—cheap : scarce—(costly, plentiful, common, gold) | 23 |
| 24 | polite—impolite : pleasant—(disagreeable, agreeable, man, face) | 24 |
| 25 | large—elephant : loud—(soft, hear, cannon, see) | 25 |
| 26 | succeed—fail : praise—(lose, friend, God, blame) | 26 |
| 27 | theatre—people : hive—(thrive, sting, bees, thick) | 27 |
| 28 | peace—happiness : war—(sorrow, fight, battle, Europe) | 28 |
| 29 | dismal—cheerful : dark—(sad, stars, night, bright) | 29 |
| 30 | complex—simple : hard—(brittle, money, easy, work) | 30 |
| 31 | music—noise : harmony—(hear, accord, violin, discord) | 31 |
| 32 | truth—gentleman : lie—(rascal, live, give, falsehood) | 32 |
| 33 | airplane—air : submarine—(dive, engine, ship, water) | 33 |
| 34 | violence—anger : caress—(love, woman, kiss, child) | 34 |
| 35 | hospital—patient : prison—(cell, criminal, bar, jail) | 35 |
| 36 | square—cube : circle—(line, round, square, sphere) | 36 |
| 37 | mountain—valley : genius—(idiot, right, think, brain) | 37 |
| 38 | clock—time : thermometer—(cold, weather, temperature, mercury) | 38 |
| 39 | a—b : c—(e, d, b, letter) | 39 |
| 40 | fear—anticipation : regret—(vain, memory, express, resist) | 40 |

VII
TEST 3

The words

MORNING THE RISES EVERY SUN

in that order don't make a sentence; but they would make a sentence if put in the right order:

THE SUN RISES EVERY MORNING

and this statement is true.

Again, the words

ANIMAL A IS THE RARE DOG

would make a sentence if put in the order:

THE DOG IS A RARE ANIMAL

but this statement is false.

Below are twenty mixed-up sentences. Some of them are true and some are false. When I say "go," take these sentences one at a time. Decide what each sentence *would* say if the words were straightened out, but don't write them yourself. Then, if what it would say is true, draw a line under the word "true;" if what it would say is false, draw a line under the word "false." If you cannot be sure, guess. The two samples are already marked as they should be. Begin with No. 1 and work right down the page until time is called.

- | | | | |
|-----------|-------------------------------------------------|------------|----|
| SAMPLES { | morning the rises every sun | true false | |
| | animal a is the rare dog | true false | |
| 1 | men makes marching tired | true false | 1 |
| 2 | east the in rises sun the | true false | 2 |
| 3 | chairs sit are to on | true false | 3 |
| 4 | wood made carpets are of | true false | 4 |
| 5 | not eat gunpowder to good is | true false | 5 |
| 6 | are clothes all made cotton of | true false | 6 |
| 7 | trees in nests build birds | true false | 7 |
| 8 | good are shots soldiers all | true false | 8 |
| 9 | north all railroads south and run | true false | 9 |
| 10 | money marry always for men | true false | 10 |
| 11 | eggs birds hens and lay | true false | 11 |
| 12 | high hard to are mountains climb | true false | 12 |
| 13 | policy not is the honesty best | true false | 13 |
| 14 | pole north equator mile one from is the the | true false | 14 |
| 15 | explosive a dynamite high is | true false | 15 |
| 16 | place pole is north fine a the | true false | 16 |
| 17 | fever from free army usually camps typhoid are | true false | 17 |
| 18 | and eat good gold silver to are | true false | 18 |
| 19 | Bible earth the says inherit the the shall meek | true false | 19 |
| 20 | to aid deep great snow a military manoeuvres is | true false | 20 |

TEST 8

In the lines below, each number is gotten in a certain way from the numbers coming before it. Study out what this way is in each line, and then write in the space left for it the number that should come next. The first two lines are already filled in as they should be.

SAMPLES

2, 4, 6, 8, 10, ..12..

11, 12, 14, 15, 17, ..18..

7, 8, 9, 10, 11,

10, 9, 8, 7, 6,

6, 8, 10, 12, 14,

5, 8, 11, 14, 17,

16, 14, 12, 10, 8,

5, 6, 8, 11, 15,

27, 28, 31, 32, 35,

32, 30, 29, 27, 26,

27, 29, 32, 34, 37,

43, 47, 49, 53, 55,

33, 42, 51, 60, 69,

30, 33, 39, 48, 60,

41, 39, 34, 32, 27,

47, 42, 39, 34, 31,

51, 49, 45, 39, 31,

IX TEST 4

Get the answers to these examples as quickly as you can.
Use the side of this page to figure on if you need to.

- SAMPLES {
- 1 How many are 5 men and 10 men? ----- Answer (15)
 - 2 If you walk 4 miles an hour for 3 hours, how far do you walk?----- Answer (12)
- 1 How many are 20 boats and 9 boats? - - - - - Answer ()
 - 2 If you save \$4 a month for 9 months, how much will you save? - - - - - Answer ()
 - 3 If 64 men are divided into squads of 8, how many squads will there be? - - - - - Answer ()
 - 4 Mike had 11 cigars. He bought 3 more and then smoked 8. How many cigars did he have left? - - - - - Answer ()
 - 5 A company advanced 6 miles from their trenches and retreated 2 miles. How far were they from their trenches then? - Answer ()
 - 6 How many hours will it take a truck to go 48 miles at the rate of 3 miles an hour? - - - - - Answer ()
 - 7 How many cigars can you buy for \$1.00 at the rate of 2 for 5 cents? - - - - - Answer ()
 - 8 A regiment marched 40 miles in five days. The first day they marched 9 miles, the second day 6 miles, the third 10 miles, the fourth 7 miles. How many miles did they march the last day? - - - - - Answer ()
 - 9 If you buy 2 packages of tobacco at 7 cents each and a pipe for 75 cents, how much change should you get from a two-dollar bill? - - - - - Answer ()
 - 10 If it takes 5 men 4 days to dig a 50-foot trench, how many men are needed to dig it in half a day? - - - - - Answer ()
 - 11 A dealer bought some mules for \$1200. He sold them for \$1500, making \$50 on each mule. How many mules were there? - Answer ()
 - 12 A rectangular bin holds 500 cubic feet of lime. If the bin is 10 feet long and 5 feet deep, how wide is it? - - - - - Answer ()
 - 13 A recruit spent one-eighth of his spare change for post cards and twice as much for a box of letter paper, and then had \$2.00 left. How much money did he have at first? - - - - - Answer ()
 - 14 If $5\frac{1}{2}$ tons of bark cost \$33, what will $3\frac{1}{2}$ tons cost? - - - - - Answer ()
 - 15 A ship has provisions to last her crew of 400 men 6 months. How long would it last 1600 men? - - - - - Answer ()
 - 16 If an aeroplane goes 300 yards in 10 seconds, how many feet does it go in a fifth of a second? - - - - - Answer ()
 - 17 A U-boat goes 6 miles an hour under water and 20 miles on the surface. How long will it take to cross a 100-mile channel, if it has to go three-fifths of the way under water? - - - - - Answer ()
 - 18 If 214 squads of men are to dig 5,992 yards of trench, how many yards must be dug by each squad? - - - - - Answer ()
 - 19 A certain division contains 6,000 artillery, 15,000 infantry, and 1,000 cavalry. If each branch is expanded proportionately until there are in all 24,200 men, how many will be added to the artillery? - - - - - Answer ()
 - 20 A commission house which had already supplied 1,897 barrels of apples to a cantonment, delivered the rest of its stock to 38 mess halls. Each mess hall received 45 barrels. What was the total number of barrels supplied? - - - - - Answer ()

TEST 7

This is a test of common sense. Below are ten questions. Four answers are given to each question. You are to look at the answers carefully; then make a cross in the square before the best answer to each question, as in the sample:

- Why do we use stoves? Because
- SAMPLE { they look well
 they are black
 they keep us warm
 they are made of iron

Here the third answer is the best one and is marked with a cross. Begin with No. 1 and keep on until time is called.

1 If a man gets tired of his work, he should

- throw it up
 keep at it till the work is done
 run away and loaf
 make someone else do it

2 If you find a man who has hanged himself, what is the thing to do?

- run away
 send a notice to the paper
 take him home
 call a doctor or the police

3 If a person asks you for information which you do not have, you should

- tell him something else
 walk away
 pretend you do not understand his language
 say you do not know

4 If a man who can't swim should fall into a river, he should

- yell for help and try to scramble out
 collect wood and make a raft
 dive to the bottom and crawl out
 lie on his back and float

5 If your gun explodes during a battle, what should you do?

- throw it away and get another
 keep it to use as a club
 take it apart and save the undamaged parts
 try to fix it

Go to No. 6 above

6 If someone does you a favor, what should you do?

- try to forget it
 steal for him if he asks you to
 return the favor as soon as you can
 marry his sister if she wants you to

7 If you are hurrying in an auto to catch a train and come to a swollen stream, what should you do?

- wait till the water goes down
 go around and try another road
 take off your clothes and swim across
 hire a horse and ride across

8 Why are high mountains covered with snow? Because

- they are near the clouds
 the sun seldom shines on them
 they shed the rain
 the air at great heights is always cold

9 Why is leather used for shoes? Because

- it is cheap and produced in all countries
 it wears out easily
 it wears well and is easy to shape to the foot
 it is made of felt

10 If you are held up and robbed in a strange city, you should

- ask the next man you meet for money to get home
 telegraph home for money or get a job
 borrow some money at a bank
 sell your clothes

TEST 5

Notice the sample sentence:

People hear with the eyes ears nose mouth

The correct word is *ears*, because it makes the truest sentence.

In each of the sentences below, you have four choices for the last word. Only one of them is correct. In each sentence draw a line under the one of these four words which makes the truest sentence. If you cannot be sure, guess. The two samples are already marked as they should be.

SAMPLES { People hear with the eyes ears nose mouth
 France is in Europe Asia Africa Australia

- 1 The number of a dog's legs is four six eight ten
- 2 Bees gather milk honey flour leaves
- 3 Mice are fond of rabbits cats cheese owls
- 4 Sheep eat mostly nuts fruits stones grass
- 5 Chicago is in Minnesota Wisconsin Nebraska Illinois
- 6 Horns grow on mules squirrels cows pigs
- 7 Cider comes from peaches grapes apples lemons
- 8 A good tree climber is the dog rabbit cat horse
- 9 The meat of the steer is called beef mutton veal pork
- 10 The clarinet is used in book-binding riding music carpentry
- 11 The liver is in the chest head neck abdomen
- 12 Soap is made by Smith & Wesson Procter & Gamble Anhaenser-Busch Cluett-Peabody
- 13 Edison is most famous in religion invention war literature
- 14 Fatima is a make of automobile cigarette lamp fountain pen
- 15 The U. S. school for army officers is at Annapolis West Point Terre Haute Ithaca
- 16 The copperhead is a kind of tree flower snake fish
- 17 Vienna is in Austria Spain Italy Rumania
- 18 A small heavy rubber ball is used in base-ball hand-ball foot-ball tennis
- 19 Among the evergreen trees is the birch spruce hickory walnut
- 20 The number of cylinders in the standard Cadillac is four six eight twelve
- 21 Venizelos is most famous in science literature music politics
- 22 The Jersey is a kind of cattle fish fowl fruit
- 23 "The Autocrat of the Breakfast Table" is by Lowell Poe Holmes Cooper
- 24 The capital of Ireland is Belfast Cork Dublin Listowell
- 25 Edith Cavell was best known as a suffragette army-nurse singer pianist
- 26 Bombay is a city in China France Japan India
- 27 The headquarters of the B. F. Goodrich Co. are in Youngstown Akron Troy Louisville
- 28 Diamonds are obtained from reefs oysters mines elephants
- 29 The Multigraph is a time-recorder copying machine calculator addressing machine
- 30 An air-cooled engine is used in the Packard Buick Franklin Ford
- 31 "World's Work" is published by Doubleday, Page McClures Munseys Harpers
- 32 The Durham Shorthorn is a kind of sheep goat elephant cattle
- 33 Insurance is the chief business of Pittsburgh Hartford Detroit New Haven
- 34 Faraday was most famous in literature war science religion
- 35 Joseph Choate was a lawyer engineer merchant scientist
- 36 Libby, McNeill & Libby deal in beef cut glass jewelry toilet preparations
- 37 The number of a Guernsey's legs is two four six eight
- 38 The President during the Mexican War was McKinley Polk Madison Hayes
- 39 Blackstone was most famous in literature science law religion
- 40 Feldspar is a liquid gas mineral vegetable

TEST 6

If the two words of a pair mean the same or nearly the same, draw a line under *same*. If they mean the opposite or nearly the opposite, draw a line under *opposite*. If you cannot be sure, guess. The two samples are already marked as they should be.

SAMPLES	{	good - bad.....	<u>same</u> ..opposite	
		little - small.....	same.. <u>opposite</u>	
		1 alive - dead.....	same..opposite	1
		2 tie - fasten.....	same..opposite	2
		3 whole - part.....	same..opposite	3
		4 danger - safety.....	same..opposite	4
		5 genuine - real.....	same..opposite	5
		6 choose - select.....	same..opposite	6
		7 fault - virtue.....	same..opposite	7
		8 similar - different.....	same..opposite	8
		9 jealousy - envy.....	same..opposite	9
		10 excess - surplus.....	same..opposite	10
		11 sacred - profane.....	same..opposite	11
		12 conquer - subdue.....	same..opposite	12
		13 treason - loyalty.....	same..opposite	13
		14 vanity - conceit.....	same..opposite	14
		15 allure - attract.....	same..opposite	15
		16 waste - conserve.....	same..opposite	16
		17 deride - ridicule.....	same..opposite	17
		18 censure - praise.....	same..opposite	18
		19 slovenly - neat.....	same..opposite	19
		20 illustrious - brilliant.....	same..opposite	20
		21 agitate - excite.....	same..opposite	21
		22 haggard - gaunt.....	same..opposite	22
		23 con - pro.....	same..opposite	23
		24 subject - object.....	same..opposite	24
		25 orifice - aperture.....	same..opposite	25
		26 conspicuous - prominent.....	same..opposite	26
		27 depressed - elated.....	same..opposite	27
		28 eminent - distinguished.....	same..opposite	28
		29 frivolous - serious.....	same..opposite	29
		30 erudite - scholarly.....	same..opposite	30
		31 recline - stand.....	same..opposite	31
		32 degenerate - deteriorate.....	same..opposite	32
		33 martial - civil.....	same..opposite	33
		34 nonchalance - anxiety.....	same..opposite	34
		35 torpor - stupor.....	same..opposite	35
		36 comprehensive - restricted.....	same..opposite	36
		37 latent - hidden.....	same..opposite	37
		38 node - knot.....	same..opposite	38
		39 celestial - terrestrial.....	same..opposite	39
		40 carnivorous - herbivorous.....	same..opposite	40

FORM 6

GROUP EXAMINATION ALPHA

GROUP NO.

Name..... Rank..... Age.....

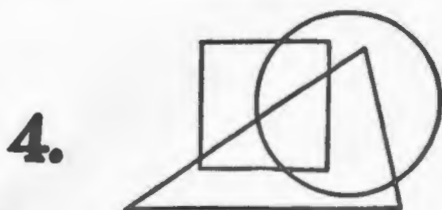
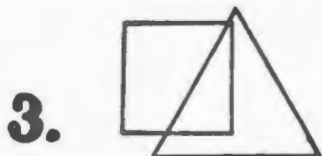
Company..... Regiment..... Arm..... Division.....

In what country or state born?..... Years in U. S.?..... Race.....

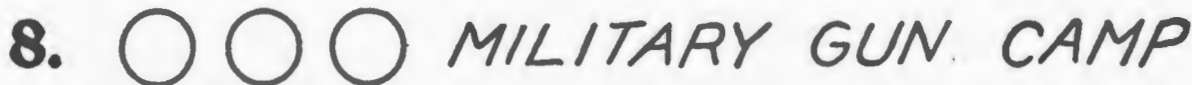
Occupation..... Weekly Wages.....

Schooling: Grades, 1. 2. 3. 4. 5. 6. 7. 8: High or Prep. School, Year 1. 2. 3. 4: College, Year 1. 2. 3. 4.

TEST 1



7. A B C D E F G H I J K L M N O P



9. 34-79-56-87-68-25-82-47-27-31-64-93-71-41-52-99



12. 1 2 3 4 5 6 7 8 9

TEST 8

Notice the sample sentence:

People hear with the eyes ears nose mouth

The correct word is ears, because it makes the truest sentence.

In each of the sentences below you have four choices for the last word. Only one of them is correct. In each sentence draw a line under the one of these four words which makes the truest sentence. If you can not be sure, guess. The two samples are already marked as they should be.

SAMPLES	}	People hear with the eyes <u>ears</u> nose mouth	
		France is in <u>Europe</u> Asia Africa Australia	
1	Boston is in Connecticut Rhode Island Maine Massachusetts.....	1	
2	Euchre is played with dice rackets cards pins.....	2	
3	The Arabian is a kind of horse goat cow sheep.....	3	
4	The most prominent industry of Milwaukee is fish brewing flour automobiles.....	4	
5	Turquoise is usually yellow red green blue.....	5	
6	The Leghorn is a kind of cow horse fowl granite.....	6	
7	Arthur Brisbane is famous as a newspaper man comic artist athlete actor.....	7	
8	Shoes are made by Swift & Co. Smith & Wesson W. L. Douglas Babbitt Co.....	8	
9	Blanche Sweet is known as a writer singer suffragist movie actress.....	9	
10	"The makings of a nation" is an advertisement of a tobacco flour beer health food..	10	
11	Country Gentleman is a kind of wheat corn hay oats.....	11	
12	The artichoke is a vegetable fish lizard snake.....	12	
13	Yale University is at New Haven Annapolis Ithaca Cambridge.....	13	
14	Tokio is a city of India China Egypt Japan.....	14	
15	Diamonds are obtained from mines reefs elephants oysters.....	15	
16	Rodin is famous as a poet painter sculptor composer.....	16	
17	The chameleon is a bird reptile insect fish.....	17	
18	The thyroid is in the shoulder neck head abdomen.....	18	
19	Dioxygen is a disinfectant food product patent medicine tooth paste.....	19	
20	The U. S. S. Michigan is a destroyer monitor submarine battleship.....	20	
21	The cutlass is a kind of sword musket cannon pistol.....	21	
22	The Corona is a kind of phonograph multigraph adding machine typewriter.....	22	
23	Indigo is a food drink color fabric.....	23	
24	The xylophone is used in lithography music stenography book-binding.....	24	
25	Madras is a drink fabric food dance.....	25	
26	The author of "The Scarlet Letter" is Hawthorne Poe Stevenson Kipling.....	26	
27	John Wesley was most famous in literature science war religion.....	27	
28	The Delco System is used in plumbing filing ignition cataloguing.....	28	
29	Rubber is obtained from ore petroleum trees hides.....	29	
30	Darwin was most famous in literature science war politics.....	30	
31	Falstaff appears in Romola Vanity Fair Oliver Twist Henry IV.....	31	
32	The number of a Korean's legs is two four six eight.....	32	
33	Perjury is a term used in pedagogy law theology medicine.....	33	
34	A tedder is used in farming fishing hunting athletics.....	34	
35	Slice is a term used in bowling golf tennis football.....	35	
36	The Battle of Lexington was fought in 1620 1775 1812 1864.....	36	
37	The kilowatt is used in measuring rainfall wind power electricity water power.....	37	
38	The Buick car is made in Toledo Flint Buffalo Detroit.....	38	
39	Among the allies of Germany is Bulgaria Norway Rumania Portugal.....	39	
40	An eight-sided figure is called a trapezium scholium parallelogram octagon.....	40	

TEST 2

Get the answers to these examples as quickly as you can.
Use the side of this page to figure on if you need to.

- | | | | | | | |
|---------|---|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----|---|
| SAMPLES | { | 1 | How many are 5 men and 10 men?..... | Answer (| 15 |) |
| | | 2 | If you walk 4 miles an hour for 3 hours, how far
do you walk?..... | Answer (| 12 |) |
| | | 1 | How many are 40 guns and 6 guns?..... | Answer (| |) |
| | | 2 | If you save \$6 a month for 5 months, how much will you
save?..... | Answer (| |) |
| | | 3 | If 32 men are divided into squads of 8, how many squads will
there be?..... | Answer (| |) |
| | | 4 | Mike had 11 cigars. He bought 3 more and then smoked 6.
How many cigars did he have left?..... | Answer (| |) |
| | | 5 | A company advanced 6 miles and retreated 3 miles. How far
was it then from its first position?..... | Answer (| |) |
| | | 6 | How many hours will it take a truck to go 48 miles at the rate
of 4 miles an hour?..... | Answer (| |) |
| | | 7 | How many pencils can you buy for 40 cents at the rate of 2
for 5 cents?..... | Answer (| |) |
| | | 8 | A regiment marched 40 miles in five days. The first day they
marched 9 miles, the second day 6 miles, the third 10 miles, the
fourth 9 miles. How many miles did they march the last
day?..... | Answer (| |) |
| | | 9 | If you buy 2 packages of tobacco at 8 cents each and a pipe for
55 cents, how much change should you get from a two-dollar
bill?..... | Answer (| |) |
| | | 10 | If it takes 8 men 2 days to dig a 160-foot drain, how many men
are needed to dig it in half a day?..... | Answer (| |) |
| | | 11 | A dealer bought some mules for \$900. He sold them for \$1,000,
making \$25 on each mule. How many mules were there?.. | Answer (| |) |
| | | 12 | A rectangular bin holds 600 cubic feet of lime. If the bin is 10
feet wide and 5 feet deep, how long is it?..... | Answer (| |) |
| | | 13 | A recruit spent one-eighth of his spare change for post cards
and four times as much for a box of letter paper, and then had
60 cents left. How much money did he have at first?.. | Answer (| |) |
| | | 14 | If $2\frac{1}{2}$ tons of hay cost \$20, what will $4\frac{1}{2}$ tons cost?.... | Answer (| |) |
| | | 15 | A ship has provisions to last her crew of 600 men 6 months.
How long would it last 800 men?..... | Answer (| |) |
| | | 16 | If a train goes 200 yards in 10 seconds, how many feet does it
go in a fifth of a second?..... | Answer (| |) |
| | | 17 | A U-boat makes 10 miles an hour under water and 20 miles on
the surface. How long will it take to cross a 100-mile channel,
if it has to go three-fifths of the way under water?..... | Answer (| |) |
| | | 18 | If 214 squads of men are to dig 4,066 yards of trench, how
many yards must be dug by each squad?..... | Answer (| |) |
| | | 19 | A certain division contains 2,000 artillery, 15,000 infantry, and
1,000 cavalry. If each branch is expanded proportionately
until there are in all 19,800 men, how many will be added to the
artillery?..... | Answer (| |) |
| | | 20 | A commission house which had already supplied 1,897 barrels
of apples to a cantonment delivered the remainder of its stock
to 28 mess halls. Of this remainder each mess hall received 47
barrels. What was the total number of barrels supplied?.. | Answer (| |) |

TEST 7

SAMPLES { sky—blue :: grass—table green warm big
 fish—swims :: man—paper time walks girl
 day—night :: white—red black clear pure

In each of the lines below, the first two words are related to each other in some way. What you are to do in each line is to see what the relation is between the first two words, and underline the word in heavy type that is related in the same way to the third word. Begin with No. 1 and mark as many sets as you can before time is called.

-
- 1 dog—bark :: cat—chair mew fire house..... 1
 - 2 foot—man :: hoof—corn tree cow hoe..... 2
 - 3 dog—puppy :: cat—kitten dog tiger horse..... 3
 - 4 wash—face :: sweep—clean broom floor straw..... 4
 - 5 door—house :: gate—swing hinges yard latch..... 5

 - 6 water—fish :: air—spark man blame breathe..... 6
 - 7 white—black :: good—time clothes mother bad..... 7
 - 8 boy—man :: lamb—sheep dog shepherd wool..... 8
 - 9 roof—house :: hat—button shoe straw head..... 9
 - 10 camp—safe :: battle—win dangerous field fight..... 10

 - 11 straw—hat :: leather—shoe bark coat soft..... 11
 - 12 pan—tin :: table—chair wood legs dishes..... 12
 - 13 left—right :: west—south direction east north..... 13
 - 14 floor—ceiling :: ground—earth sky hill grass..... 14
 - 15 cold—ice :: heat—wet cold steam stars..... 15

 - 16 hat—head :: thimble—sew cloth finger hand..... 16
 - 17 Monday—Tuesday :: Friday—week Thursday day Saturday... 17
 - 18 lead—bullet :: gold—paper coin silver copper..... 18
 - 19 skin—body :: bark—tree dog bite leaf..... 19
 - 20 cannon—large :: rifle—ball small bore shoot..... 20

 - 21 cellar—attic :: bottom—well tub top house..... 21
 - 22 man—arm :: tree—shrub limb flower bark..... 22
 - 23 suitcase—clothing :: purse—purchase money string stolen.... 23
 - 24 knitting—girls :: carpentry—trade houses boys lumber..... 24
 - 25 arteries—body :: railroads—country train crossing accident.... 25

 - 26 ocean—pond :: deep—sea well shallow steep..... 26
 - 27 revolver—man :: sting—gun hurt bee hand..... 27
 - 28 engineer—chauffeur :: locomotive—iron stack engine auto..... 28
 - 29 terrier—dog :: Jersey—City cow horse State..... 29
 - 30 airplane—air :: submarine—dive engine ship water..... 30

 - 31 esteem—friends :: despise—forsake detest enemies people... 31
 - 32 hospital—patient :: prison—cell criminal bar jail..... 32
 - 33 tears—laughter :: sorrow—joy distress funeral sad..... 33
 - 34 yes—no :: affirmative—win debate deny negative..... 34
 - 35 establish—abolish :: begin—work year end commence..... 35

 - 36 order—confusion :: peace—part treaty war enemy..... 36
 - 37 education—ignorance :: wealth—poverty riches health comfort... 37
 - 38 10—100 :: 1000—money 10000 20000 wealth..... 38
 - 39 imitate—copy :: invent—study Edison machine originate 39
 - 40 historian—facts :: novelist—fiction Dickens writer book..... 40

TEST 3

This is a test of common sense. Below are sixteen questions. Three answers are given to each question. You are to look at the answers carefully; then make a cross in the square before the best answer to each question, as in the sample:

- SAMPLE } Why do we use stoves? Because
- they look well
 - they keep us warm
 - they are black

Here the second answer is the best one and is marked with a cross. Begin with No. 1 and keep on until time is called.

- | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>1 If plants are dying for lack of rain, you should</p> <ul style="list-style-type: none"> <input type="checkbox"/> water them <input type="checkbox"/> ask a florist's advice <input type="checkbox"/> put fertilizer around them <p>2 A house is better than a tent, because</p> <ul style="list-style-type: none"> <input type="checkbox"/> it costs more <input type="checkbox"/> it is more comfortable <input type="checkbox"/> it is made of wood <p>3 Why does it pay to get a good education? Because</p> <ul style="list-style-type: none"> <input type="checkbox"/> it makes a man more useful and happy <input type="checkbox"/> it makes work for teachers <input type="checkbox"/> it makes demand for buildings for schools and colleges <p>4 If the grocer should give you too much money in making change, what is the right thing to do?</p> <ul style="list-style-type: none"> <input type="checkbox"/> buy some candy of him with it <input type="checkbox"/> give it to the first poor man you meet <input type="checkbox"/> tell him of his mistake <p>5 Why should food be chewed before swallowing?</p> <ul style="list-style-type: none"> <input type="checkbox"/> it is better for the health <input type="checkbox"/> it is bad manners to swallow without chewing <input type="checkbox"/> chewing keeps the teeth in condition <p>6 If you saw a train approaching a broken track you should</p> <ul style="list-style-type: none"> <input type="checkbox"/> telephone for an ambulance <input type="checkbox"/> signal the engineer to stop the train <input type="checkbox"/> look for a piece of rail to fit in <p>7 If you are lost in a forest in the daytime, what is the thing to do?</p> <ul style="list-style-type: none"> <input type="checkbox"/> hurry to the nearest house you know of <input type="checkbox"/> look for something to eat <input type="checkbox"/> use the sun or a compass for a guide <p>8 It is better to fight than to run, because</p> <ul style="list-style-type: none"> <input type="checkbox"/> cowards are shot <input type="checkbox"/> it is more honorable <input type="checkbox"/> if you run you may get shot in the back <p style="text-align: center;">➡ Go to No. 9 above</p> | <p>9 Why are warships painted gray? Because gray paint</p> <ul style="list-style-type: none"> <input type="checkbox"/> is cheaper than other colors <input type="checkbox"/> is more durable than other colors <input type="checkbox"/> makes the ships harder to see <p>10 Why should all parents be made to send their children to school? Because</p> <ul style="list-style-type: none"> <input type="checkbox"/> it prepares them for adult life <input type="checkbox"/> it keeps them out of mischief <input type="checkbox"/> they are too young to work <p>11 The reason that many birds sing in the spring is</p> <ul style="list-style-type: none"> <input type="checkbox"/> to let us know spring is here <input type="checkbox"/> to attract their mates <input type="checkbox"/> to exercise their voices <p>12 Gold is more suitable than iron for making money because</p> <ul style="list-style-type: none"> <input type="checkbox"/> gold is pretty <input type="checkbox"/> iron rusts easily <input type="checkbox"/> gold is scarcer and more valuable <p>13 The cause of echoes is</p> <ul style="list-style-type: none"> <input type="checkbox"/> the reflection of sound waves <input type="checkbox"/> the presence of electricity in the air <input type="checkbox"/> the presence of moisture in the air <p>14 We see no stars at noon because</p> <ul style="list-style-type: none"> <input type="checkbox"/> they have moved around to the other side of the earth <input type="checkbox"/> they are so much fainter than the sun <input type="checkbox"/> they are hidden behind the sky <p>15 Some men lose their breath on high mountains because</p> <ul style="list-style-type: none"> <input type="checkbox"/> the wind blows their breath away <input type="checkbox"/> the air is too rare <input type="checkbox"/> it is always cold there <p>16 Why do some men who could afford to own a house live in a rented one? Because</p> <ul style="list-style-type: none"> <input type="checkbox"/> they don't have to pay taxes <input type="checkbox"/> they don't have to buy a rented house <input type="checkbox"/> they can make more by investing the money the house would cost |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

TEST 6

SAMPLES	}	2	4	6	8	10	12	<u>14</u>	<u>16</u>
		9	8	7	6	5	4	<u>3</u>	<u>2</u>
		2	2	3	3	4	4	<u>5</u>	<u>5</u>
		1	7	2	7	3	7	<u>4</u>	<u>7</u>

Look at each row of numbers below, and on the two dotted lines write the two numbers that should come next.

2	3	4	5	6	7	.....	.....
5	10	15	20	25	30	.....	.....
10	9	8	7	6	5	.....	.....
6	9	12	15	18	21	.....	.....
8	8	6	6	4	4	.....	.....
3	7	11	15	19	23	.....	.....
9	1	7	1	5	1	.....	.....
25	25	21	21	17	17	.....	.....
4	5	8	9	12	13	.....	.....
21	18	16	13	11	8	.....	.....
1	2	4	8	16	32	.....	.....
3	4	6	9	13	18	.....	.....
12	14	13	15	14	16	.....	.....
25	24	22	21	19	18	.....	.....
16	12	15	11	14	10	.....	.....
16	8	4	2	1	1/2	.....	.....
15	16	14	17	13	18	.....	.....
1	4	9	16	25	36	.....	.....
21	18	16	15	12	10	.....	.....
4	8	10	20	22	44	.....	.....

TEST 4

If the two words of a pair mean the same or nearly the same, draw a line under *same*. If they mean the opposite or nearly the opposite, draw a line under *opposite*. If you cannot be sure, guess. The two samples are already marked as they should be.

SAMPLES	{	good—bad.....	<u>same</u> — <u>opposite</u>	
		little—small.....	<u>same</u> — <u>opposite</u>	
1	cold—hot.....	<u>same</u> — <u>opposite</u>	1	
2	long—short.....	<u>same</u> — <u>opposite</u>	2	
3	bare—naked.....	<u>same</u> — <u>opposite</u>	3	
4	joy—happiness.....	<u>same</u> — <u>opposite</u>	4	
5	find—lose.....	<u>same</u> — <u>opposite</u>	5	
6	shrill—sharp.....	<u>same</u> — <u>opposite</u>	6	
7	minus—plus.....	<u>same</u> — <u>opposite</u>	7	
8	grim—stern.....	<u>same</u> — <u>opposite</u>	8	
9	careless—anxious.....	<u>same</u> — <u>opposite</u>	9	
10	crude—coarse.....	<u>same</u> — <u>opposite</u>	10	
11	commend—approve.....	<u>same</u> — <u>opposite</u>	11	
12	linger—loiter.....	<u>same</u> — <u>opposite</u>	12	
13	agony—bliss.....	<u>same</u> — <u>opposite</u>	13	
14	defective—normal.....	<u>same</u> — <u>opposite</u>	14	
15	competent—qualified.....	<u>same</u> — <u>opposite</u>	15	
16	knave—villian.....	<u>same</u> — <u>opposite</u>	16	
17	null—void.....	<u>same</u> — <u>opposite</u>	17	
18	wax—wane.....	<u>same</u> — <u>opposite</u>	18	
19	adversary—colleague.....	<u>same</u> — <u>opposite</u>	19	
20	altruistic—egotistic.....	<u>same</u> — <u>opposite</u>	20	
21	furtive—sly.....	<u>same</u> — <u>opposite</u>	21	
22	any—none.....	<u>same</u> — <u>opposite</u>	22	
23	asunder—apart.....	<u>same</u> — <u>opposite</u>	23	
24	deplete—exhaust.....	<u>same</u> — <u>opposite</u>	24	
25	superfluous—essential.....	<u>same</u> — <u>opposite</u>	25	
26	recoup—recover.....	<u>same</u> — <u>opposite</u>	26	
27	celibate—married.....	<u>same</u> — <u>opposite</u>	27	
28	recant—disavow.....	<u>same</u> — <u>opposite</u>	28	
29	avarice—cupidity.....	<u>same</u> — <u>opposite</u>	29	
30	aggrandize—belittle.....	<u>same</u> — <u>opposite</u>	30	
31	decadence—decline.....	<u>same</u> — <u>opposite</u>	31	
32	nullify—annul.....	<u>same</u> — <u>opposite</u>	32	
33	ambiguous—equivocal.....	<u>same</u> — <u>opposite</u>	33	
34	agglomerate—scatter.....	<u>same</u> — <u>opposite</u>	34	
35	plenary—complete.....	<u>same</u> — <u>opposite</u>	35	
36	suavity—asperity.....	<u>same</u> — <u>opposite</u>	36	
37	perfunctory—meticulous.....	<u>same</u> — <u>opposite</u>	37	
38	lugubrious—maudlin.....	<u>same</u> — <u>opposite</u>	38	
39	desuetude—disuse.....	<u>same</u> — <u>opposite</u>	39	
40	adventitious—accidental.....	<u>same</u> — <u>opposite</u>	40	

TEST 5

The words A EATS COW GRASS in that order are mixed up and don't make a sentence; but they would make a sentence if put in the right order: A COW EATS GRASS, and this statement is true.

Again, the words HORSES FEATHERS HAVE ALL would make a sentence if put in the order ALL HORSES HAVE FEATHERS, but this statement is false.

Below are twenty-four mixed-up sentences. Some of them are true and some are false. When I say "go," take these sentences one at a time. Think what each would say if the words were straightened out, but don't write them yourself. Then, if what it would say is true, draw a line under the word "true"; if what it would say is false, draw a line under the word "false." If you can not be sure, guess. The two samples are already marked as they should be. Begin with No. 1 and work right down the page until time is called.

- | | | | | |
|---------|---|----------------------------------------------------|--------|--------------|
| SAMPLES | { | a eats cow grass..... | true.. | <u>false</u> |
| | | horses feathers have all..... | true.. | <u>false</u> |
| <hr/> | | | | |
| 1 | | cows milk give..... | true.. | false 1 |
| 2 | | write are with to pencils..... | true.. | false 2 |
| 3 | | are and apples long thin..... | true.. | false 3 |
| 4 | | east the in rises sun the..... | true.. | false 4 |
| 5 | | months warmest are summer the..... | true.. | false 5 |
| 6 | | wood made carpets are of always..... | true.. | false 6 |
| 7 | | known elephant animal an is smallest the..... | true.. | false 7 |
| 8 | | water cork on float will not..... | true.. | false 8 |
| 9 | | vote children 21 cannot under..... | true.. | false 9 |
| 10 | | Battleships on seldom sails used are..... | true.. | false 10 |
| 11 | | four hundred all pages contain books..... | true.. | false 11 |
| 12 | | iron paper made of is filings..... | true.. | false 12 |
| 13 | | pays cautious it be to often..... | true.. | false 13 |
| 14 | | a general not major a and rank same the of are... | true.. | false 14 |
| 15 | | Washington canal 1776 Panama the in built.... | true.. | false 15 |
| 16 | | never deeds rewarded be should good..... | true.. | false 16 |
| 17 | | will live bird no forever..... | true.. | false 17 |
| 18 | | gases the in Mohawks fighting used poisonous... | true.. | false 18 |
| 19 | | friends in us disaster often false desert..... | true.. | false 19 |
| 20 | | external deceptive never appearances are..... | true.. | false 20 |
| 21 | | size now of guns use are great in..... | true.. | false 21 |
| 22 | | happiness lists great casualty cause..... | true.. | false 22 |
| 23 | | always sleeplessness clear causes a conscience.... | true.. | false 23 |
| 24 | | inflict men pain needless cruel sometimes..... | true.. | false 24 |