MENTALITY TESTS

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Mental Tests

A STUDY OF MENTALITY TESTS WITH REGARDS TO THE SELECTING OF MEN

A REPORT SUBMITTED TO THE FACULTY OF
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-by-
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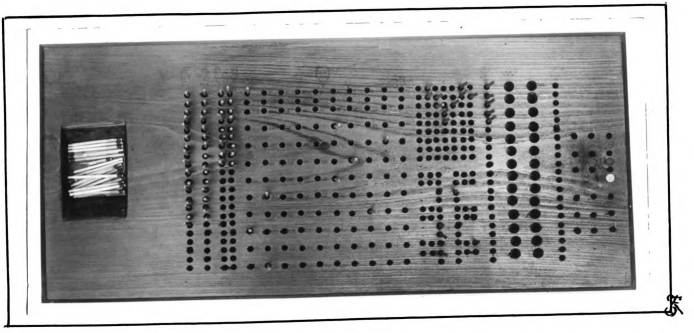
THESIS



The Match Board

A REPORT ON MENTALITY TESTS AS GIVEN TO FRESHMEN ENGINEERING STUDENTS AND A DISCUSSION OF TESTS WITH R REGARDS TO THE HIRING AND PLACING OF OFFICE HELP AND LABOR.

We find upon looking back thru the pages of history that the psychological element in life has been studied since the beginning of time. The old prophets in using the future as their subjects of discussion, were able to bring themselves into prominence whether their prophecies ever came true or not. The old leaders led their armies to victory many times due entirely to the confidence created in them by the tactful leaders, and so on down thru the ages the psychological element enters into our every day life andis picked up and used to advantage by the keener type of person quite often to the disadvantage of his adversary.

However it is not until the last century that this subject has become a part of the regular school curriculum andnot until the last half century that any practical applications ofthe subject have been intelingently applied in the form of examinations of mentality tests for which we now see a great field in the future.

The title "Mental tests" would lead one to believe that the tests were for the purpose of determ ning the existence of certain mental abilities, but to be a little more exact or explicit; the mentality test as used is given to a group of indivi duals for the purpose of determining their comparative abilities and not their actual ability along any certain line.

These tests are usually characterized by their simplicity. This quality of the test makes any deductions therefrom more comprehensible and much more liable to be correct. The tests as given are also usually of short duration.

As early as 1877 Francis Galton suggested the use of the reaction experiment for the diagnosis of temperament He developed a number of simple tests which he hoped would make it possible to obtain a general knowlege of the capacities of a man by striking directly as it were at a few critical points.

In the early nineties mentality tests came into prominence in America. Interest was then centered on the relation of mental to physical variations. For the most part the tests given resembled experiments already employed by psychology in the investigation of the simpler mental processes.

A few years later tests of a similar character were developed in Germany but at about the same time, tests of an entirely different kind were formed in France. These tests were made by Alfred Binet who was a French Psychologist and whose opinion was, that, the more specific functions (such as ability to discriminate tones or colors or to judge time intervals) not only varied less widely among different individuals but was of less importance in the constitution of individuality, than the more general or the higher functions as the imagination, comprehension, intelligence, sugestibility and sentiment. From his idea we can readily see that the formation of new tests was necessary to the furtherance of his work.

The inventor of such tests usually starts with a conception of the functions to be tested and lays down a procedure to suit this conception.

The originator of this new type of test Alfred Binet was born in 1857 he became a French psychologist and was director of the labatory of physiological psychology at the Sorbonne Paris. His first attempt at applied psychologhwas to apply the methods of hypnotism to psychological questions Later he turned his attentions in a slightly different direction and in 1905 he published a series of books with Simons which were the result of an attempt to find some standard by which degrees of inteligence might be measured. In 1908 he published another series of books which were a continuation of the Binet Simon tests. As a man of science Binet had a large measure of psychological insight and he will take rank with the leading psychologists of his generation.

The "Binet Simons tests" of 1908 comprises 56 single tests a group of which is assigned to each age from three to twelve years. A certain minimum of performance in each case constitutes a pass and the subject is graded on the basis of the number of tests passed, as having a degree of intelligence normal to such a year.

The tendendy towards developing tests which shall determine the fitness of students to enter college and to determine which courses they are most adaptable to and again tests to determine the fitness of individuals to become employees has become quite extensive in the past decade/

This report will deal to a great extent with testsof the kind just mentioned.

Among the psychologists of the day who are doing a great deal towards promoting work of this kind are such as Guy Montrose Whipple, professor of education; University of Michigan; William F. Kemble, Walter Dill Scott, director of bureau of salesmanship at the Carnegie Institute of Technology; Sherwin Cody, managing director of Associated Schools of Scientific Business; and Ida M. Tarbell.

Most ofthe literature published by these people result from experiments and tests carried on by themselves. The deductions from these tests are in many cases very conclusive andshow without doubt the practicalness of these tests.

Mr. Kemble who is engaged in introducing systems for standardizing the general working forces of commerical and manufacturing concerns has developed a number ofvery interesting and valuable tests. Among these is the "Kemble Match Board Test" which was used by Mr. Kemble in determining the probable efficiency of factory girls. This test has been revised slightly by the author and used in testing freshmen engineering students for the purpose of determining their probable shop ability and was found to correlate fairly close with the grades given the students by their instructors.

Great development was made in psychological testing during the war. Scarcely had the war been declared by our country before thepsychologists were brought together in a plan to make their professional knowlege, technique, and

experience useful in the emergency. In April of 1917 the American psychological Association appointed numerous commitees to study the situation and prepare for action. At the same time committee for psychology was organized by the National Reserch Council. Thus it happened that from the very outset American psychologists acted unitedly whereas their professional colleagues in France and Great Britain served individually where ever they could discover an oppertunity. The committee of psychology of the national reserch remained active over a period of about two years. Almost all of the psychological contributions to the war which the United States has made are directly or indirectly due to the support or the efforts of this body, the work of which has been carried on through conferences, committees or militayy committees of the army or navy.

Group methods of mental testing were forshadowed by a few studies previous to the development of the army methods these were scattering and had had no extensive use before 1917. The idea of examining children and other groupes, however, existed and it was on the basis of these preliminary studies and the work in individual examining that the committee which met at Vineland felt that it could produce a group examination which would serviceably classify recruits for army purposes. Three or four of the members of

this committee had had direct experience with group methods.

The committee consisted of R. M. Yerkes, chairman; W. V. Bingham, Secretary, H. H. Toddard; R. H. Haines, L. M. Terman G. M. Whipple and F. E. Wells. Each of these men brought to the committee a large amount of material. This material was carefully gone over and sifted out to produce the first " Examiners Guide". Hundreds of tests which had been published were also available.

The test to be devised for army use - the committee believed should,

First be adaptable for group use for the examining large numbers rapidly.

Second It should have a high degree of validity as a measure of intelligence.

Third

Third The range of inteligence measured by the test should be wide.

Fourth As far as possible it should be arranged for elimination of ~~p~~ persons judgment.

Fifth It should be arranged so that the scoring might be done easily.

Sixth There must be alternative tests to prevent coaching.

Seventh It was necessary to obtain clues to enable examiners to detect malingering.

Eighth Cheating had to be avoided.

Ninth The test had to be made as completely independant of schooling as possible.

Tenth The arrangement should be such as to allow a minimum of writing in recording answers.

Eleventh The tests must be comprised of interesting material.
Twelvth The different tests used should be arranged to yield an accurate measure of intelligence in a reasonable short time. With these criteria in mind the army tests were made up and put into use. They proved very efficient in the army and have since been used in testing students where they were also found to be of much value in determining the comparative acility of the person tested.

The tests made by the author in conjunction with Mr. Spletzdozer, which will be described in detail in this report were carried on entirely with Freshmen engineering students in their third term at Michigan Agricultural College in May of 1921. The most of these tests were merely selections of tests taken from tests originated by men of thepresent generation who are interested in this work.

The first test carried out with the students was of a technical nature. The list of questions used is one that has been adopted by thirty-eight techinical schools and colleges in the United States, which schools use the test on applicants for entrance into the engineering course. No men are actually kept from taking this course upon failing this test but it is the concensus of opinion that a man interested in engineering would have obtained this interest by reading technical articles or by comming in contact with the simpler engineering problems. Consequently the faculty uses its influence to dissuade any failing applicants from entering an engineering work and also uses its committees to help determine for the applicant a

course that he will be more liable to follow successfully.

The other five tests are as follows:

Test One Contains a series of simple problems in arithmetic. All of these problems are intended to appeal especially to those boys who have been interested in things mechanical and electrical. We have tried to avoid problems that are stereotyped. This seems to be one of the best tests in the series.

Test Two Contains a series of simple problems in algebra. It does not differ noticeable from the ordinary algebra examination.

Test Three Is an examination in geometrical construction. It differs markedly from the usual examination in geometry in that the student is asked to solve a series of simple problems in geometrical construction by means of compass and ruler. No Proofs are required.

Test Four Is an intelligence test. It is in some respects s similar to the Army Intelligence Examination but is keyed more difficult so as to be suitable for college freshmen.

Test Five Is a series of simple problems in physics in which some knowledge of physics is implied. The problems are so worded as to discourage mere repetition of memorized material.

The schools using these tests are:

Throop College of Tech.
Univ. of California
Cornell Univeersity
Worcester Poly. Institute
Case School of Applied Seience
University of Virginia
Lafayette College
Univ. of Arkansas
Univ. of Oklahoma
Oklahoma Agric. College

Rensselaey Poly. Institute

Syracuse University

Carnegie Inst. of Tech.

Ohio State University

Univ. Of Michigan

Univ. of Pennsylvania

Tufts College

Michigan Agric. College

Univ. of Washington

Univ. of Kansas

Missouri School of Mines

Drexel Institute

New York University

Rose Poly. Institute

John Hopkins Univ.

University of Missouri

Kansas Agric. College

Rhode Island State College

Marquette University

Municipal Univ. of Akron

Vanderbilt University

Purdue University

Iowa State College

Trade School at Carnegie

University of Maine

University of Vermont

University of Alabama

New Mexico Agri. College

INTELLIGENCE TEST

for

TECHNICAL INFORMATION.

Name_____ Date_____

The object of this test is to determine how much technical information you have absorbed not only in school, but also in your activities outside of school.

Each question has four printed answers and you are to underline one of the four printed answers. Thus;

Electricity is conducted by
ropes wires twine yarn

Underline the word "wire" because that makes the truest statements in this test.

Do not write any other answers. Simply underline one, and only one, of the four printed answers.

Be sure to underline one of the four answers for each question even if you have to guess. Even if you do not know the answer you will make a guess. Try to guess the answer to you the most reasonable even if you know very little about the question.

You are expected to finish this test. Take as much time as you reasonably need to answer all the questions. When you have answered all the questions, return this test to the examiner and leave the room quietly.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO BEGIN

UNDERLINE ONE OF THE FOUR ANSWERS FOR EACH STATEMENT.

1. A magnet attracts
   brass (1) copper (2) iron (3) platinum. (4)

2. The rear hub of a bicycle is often fitted with a
   coaster brake (1) cyclometer (2) grease cup (3) tail light (4)

3. An air rifle uses for ammunition
   .22 short (1) BB shot (2) .32 center fire (3) CB caps (4)

4. Oil is ordinarily used as a lubricant when drilling holes in
   cast iron (1) steel (2) wood (3) brass (4)

5. A common diaphragm opening for snap shots is
   8 (1) 64 (2) 128 (3) 400 (4)

6. In making a core for an induction coil one ordinarily uses
   mahogany (1) rubber (2) copper (3) iron (4)

7. Harley-Davidson is the name of a
   motor-cycle (1) electric clock (2) wireless detector (3)
   aeroplane (4)

8. The distributor in an automobile is a part of the
   cooling system (1) ignition system (2) oiling system (3)
   transmission (4)

9. R. P. M. represents
   volume (1) speed (2) content (3) direction (4)

10. In order to make solder adhere to metal surfaces it is necessary to use
    oil (1) flux (2) glue (3) gasolene (4)

11. To keep the barrel of a target rifle in good condition one often uses
    carborundum paste (1) dutch cleanser (2) vinegar (3)
    three-in-one oil (4)

12. Low voltage fuse wire ordinarily contains
    lead (1) silver (2) brass (3) platinum (4)

13. The regulation Ford is equipped on the rear wheels with tires of a diameter of
    2-1/2" (1) 3" (2) 3-1/2" (3) 4" (4)

14. The boiling point of water on the Fahrenheit scale is
    212° (1) 312° (2) 512° (3) 100° (4)

15. A gas engine in which the explosion takes place in each cylinder once in every two revolutions of the shaft is called
one cycle two cycle three cycle four cycle

16. The material used for trolley wire is
galvanized iron aluminum copper brass

17. DeForest invented the
triple-valve vacuum-valve needle-valve safety-valve

18. What size wire is most commonly used for wiring a house for 110 volts?
6 8 14 20

19. The wrench to turn small sizes of gas pipe should be a
socket monkey Stilson box

20. Broaches are used in a
lathe boring mill drill press arbor press

21. What is the approximate daylight limit in miles radius of a quarter kilowatt spark gap wireless telegraph sending set?
one mile 10 miles 200 miles 1000 miles

22. The motion of the talbe of a planer in a machine shop is
rotary reciprocating continuous endless

23. Bricks are made of
clay granite sandstone gneiss

24. The gears used on a lathe for thread cutting are known as
helical bevel spur worm

25. The current obtained from dry cells is
rotary interrupted direct alternating

26. The purpose of back gears on a lathe is to
increase the speed cut threads turn taners
decrease speed.

27. Balloons are filled with
compressed air hydrogen oxygen steam

28. Circles which pass thru the North and South poles are called
equator latitude longitude equinox.

29. Board measure pertains to
lumber cardboard paper metal

30. A file may be made to "bite" into cast iron by using
vaseline tallow beeswax chalk

31. The top of a shop bench is often made of
Douglas fir mahogany walnut maple

32. A split pulley on a shaft is held fast by
cement solder friction glue

33. A fillet in pattern making is ordinarily made of
leather wire twine sand

34. A bearing for a steel shaft, to wear well, is sometimes made of
cast iron bronze tool steel zinc

35. A file is held square across the blade and level in filing a
cross-cut saw rip saw back saw coping saw

36. A turret lathe is used in machining
bolts nails hammers scissors

37. Which of the following terms indicates gages of electric wires?
Winchester Roebling Brown and Sharpe Westinghouse

38. The chips made by a lathe in turning metals are long spirals when turning
cast iron steel aluminum zinc

39. In ordinary pattern work patterns are made of
fiber rubber leather wood

40. Pica is term used in
navigation printing artillery railroading

41. The ~~diameter~~ stroke of a Ford piston is
2-1/2" 3-1/2" 4" 4-1/2"

42. Locks are manufactured by
Corbin Maydole Starrett Brown & Sharpe

43. Which instrument is used to measure temperature?
dynamometer condenser pyrometer rheostat

44. A file is made of
Bessemer steel machinery steel cold rolled steel high carbon steel

45. The number of leveling screws on an ordinary transit for surveying work is
2 3 4 6

46. A soldering iron is made of
iron steel copper tin

47. How many legs are there in the tripod of an ordinary surveying transit?
one two three four

48. If you had to make a strong bolt but could not get steel to make it of, your next choice would be
cast iron lead wrought iron brass

49. The blade is ground on the upper side in a
smooth plane block plane rabbet plane jack plane

50. Which of these screws requires a counter sunk hole?
fillister head round head hexagon head flat head

51. Which of these taps has the largest diameter?
3/8" pipe tap 1/2" U.S. Std.tap 1/2" S.A.E. tap
1/2" pulley tap

52. The contours on a topographic map indicate
roads elevation streams longitude

53. Edge tools and cutlery are made of
cold rolled steel wrought iron carbon steel
cast iron

54. To whet a plane blade one should use
emery cloth a file sand paper an oil stone

55. The width of a standard gage railroad track is
4 feet 4 feet 8-1/2 in. 5 feet 5 feet 6 in.

56. Shellac varnish is thinned by
distilled water alcohol turpentine gasoline

57. Shafting is sometimes made on the
planer miller shaper lathe

58. What material is used in making the insulation of common bell or annunciator wire?
wool rubber cotton silk

59. Ordinary concrete contains
asphalt cement glass rubber

60. An automobile cylinder should be finished to a very smooth even surface. This is sometimes done by
lapping milling filing turning

61. Aeroplane motor frames are sometimes made of
brass copper steel cast iron

62. Incandescent lamps in houses are ordinarily wired in
tandem multiple series

63. A good fabric for aeroplane wings is
wool cotton linen canvas

64. A star wheel is used in a
motion picture machine sewing machine
steam engine bicycle

65. The split nut on a lathe is used for
reducing speed reversing speed driving carriage
increasing speed

66. A window sash holds the
jambs casings glass sills

67. The L.S. Starrett Co. manufactures
tools soap furniture automobiles

68. Small angles are measured on an ordinary surveying transit by a
vernier capstan tripod leveling screw

69. A connecting rod bearing is sometimes made of
aluminum steel bronze cast iron

70. One part of the door is the
jamb head sill panel

71. A man six feet tall is best fitted with a diamond frame
bicycle when the frame measures
15" 18" 24" 36"

72. In sawing off a 10" board one uses a
cross-cut saw rip saw coping saw turning saw

73. A cotter pin is ordinarily used to hold in place a
nut side curtain spare tire spark plug

74. The joints in most picture frames are
dovetailed mortise and tenon butted mitered

75. The current used by a two-phase motor is
D.C. static A.C. storage battery

76. Ordinary house paint contains
oil water alcohol gasoline

77. The spark plug on a gasoline engine is located on the
crank case cylinder manifold carburetor

78. In boring a small hole one sometimes uses a
mitre brace and bit T-bevel spoke shave

79. A gauge point on a carpenter's gauge should extend about
1/16" 1/2" 7/8" 1-1/2"

80. What is the standard commercial wave length for ships?
200 600 900 1200

81. A mallet should be made of
white pine cypress bass wood beech

82. Which of these cars have air cooled engines?
Packard Dodge Franklin Ford

83. Hot glue is thinned with
water turpentine alcohol linseed oil

84. The best resistance wire for electrical circuits is
silver copper German silver platinum

85. The joists in a building support the
roof foundations chimney floor

86. Which of the following metals can be case-hardened?
wrought iron aluminum copper babbitt

87. A frame building is constructed mainly of
brick wood steel tile

88. To keep a motor commutator clean use
oil sand paper emery cloth file

89. Shingles are nailed to the
joists sheathing jambs sills

90. Machine screws come in numbered sizes No. 1 to No. 30.
Which is the smallest of these?
No. 6 No. 20 No. 12 No. 24

91. The uprights of a frame building are called
rafters lintels joists studding

92. Lead plate storage batteries are ordinarily filled with a dilute solution of
hydrochloric acid acetic acid sulphuric acid
nitric acid

93. When gluing two pieces of wood together the surfaces should be
shellaced painted stained straightened

94. The cheapest heating system to install in a house is
steam hot water electric warm air

95. In cabinet work one most frequently uses
oak hickory catalpa cypress

96. The volt is a measure of
current pressure resistance power

97. A roof which has the shape of a four-sided pyramid is called
gable gambrel mansard hip

98. Small twist drills come in numbered sizes from No. 1 to No. 60. Which is the largest of these?
No. 52 No. 12 No. 21 No. 36

99. Those parts of a staircase into which the treads and risers are framed are called
stringers spandrels newels brackets

100. Auger bits increase in size in steps of
1/16" 1/8" 1/4" 1/64"

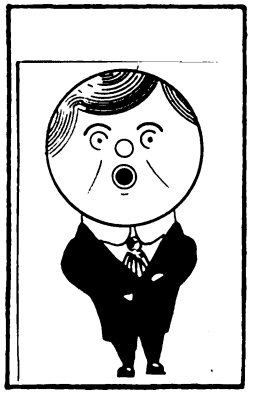
144. Who is called the "father of rail-roads" in the United States?

145. What is the heaviest kind of wood?

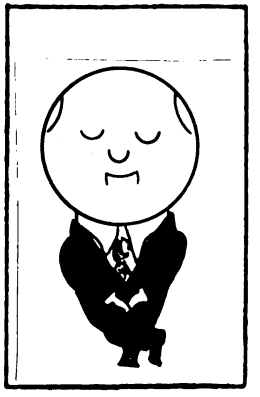
146. What is the lightest wood?

The second test given was of a humourous character and yet it was fairly conslusive. It was given with the original intention of putting the one being tested at his ease and to help destroy any nervousness that he might have, on account of being tested. The test, "Frazier's Expression Test" (#2) was laid out before the student with the expression pictures laid out in a row beneath the expression test blank. At a signal the student began to place the pictures correctly in the proper blanks on the diagram. Time and correct placements were considered in marking this test and the results thus obtained were found to correlate to 48% with the class grade which is a fairly good correlation. A person who can correctly place the pictures is one who can read the general character of a person by observing him. It is found that every one judges people to a certain extent on their first meeting. Consequent meetings may entirely change this judgement or may just round the corners off, so to speak. The type of man whose original judgment usually stands and is correct is the man to obtain a high mark on the expression test and is the type to be used advantageously in doing personal work such as welfare work, employment work, or any line of work where personal contact with other men is required. Again a high mark in this test is apt to denote a man with a keen sense of observation and lastly a real student. A man failing in this test

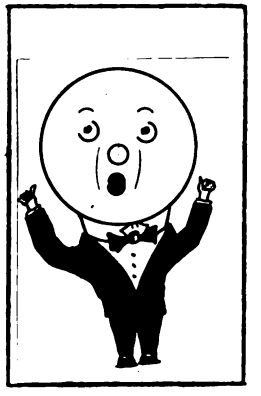
FRAZIER'S EXPRESSION TEST #2



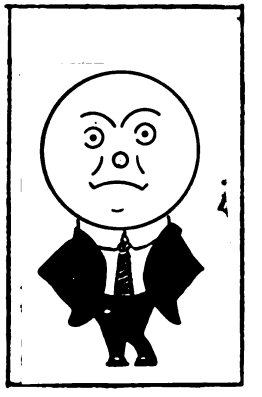
DISGUST



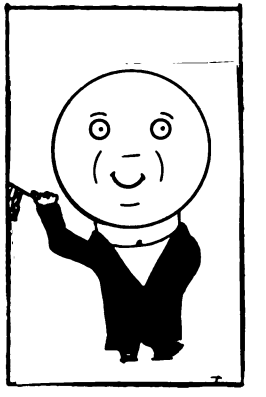
CONTENTMENT



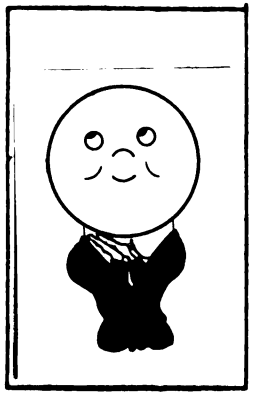
HORROR



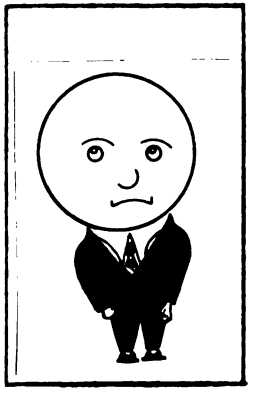
JEALOUSY



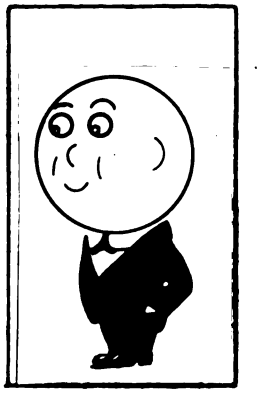
AMUSEMENT



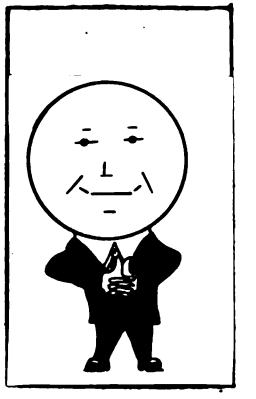
ADORATION



DISAPPOINTMENT



PRIDE

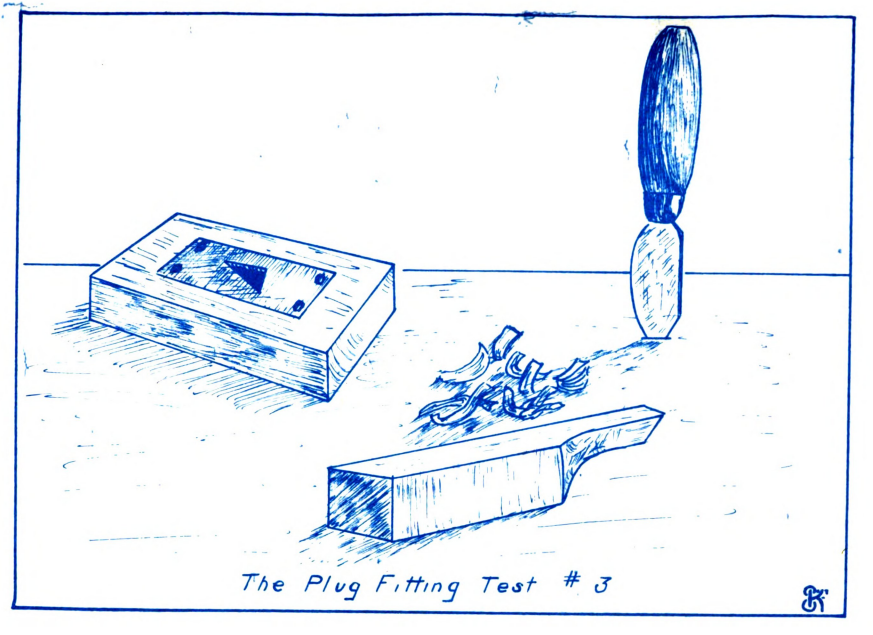


SATISFACTION

is not necessarily a failure but is apt to be the man who is always willing to work for some one and follow the explicit instructions of his superiors without question. So we can see that a test even as simple as this expression tesf really has its place amoung the mentality tests of the day and is actually of value in determining mental types while at the s same time it causes the person to forget hes nervousness and prepares him for mere strenous or exacting tests. However the next test given is not a hard one but merely a test of the ability of a man to use his head and hands similtaneously to the best advantage and is the Peg and Hole test as represented by diagram (#3)

PEG TEST

A block with a steel plate with a triangular hole in it, a 1" by 1"by 6" peice of wood and knife are given to the student. He is to shape the peg so that it fits the triangular hole for a distance of ½". Tnis test brings out different types of men. One man marked the wood before cutting it, another whittled or took many real fine cuts, while another cut it down with a few heavy cuts. The different types represented are the man who plans things before he does them, the man that takes extraordinary pains and the production man. In rating this test the time, the number of shavings and the fit were taken into consideration. Judging the fit was necessary but embodied one of those features not desirable in mental test; that of a personal element in judging. However this effected only 1/3 of the grade and if the judging was 90% correct, it would make a difference of but 3%


The Plug Fitting Test # 3

would make a difference of but 3% in the grades. This test correlated best of the tests with the course grade. This maybe from the fact that the course compared with it was Pattern making.

From this test the student was sent into the next room where the match board test was given.

MATCH BOARD TEST

The match board test as given to the Freshman engineers is a modification of the Match board as designed and used by Mr. Kemble; we can readily see from the following discussion that it is adaptable to many other classes.

On the board as revised there are eleven distinct tests e each one having a definite value in determining the probable worth of the subject being tested. However only ten of the tests were actually used.

The first test (A on the diagram test #5) is a test for determining the dexterity of the left hand. There are 21 holes in a row about 3/16" in diameter and there is a box containing matches at 3" from the row of holes. The man being tested starts at a signal given him and with his left hand attempts to fill this row of holes placing one match in each hole and never having more than one match in his hand at at a time. This is a very simple test but correlates with the man's real ability to a remarkable extent. It was found that if a man could fill twenty holes in the thirty seconds allowed for the test it showed extraordinary dexterity on the part of that individual. The average student can place seven-

teen or eighteen matches in the row in the required time. Some students were found that could only place thirteen to f fifteen matches and these same men also failed to come up to the standard in following tests. The average dexterity of the students was found to be a little higher than that of the factory girls tested by Mr. Kemble; the average girl being a able to place fifteen to sixteen matches.

The matches being so close to the holes makes it only necessary to the move the wrist and fingers in transfering the matches from the box to the test holes. The test was originally devised for determining the probable ability of the girl as a candidate for small punch press work or work of a similar nature but is found to really correlate conclusively with a persons thought speed and general ability along differedt lines.

The next or second test (B) is merely a repetition of the first with the exception that the right hand is used instead of the left. It was found that the subject usually placed one or more matches with the right hand than with the left, but this has been attributed to the fact that a better understanding of exactly what was wanted is had at the time fo the right hand dexterity test which follows that for the left hand. From this test any defects in the action of either arm will be readily observed, and this is a very important factor from a "safety first" stand point. A man with a defective arm may have ability to warrant his being hired but he should never be placed where the action of the bad arm may govern

his safety or the safety of others in the building.

The third test on thematch board (#C) completes the first series of tests and is a test to determine qualities of ambidexterity in the testee of in other words the ability of the man to use tww or more of his members similtaneously. The holes for matches are laid out in two rows as per diagram on test #5. The person being tested is requested to fill the two rows similtaneously using both hands placing one match in each hole and nevery having more than one match in each hand at one time. The average number of holes filled in the thirty seconds allowed for the test was from twenty to twenty-four or from ten to twelve pairs of holes.

It was very noticable in this test in particular that the student who became excited over the test and made his hands go as fast as his nervous system allowed, would make many unnecessary motions and in very few cases would come up to the standard of the man who took the test in a cool consistant and systematic manner.

The next test showed the comparative amount of cooperation between the different sence organs.

Test (D) tests the cooperation between the ears and the hands. The out lay greeting the man (asper diagram on test #5 is a series of numbered holes ten holes wide and eleven holes long. These holes are numbered consecutively from left to right and in rolw increasing from top to bottom with a total of 110 numbered holes. The man was told that a series of fifteen numbers was to be read to him at the rate of one

number every two seconds and that he was to place matches in the holes corresponding to the numbers. The test is then carried out and two seconds allowed after the last number is read.

Test D

58 — 17 — 81 — 30 — 101 — 12 — 47 — 62 — 96 — 1 — 77 — 69 —,11 — 4 — 22 —

In this test a variety of types of men were shown. Supposing a number was missed for example; one student would spend the time for most of the remainder of the test trying to recall the missed number while the other numbers were read unnoticed: another student upon missing a number would immediately pass and continue with the rest. The latter type would of course obtain the higher grade on this particular test but the other type of man has his place.

It is easily seen that the man who may be just a little slower than the average but on who completes his work to the best of his ability as he goes is just the man for technical research work. However this man before being recommended to research work should be given other tests of technical and problematic nature to determine his real initiative ability.

A cooperation test between the eyes and the hands was g given next (E) a small block of holes on the board was duplicated in and enlarged size with circles on a card. Twenty of these circles were filled in to form a diagram (Diagram #6) At a signal this chart appeared before theoperator of the match board and thirty seconds were given to duplicate

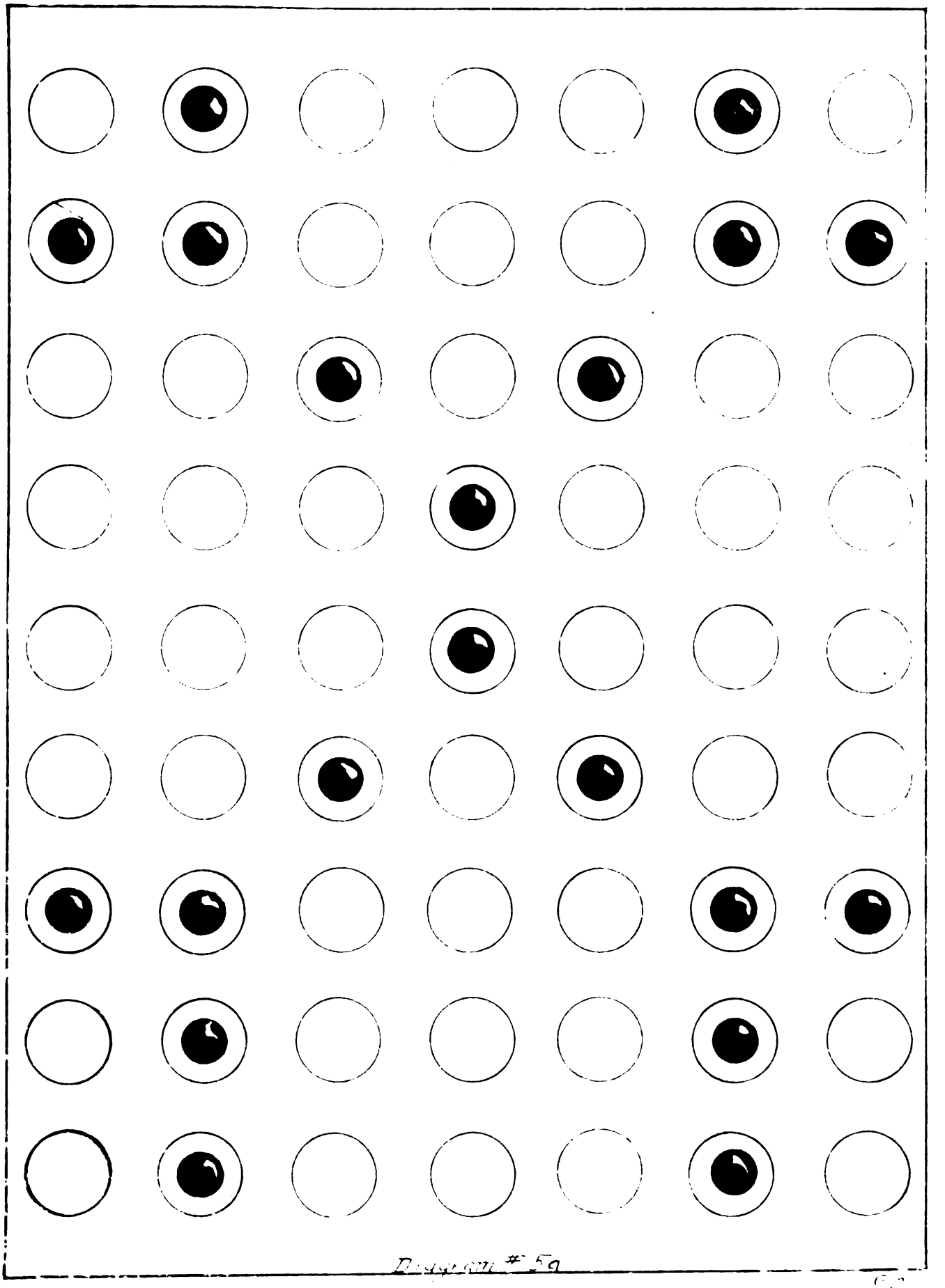


Diagram # 59

the diagram on the board. The average in this test was about twelve correctly placed out of the twenty. A couple placed up to seventeen but with seven and eight matches misplaced, At the end of the thirty sedonds the diagram drops out of s sight and a slip of paper is handed the operator with the following information.

DIAGRAM (F)

This diagram represents a series of streets and the holes thereon represent houses.

At the signal turn the slip over and follow instructions.

The operator reads this carefully and then examines the corresponding set of holes on the board which as explained by the slip are laid out in the form of a main street and side street. North being to the top as on a map.

At the signal the slip is turned and on the turned side is found the following instructions.

Placd one match in the second house on the north side of Third street, east of Broadway. Place another match on the southwest corner of Broadway and Second streets. Place two matches on the west side of Broadway in the block between Second and Third streets but not in a corner house. Place onematch at the east end of Second street on the north side of the street.

Record is taken of the length oftime that it takes to complete the test, the number of matches placed and the number incorrectly placed are recorded.

Results showed lack of ability on the part of several to follow instructions as in same cases not one of the five matches was correctly placed. Two men in the group showed exceptional ability by correctly placing the five matches in 1 minute and 1.9 minutes respectively. The average time taken was about one minute.

This test was mainly to determine opwers of concentration and powers of retaining several things in the mind at one time both of which are requisite in following instructions.

The next test begins another series. This test (G) is laid out on the board the same as test (A) but is removed about twenty inches. This means that in the carrying out of the test that the hand travels better than three feet every time a match is transfered from the box to the row of holes. This test shows the speed and ease of arm movement. The left arm only is used on this test the rules being the same as for test (A)

Test (H) is similar excepting that the holes are larger, that both hands may be used and that three matches are placed in each hole. Not more than three matches in each hand are a allo wed at any time. From this it can be seen that the left hand must count out three matches and transfer them to the right hand. While the left hand counts out three more the right hand places the first three in the proper hole. This simple operation requires concentration of the mind and coe operation between the hands.

Test (I) was not used.

Test (J) is similar to test (G) except that the right arm is used instead of the left arm.

Test K is a color test originated by the author and added to the matchboard. There are bwo blocks of nine holes each. The holes of one block are underlined with the names of colors while the holes of the other block have the corresponding colors under them. The names and the respective colors are not in the same order in the two blocks. Colored matches are placed according to color in the block with the names of colors under the holes. At a signal the matches are to be transfered from one block to the other and at another signal they are transfered back again the time for each operation is recorded. From the tests it appears that it is easier to change the matches from the names to the colors than to change them from the colors to the namesof colors. Some students would carfully pick out the right holes going each way while others would remember how they were first and would place them back much more rapidly. This brings out the two types again. The sum of the times of the two operations brought a fairly good correlation to the grades given the men by their instructor.

After the student had completed the test he was excused from the room and the results of his work were tabulated on a form as follows:

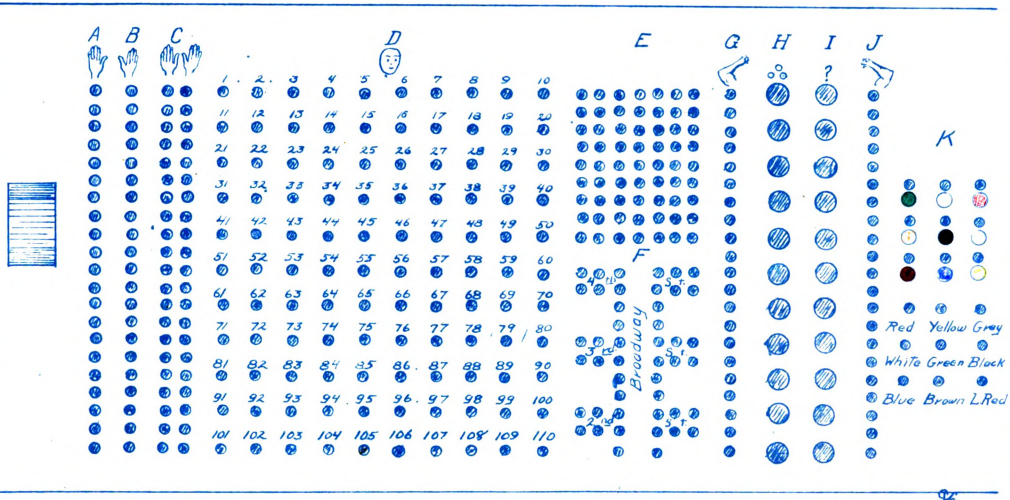
Data as taken directly from the match board.

	A Left hand dexterity.	B Right hand dexterity.	C Ambidexterity Both hands.	D Ear to hands.	E Observation test, copying diagram.	F Instruction test, with streets.	G Left arm dexterity	H Concentration test	I	J Right arm dexterity.	K Frazier color test (a)names to colors. (b)colors to names. a b
#1 Armentrout R.S.	18	17	10	13	12	3/1.2313		8		14	.35-.73
#2 Burris T.F.	19	21	11	14	20	3/1.5--14		8		15	.35-.28
#3 Bunker B.W.	18	17	11	18	26	3/1.9--13		8		14	.30-.25
#4 Dressel G.F.	20	20	14	13	14	3/1.31-18		10		12	.25-.35
#5 Eliot M.	13	15	11	11	11	0/1.1--14		9		13	.50-.70
#6 Gamel G.S.	11	13	8	11	13	0/2.6--11		7		14	.70-.30
#7 Graham F.E.	17	18	11	9	1 14	0/1.15-14		10		14	.41-.65
#8 Huges A.W.	18	2 1	11	15	10	4/ .80-16		11		16	.38-.37
#9 Huntley Harold	19	17	12	18	15	3/1.60-14		6		15	.41-.25
10 Johnson M.E.	20	20	12	14	17	3/ .96-17		9		16	.25-.36
11 Likins F.G.	18	17	10	10	13	5/1.9--13		7		12	.42-.37
12 McBroom Russel	17	19	13	12	9	5/1.00-14		11		15	.50-.50

Match board data corrected to percentages.

On a basis of ten.

	A/2	B/2	C/2	D/1.5	E/2	F/.5E	G/2	H/2	J/2	a-b	50/a-b	Tot.	Gr
#1	9	8.5	5	8.6	6	4.9	6.5	4	7	208	4.6	6411	C
#2	9.5	#0.5	5.5	9.3	10	4	7	4	7.5	63	7.9	75.2	B
#3	9	8.5	5.5	8.6	7.5	3.2	6.5	4	7	55	9.1	68.9	C
#4	10	10	7	8.6	7	4.6	9	5	6	60	8.3	75.5	B
#5	6.5	7.5	3.5	7.3	5.5	0	7	4.5	6.5	120	4.242	53.5	D
#6	5.5	6.5	4	7.3	6.5	0	5.5	7	7	100	54.3	54.3	D
#7	8.5	9	5.5	6	7	0	7	5	7	106	4.6	58.7	C
#8	9	10.5	5.5	10	5	10	8	5.5	8	75	6.7	78.2	A
#9	9.5	8.5	6	10	7.5	3.8	7	3	7.5	66	7.6	70.4	C
10	9.5	10	6	9.3	8.5	6.3	8.5	4.5	8	61	8.2	78.8	A
11	9	8.5	5	6.6	6.5	5.53	6.52	3.5	6	79	6.3	58.7	C
12	8.5	8.5	6.5	8	4.5	10	7	5.5	7.5	100	5	72.0	B



Layout of Match Board. Test #5

Match Board Test

Date _____ Name _____

TEST	A	B	C	D	E	F	G	H	I	J	Ka	Kb	T
TIME IN SEC.	30	30	30	30	30	30	30	30	30	30	__	__	_
MISTAKES													
SCORE													

Total score _____ Class grade _____

In marking the students work it was only necessary to obtain the comparative results which made it necessary for a standard of marking. The following standard was formed.

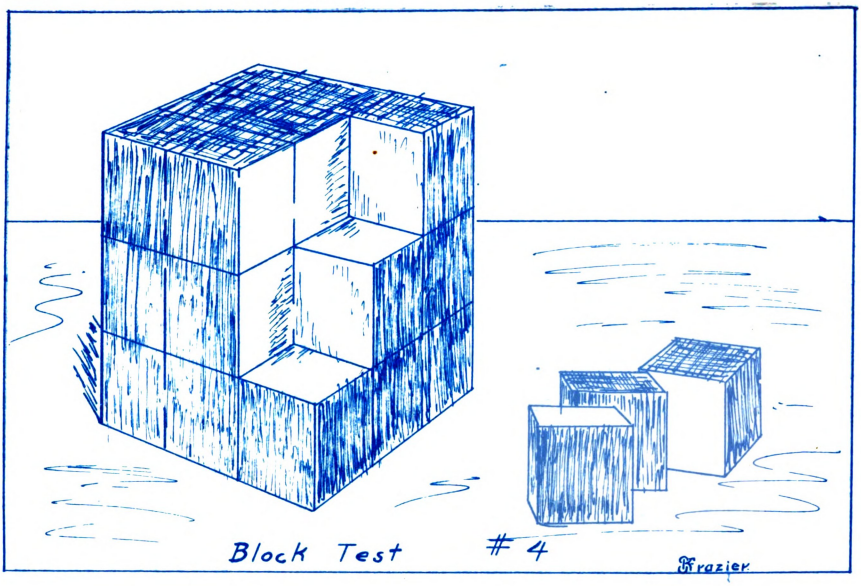
There were tem separate tests on the match board each one of shich was to bear on the final result. Then in order to mark the match board test as a whole on the basis of one hundred each test was marked on a basis of ten and the ten results added to obtain the final result.

The correlation of this test with the course grade was a about 40% which is not a discouraging correlation.

After the match board test came the fifth and last test which was a block assembling test and was for the purpose of finding the students ability in analizing and following the analysis.

Cube Assembling Test

The cube which was about 4"by 4"by 4" was painted black on the outside. This cube was composed of twenty-seven small equal cubes. Thus the corner cubes were black on three sides the edge cubes were black on two sides ,


Block Test #4
Frazier

Armentrout	1	A	C	B	A	C	B	A	B	B	B	B+	B	B
Bunker	2	C	B	B	C	B	B+	C	A	B	B	B	C	C
Burris	3	C	A	B	C	C	C+	C	B	C+	B	B	C	C
Dressel	4	C	B	C	A	B	B-	C	A	B	B	B	C+	A
Eliot	5	A	C	C	X	D	D+	A	B	D	B	B	C+	C
Gamel	6	D	D	D	D	D	D	D	D	D	D	B	C	C
Graham	7	D	C	C	C	C	C	D	D	C	B	B	C-	D
Hughes	8	C	B	B	A	B	C	D	B	B	C	D	B	C
Huntley	9	B	B	B	C	C	B-	B	C	C+	B-	B	C-	C
Johnson	10	D	B	A	A	A	A	D	C	A	B	B	B	C
Likens	11	C	A	C	B	C	C+	C	B	C+	B	B	C+	B
McBroom	12	D	B	D	X	B	C	D	C	D+	B	C	D+	C

Technical
Expression
Peg
Cube
Match board
Average
2 C Determined
Grade Actual
Shop Determined
Grade Actual
Course Determined
Grade Actual
Two Term
Scholastic Ave.

the edge cubes were black on two sides, the side cubes were black on one side and the center cube had not black sides. (Diagram of test # 5). These small cubes were laid before the student in a pile and he was to build the large cube getting the small cubes in their proper places. This is more difficult that it seems and the results show it to be of value as a mentality test. In grading the test time alone was necessary as the student would work until it was entirely right.

This was the last of the five tests. The standing of the tests were tabulated and correlated with the grades given by the instructor.. The average for all tests was found and another correlation between this andthe instructors grades. These averages were also correlatedagainst.

The students total college average as received for two terms work.

Correlation of test grades to grades given in class

The method of correlation is as follows.

With twelve students graded the highest number of misplacements is 12 divided by 2 or 6.

The students are numbered from 1 to 12 and their numbers arranged with respect to class grade with the highest grade first another row arranged with respect to test grade is made under this.

A row of numbers ranging from 1 to 12 is placed on the proper and under this is placed a row obtained as follows.

Take the first number in the first row and locate the same number in the second row. Place its position number counting from the left under the 1 of the third row.

Taking the second number in the first row continue as before until the forth row is completed.

Now subtract each number in the ofrth row from the number above it in the third row andadd these results disregarding the signs. This number divided by the number of men tested will give the average misplacements and since 6 is the highest possible number of misplacements, this number divided by six will give the percent of displacement. Subtract this percent from 100 and the result is the percent of correlation. A 50% correlation or above in very good meaning that the students agerage position was within a quarter length of the row from being correct as comparing the test grades with the shop grades.

The following are correlations for the five tests given.

Tachnical Test Correlation With Recitation Grade

# Man (	4	2	5	11	3	6	9	10	1	12	7	8
(	1	5	9	4	8	11	3	2	6	7	10	12

Test #1-	1	2	3	4	5	6	7	8	9	10	11	12	
	4	8	2	6	7	9	3	11	1	12	10	5	
	3	6	1	2	2	3	4	3	8	2	1	7	= 41

41 divided by 12 equals 3.41 which is the average misplacement.

12 divided by two equals 6 which is the highest possible misplacement.

3.41 divided by 6 equals .568 100 - .568 equals 43% which is the amount of Correlation.

Technical Test Correlation With Course Grade

#Man	4	5	2	3	10	9	1	6	7	11	12	8	Course
	1	5	9	4	8	11	3	2	6	7	10	12	Test

	1	2	3	4	5	6	7	8	9	10	11	12	
	4	2	8	7	11	3	1	9	10	6	12	5	
	3	0	5	3	6	3	6	1	1	4	1	7	equals 40

40 divided by 12 equals 3.31 which is the average misplacement.

6 equals the highest possible misplacement.

3.31 divided by 6 equals .552 100- 1552 equals 45% which is the amount of correlation.

Expression Test Correlation With Course Grade

#Man	4	5	2	3	10	9	1	6	7	11	12	8
	3	11	4	2	10	9	8	12	7	1	5	6

	12	2	3	4	5	6	7	8	9	10	11	12	
	3	11	4	1	5	6	10	12	9	2	8	7	
	2	9	1	3	0	0	3	4	0	8	3	5	equals 37

37 divided by 12 equals 3.08 which is the average misplacement.

6 equals the highest possible misplacement.

3.08 divided by 6 equals .513

100 ⊖ .513 equals .487 which is the amount of correlation.

Peg Test Correlation With Course Grade

#Man	4	5	2	3	10	9	1	6	7	11	12	8
	10	1	2	3	8	9	4	5	7	11	12	6

	1	2	3	4	5	6	7	8	9	10	11	12	
	7	8	3	4	1	6	2	12	9	10	11	5	
	6	6	0	0	4	0	5	4	0	0	0	7	equals 32

32 divided by 12 equals 2.66 which is the average misplacement.

2.66 divided by 6 equals .444

100 - .444 equals .556 which is the amount of correlation.

Cube Board Correlation With Course Grade

#Man	1	4	5	2	3	10	9	1	6	7	11	12	8
		4	1	10	8	11	2	3	9	7	6	12	5

	1	2	3	4	5	6	7	8	9	10	11	12	
	1	12	6	77	3	8	2	10	9	8	11	4	
	0	10	3	3	2	2	5	2	0	5	0	6	equals 40

40 divided by 12 is 3.31 which is the average misplacement.

3.31 divided by 6 equals .552

100- .552 equals 45% whidh is the amount of colleration.

Match Board Correlation With Course Grade

#Man	4	5	2	3	10	9	1	6	7	11	12	8
	10	8	4	2	12	9	3	1	7	11	5	6

	1	2	3	4	5	6	7	8	9	10	11	12	
	3	11	4	7	1	6	8	12	9	10	5	2	
	2	9	1	3	4	0	1	4	0	0	6	10	Equals 40

follow same plan as above.

Determined Course Grade Correlation With Two Term Scholastic Average

# Man	1	8	9	10	4	5	11	3	2	7	12	6
	4	11	1	10	9	12	6	3	2	8	5	7

1	2	3	4	5	6	7	8	9	10	11	12	
3	10	5	4	1	11	2	8	9	12	6	7	
2	8	2	0	4	5	5	0	0	2	5	5	equals 38

38 divided by 12 equals 3.18 which is the average misplacement.

3.18 divided by 6 equals .53

100 - .53 equals 47% which is the amount of correlation.

Now that some of the merrits of these tests have been shown it will be well to say a word as to selection of tests for the purpose wanted.

Selection of Tests

Since the development of mentality tests to be used in employment and proper placing of the many different types of lavor and clerical help has been, only after about 1914, there are consequently innumerable available tests worked out by different individuals or groups to cover the different requirements of employment, a portion of these have not been practced or standardized.

It is very evident that different types of labor would not do equally well with the same test altho they might be equally efficient at their respective jobs.

For example it would be absurd to expect a man who is an expert on a punch machine to pass the same type of test as the man who carries or trucks all day.

Mr. Kemble in his book on "Choosing Employees" by the test brings this out very well in andexceptionally simple test used on several men of the laboring class. The test was merely this. The man to be tested was given an eight pound dumbell and was told to raise it from his shoulder as amny times as he cuuld. This test is ont that is usually entered into by the man as a sort of challange and really brings out what the man actually is. On this test not only the number of times but also the rate per minute is taken into consideration. It was found that one man raised and lowered the weight at a very high R P M but that he tired much quicker with respect to number of times that his pardner who was not so fast. The first man would make a peice worker while the other would do to handle stock.

A test for small office boys of course would not be like one for older people. The test used by the Western Electric and which is also found in Hollingworth Vocational Psychology consists of the following, one sheet of two numbersadditions, a sheet of simple subtractions, one of simple multiplication and one of division, a sheet of simple ppposits one of copying, one of silent reading, one of language (filling in blanks in sentences) and one of instructions.

The test of instructions is one that will puzzle many people

and is a catchy test.

Thus we see that the tests for different classes of men must be carefully selected. These may be classified as follows:

Tests for:

Office boys

Laborers

Superintendents

Office employes

Executives

If it is required to give the same general examination to all employees a general examination containing a few essentials to all possible placements. Then in grading the tests the testee may be classified as well as graded on comparative ability.

Major Robert M. Yerkes states as the purpose of psychological testing as (A) To aid in segregating the mentally incompetant.

(B) To classify men according to their mental capacity.

(C) To assist in selecting competant men for responsible positions.

These three points seem to cover the requirements and should be considered in the selection of tests.

In April of 1921, Thomas A. Edison made public a series of questions prepared to be used as a test for prospective employees. This list of questions has met with a great deal of criticism and mostly adverse criticism. The questions are of a nature which would require a general knowledge of engineering, medicine, history, and many other subjects. But which do not necessarily require initiative only inas much as that initiative was used in acquiring this knowlege; which point must not be over looked.

This test has been used with college men, with college women and with business men and in nearly every case proved to much for the contestants.

This would point to the fact that the test was a failure, but on the contrary in the mind ofthe author it was anything but a failure. The point is here. The test itself has undoubtedly been proved as impractical, but the idea involved is absolutly correct and the giving of the test only better defined the practical test which will probably be an out growth of this one.

Thetype of test made by Edison is one that covers pratically every field of human interest so that upon examining a test paper one can readily see what things the testee is most interested in and which things he is best adapted to/

Failing in the Edison test, as refered to, does not condem a mans abillity but only classifies him in one group or another according to the amount and class of his failure.

Our technical test differs from this test in that it is

to determine comparative ability only along one certain line.

The following are questions formulated by Edison and show a marked contrast with the technical questions used by the author.

1. What countries bound France?
2. What city and country produce the finest china?
3. Where is the river Volga?
4. What is the finest cotton grown?
5. What country consumed the most tea before the war?
6. What city in the United States leads in making laundry machines?
7. What city is the fur center of the United States?
8. What country is the greatest textile producer?
9. Is Australia greater than Greenland in area?
10. Where in Copenhagen?
11. Where is Spitzbergen?
12. In what country other than Australia are kangaroos found?
13. What telescope is the largest in the world?
14. Who was Bessemer and what did he do?
15. How many states in the Union?
16. Where do we get prunes from?
17. Who was Paul Revere?
18. Who was John Hancock?
19. Who was Plutarch?
20. Who was Hannibal?
21. Who was Danton?

22. Who was Solon?

23. Who was Francis Marion?

24. Who was Leonidas?

25. Where did we get Louisiana from?

26. Who was Pizarro?

27. Who was Bolivar?

28. What war-material did Chile export to the Allies during the war?

29. Where does most of the coffee come from?

30. Where Korea?

31. Where is Manchuria?

32. Where was Napoleon born?

33. What is the highest rise of tide on the North Atlantic coast?

34. Who invented logarithms?

35. Who was the Emperor of Mexico when Cortez landed?

36. Where is the Imperial Valley andwwhat is it noted for?

37. What and where is the Sargasso Sea?

38. What is the greatest known depth of the ocean?

39. What is the name of a large inland body of water that has no outlet?

40. What is th e capital of Pennsylvania?

41. What State is the largest? Next?

42. Rhode Island is the smallest State. What is thenest and the next?

43. How far is it from Nes York to Buffalo?

44. How far is it from New York to San Francisco?

45.

45. How far is it from New York to Liverpool?

46. Of what State is Helena the Capital?

47. Of what State is Tallhasse the capital?

48. What State has the largest amethyst-mines?

49. What State has the largest copper-mines?

50. What is the name of a famous violin-maker?

51. Who invented the modern paper-making machine?

52. Who invented the typsetting machine?

53. Who invented printing?

54. How is leather tanned?

55. What is artificial silk made from?

56. What is a Casson?

57. What is shellac?

58. What is celluloid made from?

59. What causes the tides?

60. To what is th cahnge in seasons due?

61. What is coke?

62. From what part of the North Atlantic do we get codfish?

63. Who reached the South Pole?

64. What is a Monsoon?

65. Where is Magdalena Bay?

66. From where do we import figs?

67. From where do we get dates?

68. Where do we get our domestic sardines?

69. What isthe longest railroad in the world?

70. Where is Kenosha?

71. What is the speed of sound?

72. What is the speed of light?

73. Who was Cleppatra and how did she die?

74. Where are condors found?

75. Who discovered the law of fravitation?

76. What is the distance between the earth and sun?

77. Who invented photography?

78. What country produces the most wool?

79. What is felt?

80. What cereal is used in all parts of the world?

81. What Statesproduce phosphates?

82. Why is cast iron called pig iron?

83. Name three principal acids?

84. Name three powerful poisons?

85. Who discovered radium?

86. Who discovered the x-ray?

87. Name three principal alkalis?

88. What part of Germany do toys come from?

89. What States bound West Virginia?

90. Where do we get peanuts from?

91. What is the capital of Alabama?

92 Who compssed "Il Trovatore"?

93. What is the weight of air in a room 20 by 30 by 10?

94. Where is platinum found?

95. With what mtal is platinum associated when found?

96. How is sulfuric acid made?

97. Where do we get sulfur from?

98.

98. Who discovered how to vulcanize rubber?

99. Where do we import rubber from?

100. What is vulcanite and how is it made?

101. Who invented the cotton-gin?

102. What is the price of 12 grains of gold?

103. What is the difference between anthracite and bituminous coal?

104. Where do we get benzol from?

105. Of what is glass made?

106. How is window-glass made?

107. What is porcelain?

108. What country makes the best optical lenses and what city?

109. What kind of a machine is used to cut the facets on diamonds?

110. What is a foot-pound?

111. Where do we get boraz from?

112. Where is the Assuan Dam?

113. What star is it that has been recently measured and found to be of enormous size?

114. What large river in the United States flows from south to north?

115. What ar e the Strats of Messina?

116. What is the highest mountain in the world?

117. Where do we import cork from?

118. Where is the St. Gothard tunnel?

119. What is the Taj Mahal?

120. Where is Labrador?

121. Who wrote "The Star-Spangled Banner "?

122. Who wrote "Home Sweet Home"?

123. Who was Martin Luther?

124. What is the chief acid in vinegar?

125. Who wrote "Don Quixote"?

126. Who wrote "Les Miserables"?

127. What place is the greatest distance below sea-level?

128. What are ax-handles made of?

129. Who made "The Thinker"?

130. Why is a Fahrenheit Thermometer called Fahrenheit?

131. Who owned and ran th New York "Herald" for a long time?

132. What is copra?

133. What insect carries malaria?

134. Who discovered the Pacific Ocean?

135. What country has the largest output of nickel in the o world?

136. What ingredients are in th best white paint?

137. What is Glucose and how made?

138. In what part of the world does it never rain?

139. What was the approximate population of England, France, Germany, and Russia before the war?

140. Where is the city of Mekka?

141. Where do we get quicksilver from?

142. Of what are violin-strings made?

143. What city on the Atlantic seaboard is the greatest pottery center?

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MENTALITY TESTS AND THEIR RELATIONS TO THE HIRING AND PLACING OF LABOR AND OFFICE HELP

The object of this work is to make the writer more familiar with what has been accomplished with mentality tests, the practicalness of and the possibilities for mental tests with regard to employment and to the right placing of employees. It is also for the purpose of making him familiar with the methods of analyzing mental tests.

Intraduction:

A discussion of the history and progress of mentality work.

I. Classification of tests with regards to:

1. Type of person to be tested.
2. Information wanted.

II. Giving of tests to students.

1. Selection of tests.
2. Method of giving tests.
3. Analysis of tests.
4. Deductions from analysis.

III. Formulation of original tests with explanation of results to be obtained from using them.

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