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A Revision of the Binet-Simon System for Measuring the Intelligence of Children

——By——

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A REVISION OF THE BINET-SIMON SYSTEM FOR MEASURING THE INTELLIGENCE OF CHILDREN*

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The Binet and Simon tests are the culmination of the authors' endeavors along this line for over fifteen years. Their first published account of the tests as a more or less complete system appeared in 1905. This was revised by the authors in 1908 and again in 1911. The tests have been used in America much more extensively than in Europe or elsewhere, and from the results of this there have arisen many suggestions as to improvements, besides two American revisions.§ The first revision was by H. H. Goddard after using the test on 400 feeble-minded and on over 1,500 public school children.t The second is by L. M. Terman and H. G. Childs after using them on about 400 public school children. These revisions are in part adaptations of the tests to American conditions and American children, and in part efforts to eliminate defects in the system. The present revision incorporates most of these adaptations, but is otherwise largely along other lines.

The writer is indebted to Dr. J. B. Miner, Professor of Psychology, University of Minnesota, for suggesting a number of changes which have been incorporated in this revision.

For a condensed account of the 1908 revision of the authors see "Binet and Simon's System for Measuring the Intelligence of Children," this Journal, September, 1911. I have also given a detailed survey of the literature on the tests in "The Present Status of the Binet and Simon Tests of the Intelligence of Children," in this Journal, March, 1912, and the results from examining 1,300 feeble-minded children with the 1908 tests in "The Binet and Simon Tests of Intelligence in Grading Feeble-Minded Children," in this Journal, June, 1912.

See "Two Thousand Normal Children Measured by the Binet Measuring Scale of Intelligence" in Ped. Sem,, 1911, and "Four Hundred Feeble-Minded Children Classified by the Binet Method," this Journal, 1910.

See "A Tentative Revision and Extension of the Binet-Simon Measuring Scale of Intelligence," in the Journ. of Educat. Psychol., 1912,

A. Nature of the Present Revision.

I. Standardization of Procedure. The first need of the system of tests as it stands in the original is more specific and detailed directions as to how to proceed in each individual test and how to interpret the child's responses. In the absence of this complete standardization different examiners proceed differently and their results must necessarily often disagree. The fact that the several revisions of the scale disagree in a number of instances is very probably largely due to this one factor. My account of the 1908 tests added some directions not given in the original. In the present revision this is carried out more fully. Since a test may often be made difficult or easy according to how you proceed, the directions on procedure and interpretation have in some instances been adapted so as to make the test of the proper degree of difficulty for the place in which it was left or to which it was shifted. In considering the present revision and comparing it with others, this should be taken into account, in order to judge it correctly. It also follows that it is of the first importance to follow the directions minutely, except where special conditions, which can never be all foreseen and provided for, make a change absolutely necessary. How to proceed in such instances must be left to the judgment of the examiner, and the accuracy of the results will then depend on his qualifications as an examiner as well as on the tests. Of this more will be said later.

2. Shifting of Tests to Other Age Groups. Some of the tests were too easy or too difficult for their age group, but were otherwise good tests. They therefore simply needed shifting to. their proper places. In making these changes all available data were taken into account to place them accurately. For the age groups III to XII, inclusive, only three tests were shifted. Copying a diamond is shifted in the present revision from group VII to group VIII; naming the months of the year from X to VIII; and naming nine pieces of money from X to IX. In accordance with the findings of others all the tests of group XIII were shifted forward, no others being substituted for this year. In several instances tests were found that were considerably

easier or more difficult than others in their group but were yet not misplaced. In these the procedure was changed slightly to make them more equally difficult with the others in their group. This was done on the basis of my own results with the feeble-minded alone.

3. Elimination of Poor Tests. The tests that have been dropped from the list entirely are as follows: VI 2, repetition of a sentence of sixteen syllables. VI 6, giving age. VII 3, copying a written phrase. VII 7, counting thirteen pennies. VIII 1, reading for two memories. VIII 3, naming four colors. VIII 5, writing from dictation. IX 2, naming the days of the week. IX 5, six memories from reading a passage. X 4b, questions of comprehension, second series. XI 2, using three words in one sentence. In a few instances a test was dropped because there were over five in its group, and not because my results showed it to be particularly poor, the five being retained for a group which on the whole seemed best. In general, the tests dropped are those most likely to be influenced by the variable factor of training.

4. Reduction to Five Tests for Each Age Group and Addition of New Tests. The inequality in the number of tests in the different age groups gave rise to difficulties in determining the mental age from the results according to the rule of counting laid down for it. Previous revisions have reduced or raised the number to five for each group excepting for the age of four. In this revision there are just five tests in each age group. The shifting and elimination of tests left new ones to be provided in the following groups. IV 5, discrimination of forms; V 5. repetition of a sentence of ten words; X I, counting dots; X 3, drawing a design from memory; X 5, form board puzzle; XI 5, giving the numbers to the parts of a form; XII 5, resistance of suggestion; XV 4, passage to summarize from memory; XV 5. telling time if the hands of a clock were interchanged. Of these IV 5 and X 1 only are entirely new. V 5, X 3, XII 5, and XV 4 are taken from the authors' 1911 revision. XV 5 is borrowed from Goddard. X 5 and XI 1 are modifications of tests that have been used by different authors. The norms given for the last

two are based on my results of their use on forty normal adults and fifty feeble-minded of a mental age corresponding to the age group in which the tests are found. The norm for IV 5 is based on the results of about a hundred feeble-minded with mental ages ranging from three to five, inclusive. This test has given exceptionally uniform results characteristic of this mental age.

On the whole, eleven of the fifty-five tests of the 1908 series were dropped, six were shifted up or down the scale, and nine new ones were added. So far as changes in actual tests are concerned, therefore, the revision is not very extensive, and this speaks well for the original series. We believe these changes make a substantial improvement in the system of tests. But if the remainder of the scale is quite correct it will be seen that even without these changes the tests on the whole must give pretty accurate results. The more complete standardization of the procedure incorporated in this revision should add more to its general usefulness and accuracy when used by different examiners than do these changes in the actual tests.

5. Extension of the Scale Downwards. The authors designed the 1908 series particularly for the examination of public school children. For this purpose it is quite sufficient that the scale should begin with the age of three years. In the examination of the feeble-minded, however, there is need of extending the scale downwards. This is required, first, for the older but very low grade cases; and second, and more particularly, in order to diagnose mental deficiency at the very earliest possible age. The ability to do the latter accurately and with certainty would open a new field of inquiry as regards the nature and course of the beginnings of mental deficiency, and a new field of endeavor as regards the remedial treatment in a certain percentage of cases. Aside from this, the institutions for the feeble-minded are as a matter of fact constantly being called upon to pass upon the mentality of children less than three years of age. They are doing so at present with inadequate methods. In an effort to meet this need I have added tests for three months old children, six months, one year, and two years.

It might seem at first sight a hopeless endeavor to attempt to diagnose mental development in three and six months steps, especially when we are dealing with infants with whom the usual procedure in mental testing is quite inapplicable, and since we know further that we make errors of a year in our diagnosis of mental development of older and brighter children. This, however, is not necessarily the case, since the mental progress a child makes in a year is so much greater at first than later. The development from the third to the sixth month is probably quite as much as it is from the fifth to the sixth year, for example. However, the proof of the possibility of measuring these smaller steps in mental development, chronologically considered, during infancy does not lie alone in the truth of this general statement, but more in the concrete observations that have been made on the mental development of the child during the first three years after birth. The tests that are added here, with the exception of II 2, 3, and 5, which are taken from the authors' 1905 series, were devised on the basis of these observations, after a careful searching through the literature on them, and supplemented by a few chance observations of my own on normal infants. The procedure in applying them has been worked out in using them on a number of feeble-minded children of four years and less, chronologically. The norms for them are necessarily based on a small number of cases in a number of instances, since the processes in connection with which tests could be devised have not been carefully observed in many children. We believe, however, that on the whole, these added tests will do about as well as the others in the scale because they attempt to measure larger rather than smaller steps in the mental progress of the child. Yet, under the circumstances, they must be offered tentatively at present. It is hoped that by so doing a stimulus will be supplied for the production of something better, *

*Those interested in the literature on the development of the child during the first three years after birth should consult especially the following: Preyer, W.: The Mind of the Child, Part I. The Senses and the Will. Part II. The Development of the Intellect. Observations Concerning the Mental Development of the Human Being in the First Three Years of Life. Trans, by H. W. Brown, New York, 1909. Moore, Mrs. K. C: The Mental Develop-

B. Use of the Tests.

I. Qualifications of the Examiner. The tests are the result of psychological progress, both in experimental technique and in the knowledge of facts and principles about mental processes, particularly about the mental development of children. Without this the tests could not have been produced, nor can they be fully understood without this now that we have them. Is this knowledge of psychological technique, facts and principles required in order to use the tests successfully? Considerable discussion has arisen over this question, and there is no promise of an immediate understanding. The tests themselves are very simple and devoid of much technique. The directions for applying them are easily comprehended. This simplicity seems to have led to the belief in many quarters that anyone who can follow the directions is fully qualified to use the tests. This, however, is a mistake, because in the details of the procedure in giving the tests a variety of circumstances will always arise that cannot be foreseen and provided for beforehand, and the children's responses vary in so many ways from typical forms that rules for interpretation can never be made complete. This results from the fact that in a psychological experiment or test the subject's mental make-up at the moment of the test, which determines the particular result obtained, is so complex and variable and so largely unknown and uncontrollable, a condition which the physical experiment has to deal with only in a much less degree. To adapt the procedure in the test and to give the proper interpretation of the child's response in these frequent special circumstances, and to do this reasonably well, requires the same knowledge and training that were necessary to devise the tests in the first place. In other words, it requires a full understanding of the tests. But this is not all. Scientific

ment of a Child. Psychological Review Monograph Supplements, 1896. Shinn, M. W.: Notes on the Development of a Child. Part I. The Development of the Senses in the First Three Years of Childhood. Part II. Univ. of Calif. Publications in Education, Vols. I and IV, 1899 and 1907. Major, D. R.: First Steps in Mental Growth. A Series of Studies in the Psychology of Infancy. New York, 1906. Dearborn, G. V. N.: Moto-Sensory Development. Observations on the First Three Years of a Child. Baltimore, 1910.

training alone does not give the examiner the ability to adapt himself to children's ways, which is also quite essential. The examiner should be able to get down to the mental level of the child he is examining, to adopt his attitude and childish mannerism in speech and action. This must be supplied mostly by the examiner, as it can be indicated only in a small measure with the printed words of the directions. Some can do this readily and naturally, others fail almost entirely. Nevertheless the best trained psychologist could make only a partial success with the tests if he proceeded with the three or four-year-old child, for example, as one would with a ten-year-old, or vice versa. In the main, he would fail to arouse the effort of the younger child and disgust the older with an attitude he has outgrown and looks down upon. Furthermore some initial practice in the use of the tests is required in the case of any examiner. The authors do not regard one as prepared to use them until after he has examined at least twenty children.

The failure of the general public, of the school authorities and medical profession in particular, to appreciate these requirements is at present leading to an extensive misuse of the tests, which must necessarily tend to the result of depriving the tests of the general recognition of their merits and the public of the benefits of their use. There is an extraordinary demand for tests that will do what these promise to accomplish when properly used. But it is the teachers of the public schools and physicians who are chiefly called upon or tempted to use them, the latter particularly in connection with medical inspection of the schools. Neither is particularly qualified as an examiner, and on the whole would probably not do so much better than the intelligent layman. There is even a tendency to take this work out of the hands of the teacher and entrust it to the school medical inspector as the expert, whereas in the majority of cases the teacher would probably get the better results with the tests because of her better understanding of children and ability to adapt herself to their mental levels. There is nothing in the training of a physician that qualifies one in the use of these mental tests any more than there is in the college training

of any other profession. It would be just as rational, if not more so, to leave the diagnosis of diseases of children in the school room to their teacher as it is to leave the diagnosis of mental development to the physician. On the other hand, it would be equally erroneous and undesirable to limit the use of the tests to trained psychologists who fully understand the various details and principles connected with them. Any intelligent person should, with a little practice, be able to get approximately the same results with the tests in the majority of cases as does the best qualified examiner. The tests should be a great aid to anyone in getting at a better judgment of a child's menial development even though he is not an expert in their use. And there is no objection to anyone using them so long as he will not charge his own errors, which will occur in a certain percentage of cases, against the accuracy of the tests. All this the authors have well pointed out and warned against.

2. General Directions for Their Use. The first and most important prerequisite in all mental testing is to secure the child's maximum attention and effort. This is the one subjective factor most difficult to control in all psychological work, at least to the degree in which it is usually desirable to do so. Since performance varies directly and over a very wide range as this factor varies it is absolutely essential to keep it reasonably constant from one test to the other and from one child to the other. The best way to keep it constant is to keep it at its maximum. The means of doing this are quite different for different ages of the child. The power of voluntary attention and effort itself develops gradually from its complete absence in infancy to its maximum after physical maturity is reached. In the young child it varies much from hour to hour or day to day, and to arouse it, we must usually appeal to some spontaneous interest. With the older child we have the choice of one or more of several motives that we may give him for doing his best. However, some general rules of procedure may be laid down which will apply to all children of about three years and over.

(a) The first is encouragement. Always encourage the child and never criticise. Tell him repeatedly that he is doing very finely, and never let him know by word or action that he has failed or done poorly in a test, except in special instances indicated in the directions for giving a test; and in these cases proceed in a manner that will not make him feel that he was expected to do better. Treat him always in the kindest manner possible, no matter what his temperament or disposition of the moment may be. For remember that the object in hand is to determine his mental development, not to train or teach him.

(b) Remove all possible sources of distraction from his immediate environment. Work in a quiet room that has nothing in it except what is required for the tests. Seat the child facing away from the windows, so he will not be distracted by things outside. Have no one in the room except the child and yourself, excepting when an attendant or assistant is required, as with infants. A stenographer to take down the child's responses verbatim and incidental observations is a convenience, but on the whole his presence militates against getting the best results rather than helps. In no case should the presence of the child's parents be allowed or that of any other constant associate. For even when they are instructed to remain absolutely silent and to in no way interfere with the procedure—instructions which parents often have difficulty in following—they are a constant source of distraction to the child. The presence of a stranger is not nearly so objectionable. If parents insist on seeing the tests made, have them come in after you are through and repeat the tests.

(c) The age, general appearance and behavior will usually give the practised examiner some very rough idea of the child's intelligence. If not, this may be obtained from other sources. With this as a clue, begin with an age group of tests two or three years below his estimated level. In the present revision the tests in each age group are roughly arranged in the order in which they should be given, the easiest or most interesting first. Follow this order except when good reasons arise for changing it.

(d) Do not let the child wait long between tests. Make sure that you have his attention for each test and proceed at once, recording the responses as you go on. His interest once aroused in the tests, which should be made to appeal to him as a game, and do in the case of most younger children at least, may be held throughout a sitting. But it is more difficult to arouse again if lost through waiting between tests. The child should be kept occupied all the time. The variety of things he is required to do is well adapted for this purpose, and will not cause serious fatigue in the time required for an examination.

(e) Make sure first that you understand just what each test aims at. The directions laid down for giving the tests are designed to accomplish this aim under the usual conditions met. Follow them literally, until from obvious reasons arising from unusual circumstances the object cannot be attained with these directions. Change them only when absolutely necessary, and then proceed rationally, not haphazardly. The need for changing them much will not arise very often.

These several general rules should be kept well in mind until their observance becomes habitual and automatic. They are all required in order to get the best performances from the child of which he is capable. For the convenience of the examiner record blanks may be used on which the individual tests are arranged by number and letter only in horizontal or vertical columns. On these the tests may then be marked with a plus or minus sign accordingly as the child passes or fails in them. If the response in any case is of a nature to leave the matter in doubt for the moment, it should be taken down verbatim together with any incidental observation that may help to interpret it later. Otherwise the responses should be taken down in detail no more than is consistent with keeping the child occupied continually with the tests. At the close of the sitting the whole may then be studied to determine the doubtful cases, which should as a rule not exceed two or three for a child. Cases that ultimately remain doubtful may be counted alternately as plus and minus. Such a record will then show pluses for all the tests of the lowest age group tried, and minuses for all the tests of the highest age group tried. About midway between these two extremes some tests of an age group will be passed and others not. From this the mental age of the child is then determined according to the following rule: The child is given the mental age of the age group just below the one in which he begins to fail in one or more tests, plus one year for every five tests in which he passes in all following age groups. Since there are just five tests in each age group, fractions of a year in the mental age may be readily counted, each additional test passed counting for a fifth of a year. It occasionally happens that a child will fail in one or even two tests of a given age group and then pass in all of the next higher age group. The reason for such an irregularity is often not ascertainable. But this manner of counting up the mental age from the total results makes the system of tests more flexible, doing justice to all cases.

3. Scope of Their Application. As was stated above, the authors designed the tests particularly for use with school children. But they are applicable in the determination of the intelligence of any person with a mental age below thirteen years. Some question has arisen as to whether they are as useful with older children and adults as they are with the younger. They would not be if they were seriously influenced by training and by such acquisitions of knowledge and skill as comes with age rather than with growth of intelligence. Besides, there might be other unforeseen factors, chronological age influences, that would cause inaccurate results with adults. This question has not been inquired into sufficiently to give a final answer. The influence of training, however, has been very carefully guarded against, and each revision of the scale has made improvements eliminating it more. My own results with the feeble-minded children show some chronological age influence, but not enough to cause serious inaccuracy in the scale from this source. I am led to the conclusion that it is almost a negligible factor. On the whole the tests will give about as accurate results with adults as with children of the same mental age as the adults. The impression that they will not is largely due to the fact that the adults who have been examined with the tests have been

largely of the higher mental ages, and the tests are less accurate for these higher grades of intelligence than they are for the lower levels of mental development. There are four distinct fields in which the tests have been applied, (i) Public schools. (2) Institutions for feeble-minded. (3) Juvenile courts. (4) Army and navy. They have a decreasing usefulness in these fields, in the order named. This brings us to a consideration of the degree of accuracy that may be expected from the tests.

C. Degree of Accuracy.

1. Accuracy of the Individual Tests. In the American revisions not less than a certain definite percentage of normal children are supposed to be able to pass the individual tests. For example, not less than seventy-five per cent, of normal six-year-old children are supposed to pass each of the tests in the six-year group in Dr. Goddard's revision, the same percentage being kept, of course, for all the other tests, They have been so adjusted empirically as to make the results come out this way. The authors followed the same principle in the original scale, but do not quote any definite percentage. Many critics unfamiliar with the general plan of the system of tests have found fault with them because the individual test often gives wrong results. Such a finding in a small number of individual cases is of course worthless, and the criticism based on it is beside the point. If each individual test always gave the correct result, only one test would be needed for each mental age instead of a group of five. However, the question of the frequency of an error with the individual test is somewhat independent of the question of the possible range of error in the mental age as determined by the system of tests as a whole.

2. Errors in the Mental Age. Each individual test may give exactly correct results in seventy-five per cent, or more of the cases, but when errors do occur they may be small or very large. The range of error may be only one year or several years and either might be combined with a high or low percentage of accuracy. If through some very unusual combination of circumstances in the case of a given child each test gave its maximum error the mental age of this child as thus determined might be considerably too high or too low. Taking the results together from various sources they indicate in a general way that errors of a year in the mental age may be expected occasionally, of two years rarely, and of three years perhaps hardly ever. This assumes, of course, that errors in technique in giving the tests and of interpretation are eliminated. The degree of error possible depends, again, on the part of the scale, when years are taken as units of measurements. In the upper part an error of two years probably occurs as readily as one of a year between the mental ages of three to six. This is because a year of development at the latter age represents so much more progress than does a year at a later age, as was noted above. Thus the tests might be as accurate in one part of the scale as in the other, but seem less accurate for the upper part because the unit of measurement, the development for a year, has become smaller. However, it is much more difficult to get tests for the higher mental ages that will be as accurate as for the lower. This is because the mind becomes more complex with age, and with greater complexity comes greater individual variation through unequal development of its different aspects. Thus, while younger children are more or less alike in mental make-up adults have striking individualities. One person can do one thing well and another does the same thing poorly, while the latter excels the former in some other task.

The degree of accuracy of the tests is much higher than ca be obtained through general observation alone, without the use of tests, except when this observation extends over many months and is made in unusual detail. Extensive results on comparisons between these two modes of grading children are not yet at hand, and no definite and final conclusion can be given. In an instance under my own direction a number of teachers carefully graded fifty feeble-minded children with mental age from eight to twelve, inclusive. These teachers had had the children in their classes not less than seven months in any case, and two months were taken in which to do the grading. For nine of these children the teachers varied by an equivalent of four years

in mental age, for nine others they varied by three years, for nineteen by two years, for six by one year, and for seven there was complete agreement.* It is safe to conclude at least that the tests will give much more accurate results than this amount of class-room observation.

In the following pages is given the revised list of tests. Comments on a test to aid in interpreting the response obtained from a child follow the directions for giving it, and are in small print. These are mostly taken from the authors, but are on the whole so mixed up with others as to make it unfeasible to indicate the source in each case. Following the list of tests are a specimen record blank, reduced in size, for recording the results by plus and minus signs; a list of material required in the tests; and a number of plates.

*See "The Binet and Simon Tests of Intelligence in Grading Feeble-Minded Children," June 1912, Pp. 187 ff.

AGE THREE MONTHS,

I. Carrying hand or object to mouth, a. Note if the child can carry the hand to the mouth, as indicated in sucking finger, for example.

b. Place a small block or other object in the child's right hand. Repeat for the left hand.

This test is regarded as passed if from either "a" or "b" it is determined that the child has sufficient motor co-ordinations to carry the hand to the month more or less at will, and not merely through random, chance movements. In the earliest random movements of the arms the hands frequently come in contact with the mouth by chance. From the repetition of this develops the ability to carry the hands to the mouth at will. This ability rests on a tactual motor association, and is acquired earlier than the ability to reach for seen objects.

2. Reactions to sudden sounds, a. Snap a telegraphic snapper within less than two inches from the ear. Give two trials only for each ear at intervals of a minute or more.

b. Clap the hands loudly near the child's head, so he will not see the moving hands. Give one trial for each ear at the same interval as before.

The test is passed if the child reacts with a "start" or wink in the majority of cases,

Reactions to sudden sounds appear during the first week after birth. At this time it may he a general "starting" over the whole body, or only a slight quiver of the eyelids, Its character varies much during the first three months, both from one child to another and with the same child on different days. For a while all reactions are frequently entirely absent. They increase much in frequency and intensity and by the end of the third month the child reacts almost invariably with a wink or a "start" to most sudden sounds. Later this reaction disappears again, first the general "starting", then the wink, so that in older children and adults only very loud and unusual sudden noises cause this reflex reaction. The important characteristic of the reaction at the age of three months is its intensity and the readiness with which it occurs.

3. Binocular co-ordination. in a darkened room move a lighted candle about two and a half feet in front of the child's face, first from right to left and back, then down in the median plane and up again, then diagonally. Move to extreme positions in all cases.

The test is passed if no marked incoordination occurs even when the eyes are turned to quite extreme positions.

The eyes follow a moving light in a co-ordinated manner much of the time soon after birth. Towards the end of the second mouth in co-ordination is rare, and during the third month it is seldom observed in the ordinary range of eye movements. The eyes of the one or two months old child, however, do not follow a light as far as later, and in co-ordination appears readily for the extreme positions. Also, the younger child turns the head with the eyes more. Turning the eyes independently in following moving objects usually occurs first by about the second month.

4. Turning eyes towards light in marginal field of vision. In a darkened room bring a lighted candle slowly into the child's field of vision from the back and side, and keep the light in the marginal field. Try several times, alternating sides.

Passed if the child turns the head and eyes towards the light, or better yet, if

the eyes are turned much without turning the head.

Following a moving light placed directly before the eyes and then moved away occurs more readily than turning towards a light brought into the field of vision. The first step in visual development consists of staring at an object on which the eyes fall by chance. This occurs occasionally at once after birth. Turning the head and eyes towards an object in the marginal field of vision is the next step. This occurs sometimes as early as the first week and develops rather gradually as a reflex. which later is readily inhibited. At the age of three mouths this reflex is well developed and occurs readily.

5. Winking to an object threatening the eyes. Make a rapid pass toward the child's eyes with some large object to within three or four inches of his face. A hat will serve the purpose. Repeat several times.

Passed if the child winks to the threat.

A sudden approach of an object to within a few inches of the child's face rarely causes a wink during the first six weeks. This reflex appears first towards the end of the second month, and increases rather rapidly in frequency and readiness. During the third month it becomes almost invariable and remains so throughout life. It is essential that the object used be large. The band alone for example, may not cause the wink when a larger object does so readily.

AGE SIX MONTHS.

1. a. Balancing head. Hold the child so that the head may drop forward, to right, to left, and backward. Note, when child is held in vertical position, whether he keeps the head balanced.

b. Sitting. Note, if the child sits up indefinitely when supported with a pillow in the back. Place the child on a chair or stool without any support in the back.

Passed if in "a" the child keeps the head balanced, that is, in the axis or *the.* body, most of the time and if in "b" he sits up Indefinitely when suf ported in the back or momentarily without support.

Momentary balancing: of the head occurs during the third month. Ability to hold up the bend indefinitely when the child is held in the vertical position develops rapidly, and Is usually quite well established before the end of the fifth month. Ability to sit up when supported in the back appears slightly liter than the ability to balance the bead. Children six months old sit up momentarily unsupported in the great majority of fuses, and can do so indefinitely before the end of the tenth month.

2. Turning the head towards source of a sound. Place your hands in symmetrical positions opposite the child's two ears. about two feet from his head. In one hand snap a telegraphicsnapperseveraltimes in quick succession. Give several trials with the snapper alternately in right and left hands. If there is no response repeat with a small hand bell, or have an assistant standing back and to one side of the child speak to it.

Passed if the child turns head towards the sound.

During the third month the child begins to turn the head on hearing a sound. This turning is at first usually not accurate, hut increases in frequency and readiness and takes on the character of a real searching, as if the child were trying to see the object making the sound. By the sixth month the child turns the head readily and accurately towards the source of a sound,

3. Opposing thumb in grasping, a. Place an inch cube in the child's right palm. Repeat for the left.

b. Press a pencil lengthwise across the child's right palm. Repeat for the left. In all cases, lift the thumb to note the degree of opposition.

Passed if in "a" the cube is clasped with the thumb as well as with the fingers, or if in "b" the thumb presses firmly against the pencil or forefinger.

The child readily clasps objects touching Its palm soon after birth. This reflex develops rapidly to a maximum intensity and later decreases again. Co-operation of the thumb, however, is absent in this early clasping. The first evidence of opposition of the thumb seems to appear during the fourth month. This may be noted in the slight resistance met when lifting the thumb during the reflex clasp. This resistance increases, and by the age of six months co-operation of the thumb with the fingers is usually well developed.

4. Prolonged holding of objects placed in hand. Place an inch cube or ball in the child's right hand. Repeat for the left.

Passed if the child holds the object considerably longer than in the usual reflex clasp.

As a reflex the clasping of an object usually last only a few seconds, when the object Is left resting passively In the child's band. By the end of the third month the child begins to hold on to objects for longer periods. At the age of six months there is unquestionable evidence of more than the original reflex clasping. It has been interpreted as conscious, voluntary holding of objects.

5. Reaching for seen objects. Dangle a bright object, brightly colored ball or the hand bell used in Test 2 for six months, before the child's eyes within his reach. Give a number of trials.

Passed if the child reaches readily and successfully for the object.

The sight of attractive objects begins to arouse random arm movements by the end of the fourth month, f'rom this time the child learns rather rapidly to guide the hand successfully towards the seen object. By the beginning of the sixth month he seizes readily objects reached for.

AGE ONE YEAR.

1. Sitting and standing.

a. Place the child on a stool or other seat without support to back.

b. Place him on the floor away from any support and try to make him stand up unsupported.

Passed if the child sits Up Tor three minutes unsupported, or if know from other sources that he sits up indefinitely unsupported, and if he stands momentarily unsupported.

A child one year old nearly always can sit up for an indefinite length of time without support. He learns to stand unsupported for a few seconds slightly later, but the great majority do so when one year old.

2. Speech a. Note the spontaneous vocalizations of the child, the character and number of syllables that are combined.

b. Repeat the following syllables and words several times each and try to get the child to imitate them: Ba, dada, nan, nana, mama, papa, man.

Passed if in "a" the vocalizations contain frequent combinations of two or three syllables, or if in "b" there is certain evidence that the child tries to

imitate any of the syllables or words, if his responses are rough approximations of the original. Failure is very often due to disinclination to respond at the moment. The test may therefore be regarded as passed if it can be learned from other sources, from parent or nurse, that the child sometimes does respond as required in the test.

By the end of the first year the child's speech is at the height of the babbling stage. The earlier individual sounds are largely replaced by short series of syllables. About the same time the first attempts to imitate sounds appear. It also usually understands a few words, has formed the association between a few names and objects. But the last is difficult to determine readily in any test.

3. Imitation of movements.

a. Shake a rattle two feet before the child, then place it in the child's hands, then repeat the motion of your hand.

b. Repeat with a small hand bell.

c. Sit close in front of the child and try to make him imitate nodding of the head, shaking of the head, pursing of lips, or other motions that suggest themselves.

Passed if the child unmistakably imitates in any of the three Instances.

The child begins to imitate some things before the end of the first year. The maximum tendency to imitate develops considerably later.

4, Marking with a pencil.

a. Place a paper before the child and mark on it with a pencil as he looks. Then place the pencil in his hand and guide it in a few marks roughly copying those just made. Then release his hand and say: "You make some."

b. After an interval of two or three minutes give the child another piece of paper and pencil, without any remark or motion of marking.

Passed if in "a" the child makes some marks with the pencil, even though they have no resemblance to the copy, or if in "b" he makes an effort to mark.

The response in "a" may he only an imitation of the hand movement, with' out there being any purpose of marking involved, the child not understanding the use of a pencil or the connection between the marks and the movements. If, however, he marks in "b" he probably understands the use of a pencil and marks purposely. This stage in drawing or writing begins about the end of the first year. Attempts to copy forms, or to draw them spontaneously appear about a year later.

5. Recognition of objects.

a. Learn from parent or nurse whether the child recognizes any objects, strongly prefers any plaything to another, or shows strong preferences among any other objects, as indicated by repeated reaching for the same one when among others.

b. With a block in one hand and a small rattle or vari-colored ball, or any other object most likely to be familiar to the child, in the other hand, present both objects to the child simultaneously. If he reaches for either, repeat several times interchanging the objects in the two hands each time. Note the number of times he reaches for each.

Passed if from either "a" or "b" there is undoubted evidence that the child discriminates one thing from another and gives signs of it in some mark of recognition.

The child probably recognizes a number of things before this age, but expressions of recognitions do not appear much before the end of the first year and develop rather rapidly from this time on. By the time he names any objects the process is already well advanced. It is a significant point in mental development, but is difficult to determine with any tests in its early stages.

AGE TWO YEARS.

1. Pointing out objects in a picture. Mount the eight pictures in Plates IA and IB on one card in two horizontal rows of four, leaving two inches between any two pictures. Show the card and say: "See the pictures. Look Show me the dog." Then, "Show me the man," or "Where is the . . . . . ?" for each of the other pictures.

Five out of the eight correctly pointed out passes the test. There is a considerable tendency to point at random at the card to every question. Such responses, when the child is evidently merely not attending are not counted. The object *in* to determine whether be can understand and point out correctly when his attention is good.

2. Imitation of simple movements, a. Raise both arms up straight in the vertical, saying: "Put up your arms like this."

b. Clap hands, saying: "Now like this."

c. Put both palms on top of head, saying, "Now like this."

d. Turn the hands around each other describing rather large circles, saying, "Now make them go like this."

Urging is often necessary, because of timidity or disinclination. The tests should be repeated if responses are not obtained at once, in varied form if necessary, until the cause of the failure to respond correctly becomes evident. There are different grades of responses. (a) No effort to imitate because of lack of comprehension. (b) Effort made to imitate, with the movements only incomplete or rough approximations to those of the examiner, (e) Good imitations. The test is passed if three of the responses belong to "b" or "c", or both.

3. Obeying simple commands. Having made the necessary arrangements beforehand, proceed as follows: a. Say: "See that ball on the chair there" (Ball should be a vari-colored rubber ball about two inches in diameter or similar one, to which the examiner points as he speaks). "Go bring me that ball."

b. Roll the ball away ten to fifteen feet, and say: "Now get it and throw it to me." As the child picks it up, repeat: "Throw it to me," making motions as if to catch it.

c. Then say: "Now sit down again here," pointing to the chair.

Any motion showing comprehension and effort to throw the ball is satisfactory. Two satisfactory responses out of the three passes the test.

4. Copying a circle. Give the child a pencil and paper and show him a card with a heavy circle on it an inch and a half in diameter, Say: "Make one just like this."

Any rough drawing showing an effort to make a circle, and which is more than merely irregular markings that iu-

dicate no idea of any form is accepted as satisfactory. Give at least three trials. One success passes the test.

5. Removal of wrapping from food before eating. Say: "Do you like candy?" Then wrap a piece of colored sugar candy in tissue paper, making sure that the child is seeing the candy as you do so, and hand it to the child, saying: "Here is a piece of candy. Eat it. See if you like it," The child may not recognize the candy. If no response is obtained, take back the wrapped piece and place a small piece in the child's mouth so he will eat it. Then repeat as before, with the wrapped piece. If there is still no response, take back the wrapped piece again and place an unwrapped piece in his hand.

The test is passed if he attempts to remove the wrapping before eating. It is not passed only if he attempts to eat it with the wrapping, or if he does nothing with the wrapped piece but eats the unwrapped piece placed in his hand.

AGE THREE YEARS.

I. Enumeration of objects in a picture. Use three colored pictures at least six by eight inches in size. Each should contain a person or more, several objects familiar to children, and should represent some subject which very prominently suggests some definite interpretation. Show the first one and say: "Here is a picture. Tell me what you see in the picture." If there is no response, or if only one or two things are enumerated, urge with the further question; "What do you see there? Tell me all you can find in the picture." If there is still no satisfactory response, say: "Show me the....." (Name some prominent object in the picture), and after he has pointed out several things in this way, show him the next picture and proceed as before. If the child stops after naming one or two things, continue the urging. *

The test is passed if three things at least are enumerated without intervening questions or urging for any one of the three pictures. Merely pointing out objects named by the examiner is not accepted as a satisfactory response. But this procedure is often a good way of overcoming shyness or disinclination.

The object of this test is to determine whether the child Is able to name things seen in pictures, The pictures and the questions should be adapted to bring out this ability. A variety of responses is obtained, representing fairly closely different stages of mental development. (a) No attention paid to the pictures, and no interest shown in them except perhaps a casual momentary glance or two. (b) Evident interest, indicated by a fixed gaze, and other facial expression, and sometimes spontaneous pointing out of some object or person, (c) Pointing out the more prominent objects to questions, "Where is.....?", or "Show me the....." but no enumeration, (d) Enumeration of several objects to the questions, (e)

The following pictures from "Jinglernan Jack," by J. O'Dea, New York and Chicago, 1901, are fairly satisfactory. (1) Scene on a lawn. (2) Scene in a meat market. (3) Scene in a shoe repair shop.

Description, including phrases and connectives. (f) Some Interpretation of the meaning of the picture or of some part of it, or inference from what is seen.

a. Comprehension of simple words. Say: a. "Show me your ears. b. Show me your eyes. c. Show me your mouth. d. Show me your hair."If the child does not respond at once, repeat and vary the procedure.

Three out of the four must be passed.

The object is to determine whether the child understands the meaning of words most apt to be familiar to him. At first he understands only our gestures, and is sensible only to the intonations of our voice, Next he understands the spoken word, but cannot yet express his own thought in words. The test is relatively easy for this age group.

3. Giving the family name. Ask: "What is your name?" If he gives the first name only, John, for example, ask, "John what? John Smith?" or some other wrong name. If he still remains silent, say: "You know what your name is, don't you? Now what is your name ?"

Passed if he gives his last name correctly.

Nearly every child of three knows his first name, If he gives this, it may be taken as evidence that failure to give his last name is not due to timidity or disinclination.

4. Repetition of a sentence of six syllables. Say: "Can you say 'Mama.' Say 'Slipper.' " Then give the following:

a. "The dog runs after the cat.

b. The hen is on the nest.

c. It rains. I am hungry."

If no response is obtained at once, repeat the same word or sentence once or twice with such variations as: "You can say 'The dog runs after the cat,' can't you? Now say 'The dog runs after, the cat.'"

The test is passed if the child repeats word for word one of the three sentences, after only one reading. The natural defects of pronunciation at this stage of development are not counted.

Next after understanding the meaning of some words, the child learns to repeat things said to htm. Following this he learns to name objects and to talk spontaneously, to speak his own thought. The object of this test is to determine whether the child has reached this second stage of development. The nature of his pronunciations are likewise characteristic of a stage of development and is not due to any defect. The imperfect pronunciation sometimes makes it difficult to determine whether the repetition is correct word for word or not. But if he uses the correct number of words, with only one or two unintelligible, the repetition may be regarded as satisfactory, since substitution of other words of his own for those read to him belongs to a much later stage of development. A frequent form of failure consists of repeating only a few of the significant words of the sentence, such as "Dog, cat," or "Hen on nest." The test is the most difficult one in this age group.

5. Repetition of two numerals. Read the following numerals to the child at the rate of one per second when two are read, being careful not to accent either and proceed as follows: "Listen! You say 2. Now say 3. Now say 6-4. Say 8-5. 3-7." Read the same

numerals more than once if the child does not respond on the first trial, but not for the second or third trial.

To pass he must repeat correctly once two numerals out of the three trials with only one reading. The object of this teat is the same as in the test on repeating a sentence of six syllables. Bat numerals are more difficult to repeat than are words making a sentence, because of their lack of meaning. A frequent failure consists in repeating only the last of the two numerals.

AGE FOUR YEARS.

I. Giving sex. Ask: "Are you a little boy or a little girl?" in case of boy, and, "Are you a little girl or a little boy?" in case of a girl. If the answer is "Yes," or if the last word of the question is repeated, say: "Are you a little girl?" in case of a boy, and, "Are you a little boy?" in case of a girl.

Any response indicating that he knows hie sex is satisfactory for passing the test.

2. Naming of familiar objects. Show the child in succession the following objects, asking each time, "What is this?", or "What do you call this?" a. Key. b. Closed knife, c. Penny, d. Watch, e. Ball. f. Pencil.

Correct answers to any five passes the test. "Money" for penny, and "Clock" for watch are accepted as satisfactory. The object is to find whether he can name these particular things, which is more difficult than naming several things in a picture from which be may choose what he wishes and is able to name.

3. Repetition of three numerals. Say: "Can you say 4-8? You say 4-8." Then proceed as in III 5, using the following-, but reading them a little faster, at the rate of three numerals per two seconds.

a- 7-5-3- b. 2-6-4. c. 8-1-9.

One correct repetition out of the three trials passes the test. Repenting the numerals in a different order is not counted as an error. The test is a relatively difficult one for this age group.

4. Comparison of two lines. Prepare three cards, each with two parallel horizontal lines, one five and the other six centimeters long, three centimeters apart, and with the center of one exactly under the center of the other. Place a card before the child with the lines in horizontal position, and say: "See the two sticks, one little one and one big one. Show me the big one." Repeat with the second and third cards, having the longer line alternately the nearer and the further one, and say: "Which is the big one here?" for each. Repeat with all three cards if the responses are indecisive.

All correct in the first three trials, or five out of six trials correct passes the test. Failure is often due to inability to understand the task rather than to inability to see the difference between the two lines. A frequent form of failure consists of pointing indiscriminately at any part of the card. In such cases it is often difficult to determine whether the failure is due to carelessness in pointing out or to inability. Further trials, with variations in the procedure must decide.

5. Discrimination of forms. Draw the forms given in Plate II on ten three by five inch cards, making the forms twice the size given in the plate, and prepare a duplicate set. Place the ten of one set before the child in the positions given in the plate. Place the circle of the duplicate set at "x", and say: "Show me one like this," passing a finger around the margin of this form, repeating: "Find one like this one here," pointing to the other cards. Use the square next, and the triangle next, the rest in any order. Correct the first error the child makes by saying, "No, find one just like this one," passing the finger around the margin of the card at "x" again. Make no comment on errors after the first one, proceeding at once with the next card, but encourage with a "That's good," or similar remark each time the choice is correct.

The test is passed if seven out of the ten choices are correct, the first corrected error being counted. Failures are sometimes due to lack of understanding the task, but more frequently to failure to discriminate.

AGE FIVE YEARS.

1. Counting four pennies. Place four pennies in a horizontal row before the child. Say: "See these pennies. Count them. Tell me how many there are." Unless it is evident that he has really counted them and not just given some number accidentally correct, have him repeat the count, saying: "Count with your finger," or else point to the first one yourself, saying: "Count them again. Now, 'one.'"

2. Copying a square. Prepare a card with a square on it in heavy lines an inch and a half on a side. Give him a pen and ink and paper, and say: "See how nicely you can make one just like this." Give three trials.

Two satisfactory drawings out of three trial passes the test. Drawings as good as 1, 2, and 3 in Plate X are satisfactory, 4, 5 and 6 are unsatisfactory. With defective children motor disturbances are often the cause of failure when pen and ink are used. In evident cases of this sort a pencil should be substituted. Otherwise the required coordination for drawing with pen and ink is a factor in this stage *at* development and is to be tested.

3. Comparison of two weights. Prepare a pair of weights, identical in size and appearance, one weighing nine grams and the other thirty-six grams.* Take one in each hand, between thumb and forefinger, and say: "Here are two weights, one heavy and one light. Lift them like this, (illustrate by lifting as if to discriminate) and give me the heavy one." Then give them to the child, having him take them in the same way, and repeat:

*A convenient way is to take twelve or sixteen gauge paper shot shells, cutting them off at about the middle and filling them even full with cotton and shot and putting a felt wad on top. Or, better yet, use melted wax or paraffin and shot.

"Give me the heavy one." If he gives both, or the wrong one, say: "No, give me the heavy one." Give six trials, with the heavy weight alternately in the right and left hands, but do not correct the child again after the first trial if he gives the wrong one.

The test is passed if four of the six trials are correct. As in the case of comparing the lengths of two lines, failure is often due to inability to understand the task rather than to inability to discriminate the weights. The procedure should be very carefully followed, making sure to have the attention of the child in each trial, and then the ability to understand the task is made apart of the test. Common forms of failure are giving the right or left weight each time, or giving both. The child understands that he is to "give" as in other previous tests he understands that he is to "show" or "point out" something, but does not comprehend the rest.

4. Game of patience. Prepare two two by three inch cards, cutting one into two triangles along one of its diagonals. Place the uncut card before the child with the two pieces of the other nearer him, about an inch apart, with the two hypotenuses away from each other, and so they can be combined into a rectangle without turning over one piece. Place your thumb and forefinger of one hand on the two triangles and say: "Put these two pieces together (moving them together and apart once or twice) so they will make one like this" (pointing to the uncut card). Give three trials, two of which should be successful.

Failure is again frequently due to inability to understand the task. When this seems to be the case the directions should be repeated and the child urged, as when he tries first and gives up, Frequently he puts them together wrongly and then stops, sometimes with some indication that he thinks the task accomplished. Count this as a trial, and say: "No, put them together so they make one Just like this," and then return them to their original positions. It is sometimes difficult to distinguish between a really successful trial and an accidentally correct combination, because of lack of evidence of recognition on the part of the child of correct or incorrect combinations.

5. Repetition of a sentence of ten words. Say: "You say now what I read to you just the way I read it. Listen!"' Then give the following:

a. "His name is John. He is a very good boy.

b. We will have a great time at the big picnic.

c. When the train passes you will hear the whistle blow."

If he remains silent for the first trial repeat the same sentence a second time, adding at once,"Now, what did I say?" If he repeats it very imperfectly the first time, say: "Say it just as I say it. Listen!" Then give the second trial on the same sentence.

The test is passed if one of the three sentences is repeated correctly with only one reading to the child.

AGE SIX YEARS.

1. Distinction between right and left. a. Say: "Raise your right hand." b. Then. "Show me your left ear." c. Then, "Show me your right eye." Speak very slowly, and allow plenty of time so as to avoid a tendency to confusion. If only one error is made repeat, this time in the order left hand, right ear, left eye. If the child changes his response the first response is not counted, no matter whether it was correct or wrong. Care must be taken not to suggest such a change in any way, as by waiting too long before passing on to the next.

The test is passed if the first three are correct, or if five out of six are correct. A frequent error consists of choosing the same side the second time as the first, or the same the third time as the second. This often happens when the child is quite able to distinguish right from left, and is probably due to bis attention being caught by the different parts called for—ear instead of hand, eye instead of ear—so that he does not notice the different side also that is called for. The natural tendency then is to choose the same side as the time before. The object is to determine whether the child knows right from left, and the examiner must judge whether a failure is due to such extraneous factors or to inability to discriminate, which can usually be decided by further trial, if necessary at a later time during the sitting.

2. Aesthetic comparison. Cut out the pictures given in Plate III, and mount them on cardboards in pairs, keeping the arrangement for each pair as given in the plate. Show one pair at a time to the child, and ask: "Which is the prettier of these two?" Use the cards in an order so that the prettier one will be alternately on the right and left sides. Repeat once with the three cards if only one error is made the first time. Urge by repeating in varied form if the child does not respond readily.

The test is passed if the first three are correct, or if five out of six are correct. Failure consists of absence of response through inability to understand at all what is to be done, or of pointing indiscriminately at any part of the card, or of persistently choosing the right or left. There is a strong tendency to do the last.

3. Definition according to use of object. Ask: "Can you tell me what a fork is?" Then give the following.

a. "What is a fork?

b. What is a table?

c. What is a chair ?

d. What is a horse?

e. What is a pencil?"

If he does not respond readily for the first one, say: "You know what a fork is, don't you?" Or, "Yes, you know what a fork is. You see one every day. Now, what is a fork?"

The test is passed if three out of the five are defined in terms of use, or in other descriptive terms. A child much brighter than a six-year-old normal may refuse to respond, because the task seems too childish. On the whole, the responses may be grouped into three classes, (a) Silence, or simple repetition, as "A fork is a fork," or, poorer yet, merely "Fork." (b) Definitions in terms of use alone, as, "A table is to eat," "A horse is to pull wagons." (c) Definitions better than in terms of use, as, "A hone is an animal that pulls wagons," or, "A horse has

four legs, a head and a tail." Definitions according to use are very typical of this age and are usually easily classified. But the variety of responses is great, and it is sometimes difficult to decide whether or not a response is to be classified in "c" when it does Dot belong in "a" or "b". This difficulty is diminished as the examiner gains experience in the kinds of responses that are obtained from children of different ages and grades of intelligence. The test la a relatively easy one in this age group.

4. Execution of three simultaneous commands. Have things arranged beforehand so that the following may be given: Say: "Do you see this key? Go put it on that chair there. Then close the door. Near the door you see a box on the chair there. Bring the box to me. First the key on the chair; then close the door; then bring me the box. Do you understand? Good, go ahead." If the child starts at once to do the first thing before he is told about the second, as he often does, add, "Now wait, wait," and repeat from the start. The three things to be done may be varied if circumstances require it, but great care must be taken to have them very similar, and to give the directions in a very similar manner.

The test is passed if all three are done correctly without further help or suggestion from the examiner. Change in the order is not counted an error. The most frequent form of failure consists of omitting to do one of the three things, without the child knowing at all apparently, that anything is wrong. Sometimes be stops to inquire again what is to be done next, or whether what be does is correct. He should be urged merely to go on without making any suggestion.

5. Distinction between morning and afternoon. Ask: "Is it morning or afternoon?" if it is in the morning, and, "Is it afternoon or morning," if it is afternoon.

This test Is passed in a blgh percentage of cases, possibly because the element of chance is so large, which makes it appear as relatively easy in this age group. However, it appears as too difficult for the preceding age group. There is a strong tendency to repeat the last word of the question, hence the responses to be correct involve both the ability to overcome this tendency and the discrimination.

AGE SEVEN YEARS.

I. Description of a picture. Use the same pictures called for in Test III I. Show the first one and say: "Look at this picture. Tell me what this picture is about." If there is no response, or only enumeration, change the question to, "What is this a picture of?" If there is still no response at all, say, "Tell me what you see in the picture." Use all three pictures, unless a satisfactory response is obtained for the first or second.

Any response superior to mere enumeration of things and persons in the picture for any one of the three passes the test. The object here is to determine whether the child is capable of more than mere enumeration, and the form of the question is adapted to bring out description or interpretation. Above, it was put in a form to bring out enumeration. See Test III 1 for kinds of responses obtained.

2. Naming four common pieces of money. Show the child a nickel, a penny, a quarter, and a dime, in the order given, and ask: "How much is this?" for each. One error is allowed if it is corrected at once to the further question "How much?," or if it is corrected when the same coin is shown again after one or two others have been named.

3. Telling number of fingers, a. Ask: "How many fingers on your right hand?" b. "How many on your left hand?" c. "How many in all on the two hands?"

The test is passed if a correct answer is given to each without counting or hesitation.

4. Recognition of mutilations in pictures. Cut out the four pictures in Plate IV and mount each on a card. Show one at a time in the following order, a. Picture with mouth gone. b. Picture with eye gone. c. Picture with nose gone. d. Picture with arms gone. Say for the first: "See this picture. Tell me what is gone in that face." If the child does not understand at once, or gives a wrong reply, repeat the question in varied form. If necessary, proceed as follows: Say: "You see the eyes. Look, the eyes are there. You see the nose. Yes, the nose is there. And look, the chin is there. Now, what is gone?" If he still fails to respond correctly, add: "Look, the mouth is gone, is it not? Yes, the mouth is gone," Then show the others in order, asking for each merely "What is gone in this one?"

Three correct out of the four passes the test. Any response indicating that he recognizes the mutilation is satisfactory, though it may not be quite correct literally. The child frequently fails to understand at first from the question what is wanted, and the latter part of the procedure becomes necessary. Various irrelevant answers are given. With this additional help, however, the responses for the remaining three should be prompt, and given without any further suggestions of any sort from the examiner.

5. Repetition of five numerals. Say: "I am going to read you some numbers. Now, listen very carefully and see if you can say them when I get through just the way I read them. Listen 1" Then proceed with the following, reading them very distinctly at the rate or five per three seconds.

a. 6-5-2-8-1. b. 4-9-3-7-5-c. 2-8-6-1-9.

Great care should be taken to have the child's attention each time before reading. The exact rate of reading becomes important with these larger groups. The examiner should frequently verify his rate of reading with a metronome or other means at hand and should avoid all accents and rhythm.

One correct repetition out of the three trials passes the test. A change in the order of the numerals is not counted as an error.

AGE EIGHT YEARS.

1. Copying a diamond. Pre-

pare a card with a diamond on it, having diagonals of three inches and one and one-half inch. Give him pen and ink and paper. Place this before the child with its longer diagonal in the vertical position and say: "See how nicely you can draw a diamond just like this one." Give three trials, two of which must be as good as 1, 2, and 3 in Plate XI to be satisfactory, with the acute and the obtuse angles in the proper places; 4, 5 and 6 are unsatisfactory. In the case of any evident motor disturbance a pencil may be substituted for the pen and ink.

The child's drawings should be carefully compared with the samples in the plates as standards in each case, otherwise a variable interpretation on the port of the examiner may often give wrong results.

2. Naming the months of the year. Say: "Name the months of the year." If he hesitates, say: "Begin, January—."

The test is passed if they are named in correct order with not more than one error or omission. Errors corrected by the child are not counted.

3. Counting the value of stamps. Prepare a card with a horizontal row of three one-cent stamps, and under them a row of three two-cent stamps. Show this to the child and ask: "How much will it cost to buy all these?" If a wrong answer is given the first time, ask: "How much is one of the green ones worth?" Then, "How much is one of the red ones worth?" If he knows the value of the individual one and two-cent stamps, give him a second trial with the further question: "Now, how much are they worth altogether?" Give no further suggestions.

The more usual forms of error consist of counting merely the number of stamps, and of giving any value at once in guessing. Both probably Indicate a lack of comprehension of the task. In less frequent failures the value of the individual stamps is recognized and an effort is made to count up the total value.

4. Counting backwards, from twenty to one. Say: "Let me see how well you can count backwards from twenty to one. You begin with twenty and count back to one." If he does not at once understand, say: "Count like this, 'twenty, nineteen, eighteen,' and so on. Now begin, twenty,—"

The test is passed if the count is made in twenty seconds with not more than one error. Errors corrected by the child are not counted. If the counting is done with evidence of care and effort and without any error thirty seconds may be allowed, as the rate alone depends on practice as well as on intelligence.

5. Comparing two objects from memory. Ask: "What is the difference between:

a. a butterfly and a fly?

b. wood and glass ?

c. paper and cloth?"

If the child does not at once understand what is wanted, say: "You know the butterflies ; you have seen butterflies? And flies, you know flies? Are they alike? Why are they not alike?"

The test is passed if two out of the three comparisons are made correctly. No exact definitions, pointing out essential differences are required. Any difference pointed out, if it is< correct) is satisfactory for an answer. The object is merely to determine whether the child can make a correct comparison from memory.

AGE NINE YEARS.

1. Naming nine pieces of money. Show the following pieces of money in the order given: Quarter, nickel, silver dollar, penny, dime, half dollar, two dollar bill, five dollar gold piece, and ten dollar gold piece. For the first ask: "How much is this?" For the following ask simply, "and this?" Errors corrected by the child are not counted. If a given piece is named wrongly the first time give a second trial on the same piece after one or two others have been shown.

To pass the test all must be named correctly. The test is affected more by variation in training than is Test VII 2. naming four common pieces of money, because all children have more or less equat opportunities to learn the names of the smaller more common coins, while for the larger pieces this is not the case.

2. Giving the date. Ask successively: a. "What day of the week is it today?" b. "What month?" c. "What day of the month?" d. "What year?"

All must be answered correctly, except that an error of three days is allowed for the day of the month. The fact that normal adults very frequently do not know the date does not necessarily militate against this test. They forget because there is no interest or motive for remembering. Normal children, however, at this age seem to have a natural interest in the date, and have the necessary intelligence to keep track of it.

3. Definition better than according to use. a. Ask: "What is a telephone? b. balloon? c. foot-ball? d. tiger? e. battleship?" If for any ,word the answer is "I don't know," or if there is any other indication that the word is unfamiliar to the child, another word may be substituted.

Three out of the five defined in terms better than according to use passes the test. See Test VI 3 for classification of responses. Correct definitions are not required. The object la simply to determine the child's predominant manner of defining familiar words. The test is relatively difficult for this age group.

4. Making change. Say: a. "If I bought a pencil for four cents and gave the clerk ten cents, how much money would I get back? b. If I bought a slate for ten cents and gave the clerk twenty-five cents, how much money would I get back? c. If I bought three oranges for twelve cents and gave the clerk fifteen cents, how much money would I get back?"

Two correct answers out of the three passes the test. The answers must be given without the aid of a pencil or other help.

5. Arrangement of weights. Prepare the following series of weights in the manner described in Test V 3: 9, 18, 27, 36 and 45 grams. Proceed as follows: Say: "Here are some

weights. They do not all weigh the same. Some are heavy and some are light, and there are no two just alike. Lift them all like this (illustrate by lifting several in succession with the same hand, between thumb and forefinger) and pick out the very heaviest one that is there." Then, "Now put it down here and pick out the next heaviest and put it with this one." Then, "Now pick out the next heaviest and the next, and so on, putting them all in a row with these other two." Give three trials. If in the second and third trials the directions are not followed, repeat as much of them as is necessary.

The teat 1B passed if the weights are arranged in order without an error in two out of the three trials.

AGE TEN YEARS.

1. Counting dots. Prepare a card reproducing Plate V enlarged so that the squares will be two inches on a side. The irregular arrangement of the dots, their size and distances apart must be in the same proportions as in the plate. This makes the dots an eighth of an inch in diameter. Say: "Here is a card with a lot of squares and some dots in each square. I am going to see how fast you can tell me the number of dots in each square one after the other from left to right, beginning at the top row. You count to yourself, but give me the number for each square out loud, like this:" (illustrate by counting a little over the first row). Then turn the card into another position and give to child, keeping hand over the first square, and say: "Now ready. Begin here," pointing to the first square. Give a second trial, with the card turned to the right ninety degrees. The examiner may follow the count by having a card with the number of dots for each square in the order of the squares before him while the child counts.

The test is passed if the average time in minutes for counting the dots of the twenty-five squares plus the average number of errors is less than 7.

2. Comprehension of easy questions. Say: "I am going to ask you some questions and see how nicely you can answer each one." Then ask the following, one at a time.*

a. "If you were going away and missed the train, what would you do?

b. If one of the boys should hit you without meaning to, what should you do about it?

c. If you broke something belonging to some one else what should you do about it?"

The test is passed If two are answered satisfactorily. The variety of answers given is large and they are difficult to classify. But the object of the test is simply to determine whether the child can comprehend the situations

*The form of these questions is borrowed from Dr. Clara H. Town's translations of the authors' 1911 revision of the tests.

suggested in these questions and can give some intelligent reply. The answers can often not be designated as right or wrong. Frequent forms of unsatisfactory answers are those that are "beside the point," showing failure to comprehend, such as "He should run," for "a", or same reply that bears no relation to the question at all; and absurd replies showing immature or defective judgment, such as "He should have his wounds fixed up," (or "b," Success or failure In this teat will depend somewhat on the examiner's interpretation, until he has gained skill and practice enough to judge the children's answers.

3. Drawing a design from memory. Prepare a card with a copy exact in size and shape of the designs in Plate VI. Say: "I am going to show you this card for ten seconds, and then see how well you can draw from memory what is on it. So look at it very carefully." Then show for ten seconds in the position given in the plate, and have the child draw it from memory immediately, being provided with paper and pencil beforehand.

The test is passed if one of the designs is drawn correctly and the other about half correctly. Small errors that may be the result merely of roughness of drawing are not counted.

4. Using three words in a sentence. Say: "Here are three words, 'Money, river and St. Paul,'" repeating them once slowly. "Make a sentence in which you use these three words." If he fails to understand what is to be done, give the following illustration. "If I gave you the words Spring, bloom and flowers, you might say: 'The flowers bloom in Spring.' Now use the words Money, river, and St. Paul in a sentence like that." Allow one minute for the answer, or a minute and a half if he shows persistent effort. If the words are used in three separate sentences, or three sentences connected simply by "and," say : "That is good. Now see if you can put all three words in just one sentence," and allow another half minute.

The responses obtained may be divided into several classes, (a) Using only one or two of the words and omitting the other entirely, (b) Making three separate sentences or one with three independent parts and conjunctives, like: "Money is to buy things with; the river is deep, and St. Paul is a big city." <c) Making two sentences, expressing two separate ideas, like: "St. Paul is on the river, and there is lots of money." (d) Making one sentence expressing only one idea, like: "I lost some money on the river at St. Paul." Only answers that belong to one of the last two classes are accepted as satisfactory.

5. Form board puzzle.* Use the form board pictured in Plate VII. The inside dimensions of the frame should be 3x4 inches. The frame should be of quarter inch board, and the blocks of half inch board so that the latter can be gotten hold of readily when in the frame. The dimensions of the

*This form board was suggested by Dr. W. F. Dearborn, modified by Dr. Grace M. Fernald, and is used by Dr. Wm. Healy, with a somewhat different procedure from the present one.

blocks should be as follows: 1 1/4x3; IXI 1/2; ix2 3/4;1ix1 1/2 1 1/4x2. Arrange the frame and blocks in exactly the positions given in the plate and place the whole before the child in that position. Say; "These blocks will all fit into this frame and exactly fill it with no blocks left over. I am going to see how quickly you can put them all in. Begin now." If the child succeeds in less than a minute and a half, remove the blocks at once from the frame and give a second trial, saying: "We will do this again, and see how fast you can do it the second time. Begin." It is important that the blocks should be removed from the frame before the child has a chance to note how the blocks are placed.

The second trial is to help determine whether the first success was merely accidental. The first may be regarded as accidental if any blocks are placed wrongly la the second trial, or if the time is very much longer than in the first. A block is regarded or placed wrongly only if the child leaves it and attempts to place another after it. If the first success seems accidental the second only is counted, otherwise the first only is counted. An accidental success in the first trial may teach the child to do it quickly in the second. But this cannot be avoided.

The test is passed if the time is less than a minute and a half for the trial that is counted.

AGE ELEVEN YEARS

1. Recognition of absurdity in absurd statements. Say: "I am going to read you something that has some nonsense in it. Listen very carefully and tell me what you think of what I read." Then read the following slowly and with expression. Repeat after reading each, "What do you think of that?" If he does not respond readily, read it a second time.

a. "A bicycle rider, being thrown from his bicycle in an accident, struck his head against a stone and was killed. They took him to the hospital, but they do not think that he will get well again.

b. A little boy said: 'I have three brothers, Paul, Ernest, and myself.'

c. Yesterday the police found the body of a young girl, cut into eighteen pieces. They believe that she killed herself.

d. The other day there was an accident on the railroad. But it was not very bad. There were only forty-eight killed."

One failure out of the four trials is allowed. The response given sometimes leaves it in doubt as to whether the absurdity Is recognized or not. Additional questions must then be asked adapted to the nature of the response. In rare instances no reply is made at all at first although the absurdity is recognized. In cases of silence the statement should be repeated.

2. Giving sixty words in three minutes. Say: "I am going to see how many words you can think of in three minutes. Say them out loud as fast as you can go all the time and I will count them and see how many you can get in three minutes. Any words will do, like 'clouds, dog, chair, happy' and so on. Now begin." If he stops for fifteen seconds or more he should be urged by, "More still, go right on, any words will do," which should be repeated in similar form the next time he stops.

Besides the number of words given, the kind of words given is also instructive. Some give only detached words; some only names of objects. Others give aeries of related words, while still others give abstract qualities. The last are good signs of Intelligence, and if the list includes very many such, fifty words or less may be accepted as satisfactory for passing the test instead of sixty. Allowance must also be made occasionally for a persistent tendency to give only words of a certain crass, such as names of cities, for example.

3. Giving definitions of abstract words. Say: "Can you tell me what charity is?" then,

a. "What is charity ?
b. What is justice?
c. What is bravery?
d. What is revenge?
e. What is kindness?"

Three satisfactory definitions out of the five passes the test. Formally or logically correct definitions are not required. The object is only to determine whether abstract meanings can be comprehended. A definition, however, in terms of the word defined, such as "Justice is to be just," is not accepted by itself. In such cases he should be asked: "Yes, and what is it to be just?" A correct illustration is accepted in place of a definition.

4. Words to put in order to make a sentence. Show the groups of words, one at a time, given in Plate VIII and say: "Here are some words of a sentence all mixed up. See if you can change them around so that they will make a sentence and mean something." If he fails in two minutes, give him the following help. "It begins, 'We started—(pause). We started for the park—(pause) at an early hour. We started for the park at an early hour.' " Give this very slowly and have him find the words in the group as you give them to him.

Failure to get the first sentence at once is often due to his not understanding what is to be done, and the first one should be given him in this case as an illustration. The test is passed if two out of the three are passed without any help. Allow two minutes, or more if there is any indication of persistent effort.

5. Giving the numbers to the parts of a form. Prepare cards with the forms and lettering as given in Plate IX. On the first card have the four crossed lines three inches long with the lettering, "a" to "i" as indicated. On a second card have the first group of nine parts in the order given in the plate, these parts being a half inch on a side. On a third card have the four crossed lines again, but with numbers 1 to 9 in place of the letters, in the same order as the letters. On a fourth card have the second group of nine parts in the order given in the plate. Proceed as follows. Show the first card, saying: "Here are four lines crossing with letters in the corners and parts. Notice carefully the order in which the corners and parts are lettered.

Here is 'a' 'b,' 'c' down through on your left; 'd,' 'e,' 'f.' down through the center; and 'g,' 'h,' 'i,' down through on your right." Then, leaving the first card before him, show the second card and say: "Here are these corners and parts without the letters. Now what letter goes into this one?" (pointing to the first one, and taking the others in the reading order). If he fails to understand, point out this part to him and the letter on the first card. Proceed in the same way with the next four parts. Then remove the first two cards from his sight and show him "the third card saying: "Here are the same four lines crossing, but with numbers in place of the letters. Notice again carefully how the numbers run. I will then take them away and then see how fast you can give me the numbers that go with these parts (showing him the fourth card for a second or two), just as you did with the letters before." Let him see this third card for thirty seconds after this. Then remove it and give him the fourth card, saying: "Now, what number goes in this one," pointing to the first. If he fails to take the parts in the order mentioned, after this correct him by pointing to the next one he should take. The examiner should have a small card before him on which the numbers alone are given in the order and position of the parts on the fourth card to aid in checking the errors made. Give a second trial immediately following the first, beginning by showing him the third card once more for ten seconds, and giving htm the fourth card, as before.

The test is passed if the average time in minutes for the two trials plus the average number of errors is less than five. There is a large individual variation in the ability to understand at once what is to be done in this test. The first part here is merely to familiarize the child with the procedure.

AGE TWELVE YEARS.

1. Repetition of seven numerals. Say: "I am going to read you a lot of numbers now, seven at a time. Listen very carefully and see how many you can say each time after I get through reading." Then give the following, reading at the rate of seven numerals per five seconds. See Test VII 5 on reading of the numerals.

a. 6-4-1-3-7-9-5.
b. 8-2-5-7-3-6-9.
c 3-7-2-5-8-4-6.

One correct repetition out of the three trials passes the teat. Changes in the order are not counted as errors.

2. Rhyming words. Say: "I am going to give you a word and see how many words you can find in a minute that rhyme with the word I give you. You understand what 'Rhyming' means? For instance, if I gave you the word 'Tree,' words rhyming with 'Tree' would be 'See, me, agree,' and so on. Now find all the words that rhyme with (a) 'Day.'". Give second and third trials with (b) Spring, and (c) Mill.

The test is passed if three words are found that rhyme with the word given in two out of the three trials, Some children are disinclined to do this test and need some urging.

3. Repetition of one sentence or more with twenty-four syllables in all. Say: "I am going to read you long sentences. See if you can repeat them word for word just as I read them." Then give the following:

a. "Children, it is necessary to work for a living. You must go to your school every morning.

b.* I saw a pretty little dog out in the street. He had curly brown hair, short legs and a long tail.

c. When the train crosses the road the engineer will blow the whistle and the fireman will ring the bell." If he fails on the first by only a slight error of a word or two, say: "Say it just as I say it, word for word," and give him a second trial on the same sentence, in order to impress him with the fact that no change of any sort is permissible.

One correct repetition without a single error of any sort out of the three passes the test.

4. Problems of diverse facts. Say: "I am going to read you a sentence, but will stop just before coming to the end. Listen carefully and see if you can finish it as it should be." Then read:

a. "A person out walking in the woods suddenly stopped, much frightened, and then ran to the nearest policeman and told that he had seen hanging from the limb of a tree a—— (After a pause) a what?"

b. Then for the second say: "Here is another one. listen !" Then read: "My neighbor has been having strange visitors. He has received one after the other a doctor, a lawyer, and a minister. First a doctor came, then a lawyer, and then a minister. What do you suppose happened there?" Either "a" or "b" may be repeated a second time if there is any indication that he failed to respond because of lack of attention.

Both must be answered intelligently to pass the test.

5. Resistance to suggestion. Prepare the following six cards, each 3 1/2x9 inches. First card: Two heavy horizontal lines, side by side, in the center of the card, the one on the left being two inches long and the one on the right two and a half inches and the two separated by half an inch. Second card: Same, with the lines on the left and right two and a half, and three inches long, respectively. Third card: Same, with the lines three, and three

*"b" is Goddard's adaptation of one of the Binet-Simon sentences, "c" is borrowed from Whipple. The original series of sentences of the authors was too difficult.

and a half inches. Fourth, fifth and sixth cards: Same in all three, the left and the right lines being both three and a half inches in each card. For convenience these cards may be fastened into a booklet, allowing the cards to turn easily and lie flat. Show the cards in order from first to sixth. For the first two cards ask: "Which is the longer of these two lines, left or right?" For each of the remaining two ask simply: "And of these two?"

The test is passed if two out at the last three are answered correctly, that is, if be soys they are the same. The object is to see whether the suggestion given by one of the lines being longer in each of the first three cards is resisted for the last three where the lines are the same in length.

AGE FIFTEEN YEARS.

1. Drawing the folds and a cut in a twice-folded piece of paper. Take about a six inch square of paper and say: "Watch me fold this piece of paper and how I cut it. I am going to ask you in a. moment to draw the way it would look if I unfolded it again." Then proceed as follows. In plain view of the child fold the square twice in the middle and in directions at right angles to each other. Then cut an equilateral triangle of about a centimeter from the middle of the closed side—the side showing only one fold. Then give the child another square of paper of the same size and repeat: "Draw the way this piece of paper would look if I unfolded it again. First draw the folds." He may keep the folded paper and piece cut out in view but must not touch either nor attempt to fold another.

This test la difficult if the drawing is made at once without hesitation, it may be assumed that he was already familiar with the test and had tried it before, In this case repeat the test by cutting the piece from the middle of the adjacent side, or by folding the paper from corner to corner into triangles.

a. Drawing the figure of two juxtaposed triangles. Use the two triangles cut for Test V 4. Place them in the middle of a piece of paper before the child with their hypotenuses together so as to form a rectangle. With your finger on one of the triangles, say: "Suppose I turned this piece around so that this largest corner here of this piece would be at the smallest corner of that piece there, and so that the shortest side of this piece here would run along the longest side of that piece there. What would the shape of the two pieces together be then?" Point to the corners and sides of the two triangles as they are mentioned and repeat the whole description once very slowly. Then say: "Begin by drawing a line around the piece you have left," as you take away one of the triangles, the one nearest the child and referred to as "this" one. After he has drawn one triangle remove both from his sight and say: "Now draw on the other one." Do not give any further help.

The test is passed if he draws the largest angle and shortest side of the latter triangle in the proper places.

3. Distinguishing between abstract terms. Ask: "What is the difference between:

a. laziness and idleness?
b. evolution and revolution?
c. happiness and honor?
d. poverty and misery?
e. pride and pretention?

Three satisfactory replies out of the five trials passes the test. Any response indiating that the essential difference is comprehended is accepted as satisfactory.

4. Passage to summarize from memory. Say: "I am going to read you a short passage and see how well you can repeat the main idea of it in your own words. Listen!" Then read the following slowly and distinctly:

"Tests such as we are now making are of value both for the advancement of science and for the information of the person who is tested. It is of importance for science to learn how people differ and on what factors these differences depend. If we can disentangle the complex influence of heredity and environment we may be able to apply our knowledge to guide human development. Then it is well for each of us to know in what way he differs from others. We may thus in some cases correct defects and develop aptitudes which we might otherwise neglect."*

This test is passed if about a third of it is reproduced so as to indicate that the essential parts have been understood.

5. Telling time if the hands of the clock were interchanged. a, Say: "If at 6:22 the hands of a clock were interchanged so that the small hand would be where the big hand is, and the big hand would be where the small hand is, what time would the clock show then?"

b. Repeat the same for 2:46 o'clock. No watch or clock or drawing must be made use of. Allow liberal time.

Both answers must be correct to pass the test. The discrepancy in the relative positions of the hands when Interchanged need not be recognised.

This passage is taken from Wissler, C.: "The Correlation of mental and physical test." Psych. Rev., Mon. Suppl., June, 1901. The passage used by the authors in this test seems too vague and meaningless, and is for this reason unsatisfactory.

*This test is borrowed from Goddard.

SPECIMEN RECORD BLANK

REVISED BINET-SMON TESTS

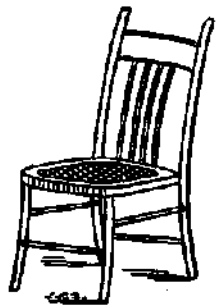
Name . . . . . Date . . . . . ,
3 Mos. i a b 2 a b 3 4 5.
6 Mos. 1 a b 2 3 a b 4 5.
I. i a b 2 a b 3 a b c 4 a b ; a b .
II. 1 2 a b c d 3 a b c 4 5,
III. i a b c 2 a b c d e 3 4 a b c j a b c .
IV. x a a b c d e f 3 a b c 4 a b c 5 >
V. 1 2 a b c 3 a b c d e f 4 J a b c.
VI. 1 a b c 2 a b c 3 a-b c d e 4 5.
VII. 1 a b c 2 a b c d 3 a b c 4 a b c 5 a b c.
VIII. 1 a b c 2 3 4 5 a b c.
IX. I 2 a b c d 3 a b c d e 4 a b c 5 a b c .
X. 1 a b 2 a b c 3 4 5 a b.
XI. i a b c d 2 3 a b c d 4 a b c 5 a b .
XII. I a b c 2 a b c 3 a b c 4 a b 5 a b c.
XV. 1 2 3 a b c 4 5 a b.
Mental Age . . . . . Examiner . . . . .
Age . . . . . School Grade.,
Remarks:

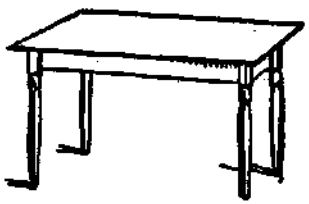
LIST OF MATERIALS REQUIRED

3 Mos. 1. One one-inch wood cube.
2. Telegraphic snapper,
3. Candle.
6 Mos. 1. Pillow.
2. Small hand bell, 1 1/2 to 2 inches in diameter.
4. Soft rubber ball, about 1 1/2 inch in diameter.
I, 1. Stool or other seat without back.
3. Baby rattle.

Card with eight pictures of familiar objects. See Plate IA & B.
Card with circle, 1 1/2 inch in diameter.
Colored sugar candy. Tissue paper.
Three pictures, in colors.
Jackknife, penny, watch, pencil, key.
Three cards, each with a pair of lines.
Two sets of form cards. See Plate II.
Four pennies.
Card with 1 1/2 inch square.
Pair of weights.
Two rectangular cards, one cut along its diagonal.
Three pairs of pictures. See Plate III.
Penny, nickel, dime, quarter.
Four pictures. See Plate IV.
Card with diamond.
Card with six stamps.
Penny, nickel, dime, quarter, half dollar, dollar, two dollar bill, five dollar gold piece, ten dollar bill.
Set of five weights.
Card with dots. See Plate V.
Card with designs. See Plate VI.
Puzzle board. See Plate VII.
Three groups of words. See plate VIII.
Four Cards with special forms. See Plate IX.
Six cards, each with pair of lines.
Specimen drawings. Plates X. and XI.

PLATE IA





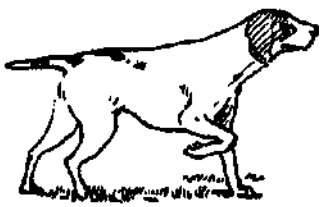
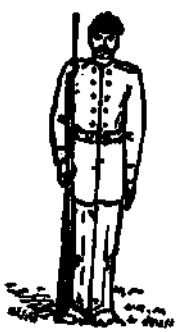


PLATE IB



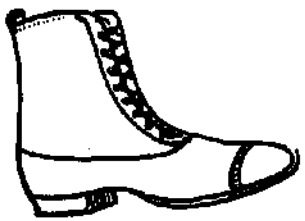


PLATE II

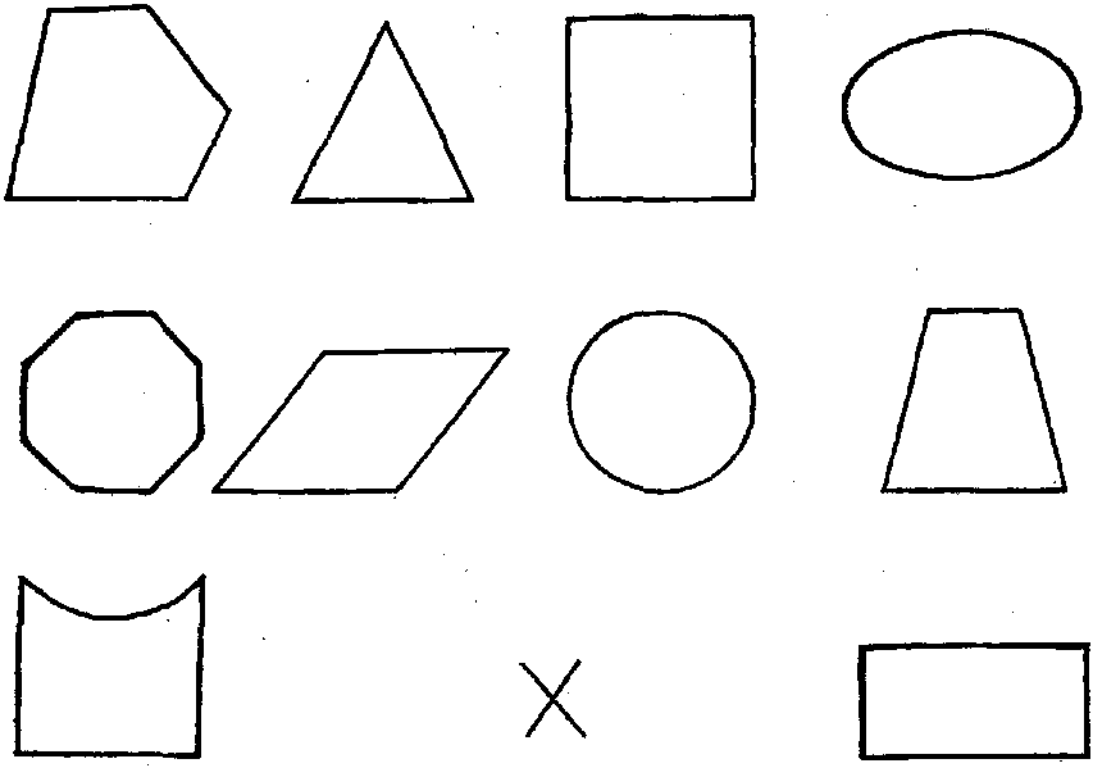


PLATE II

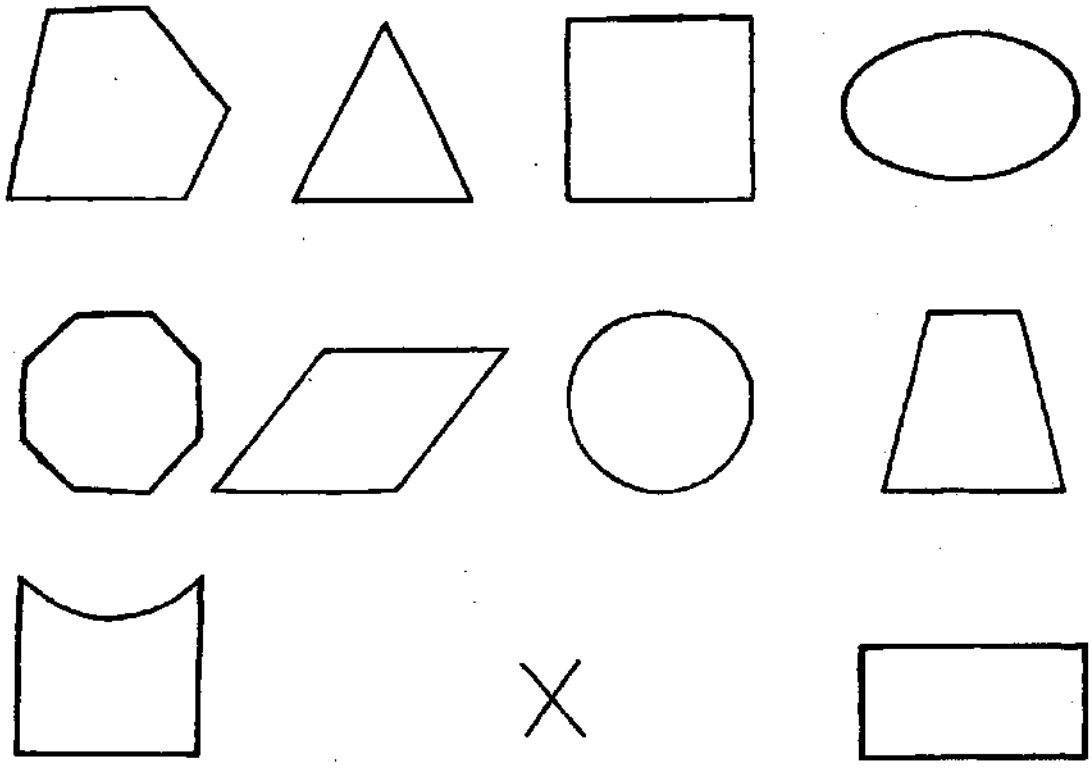


PLATE III

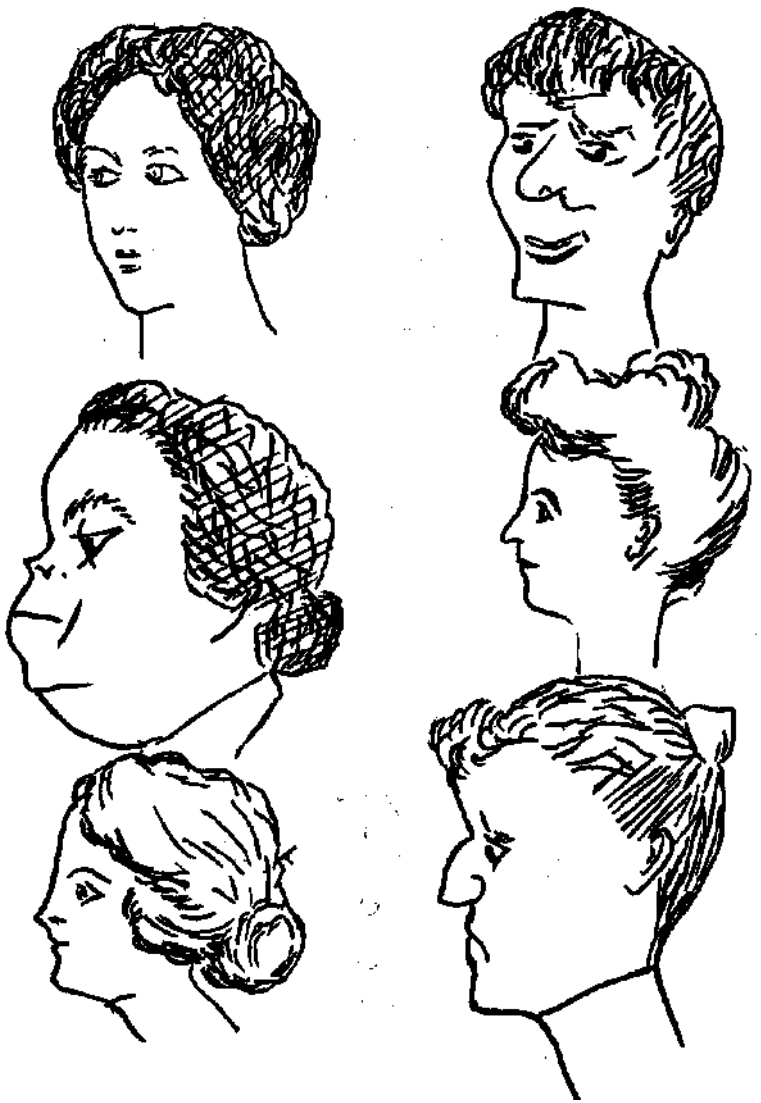


PLATE IV

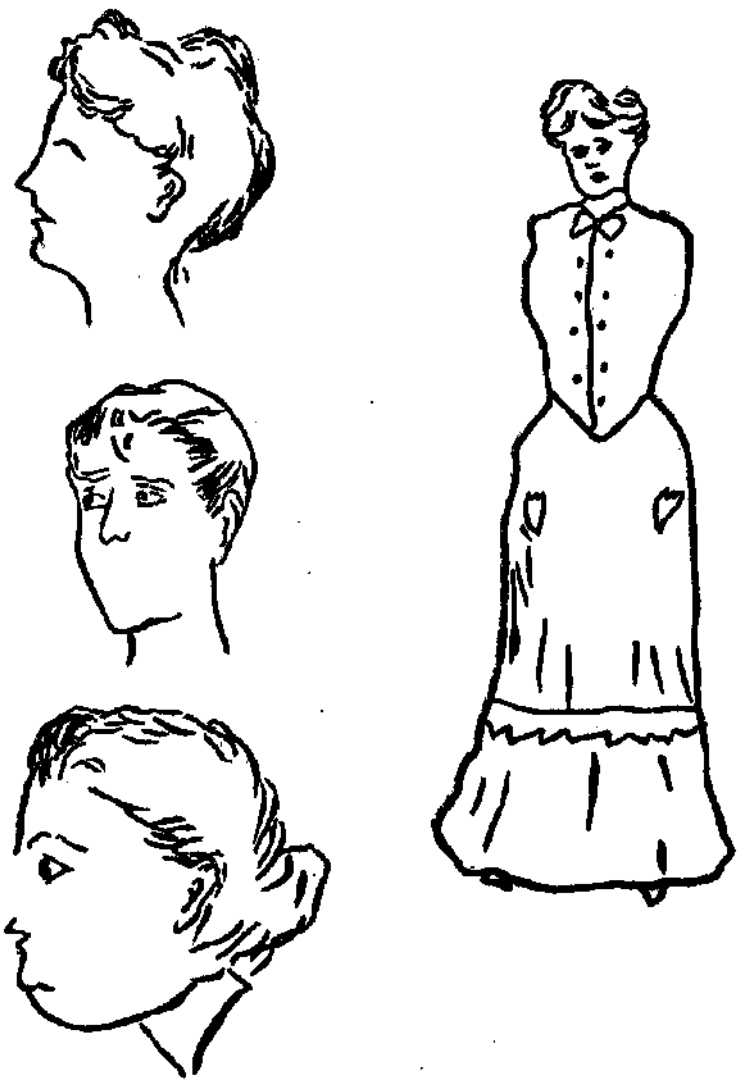


PLATE V

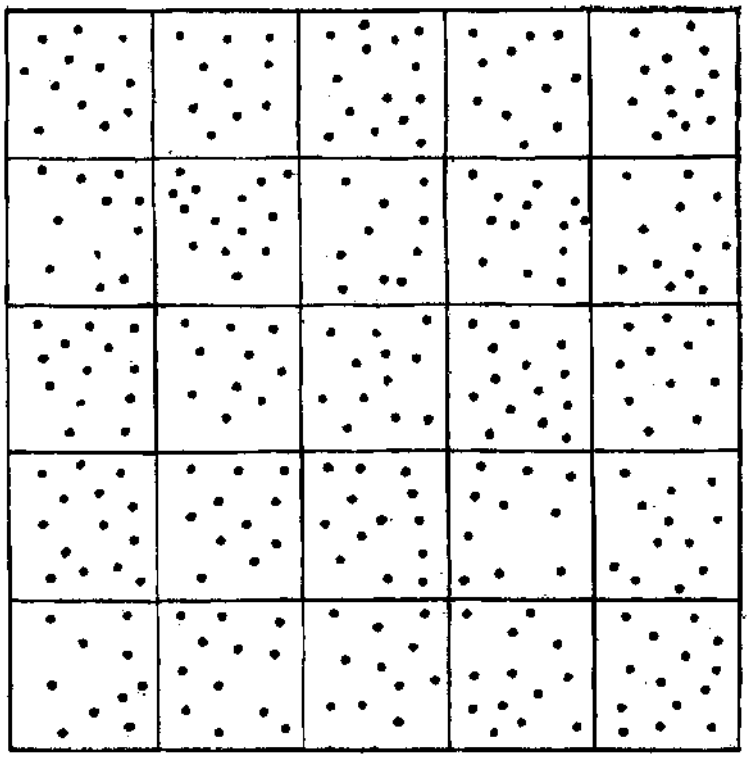


PLATE VI

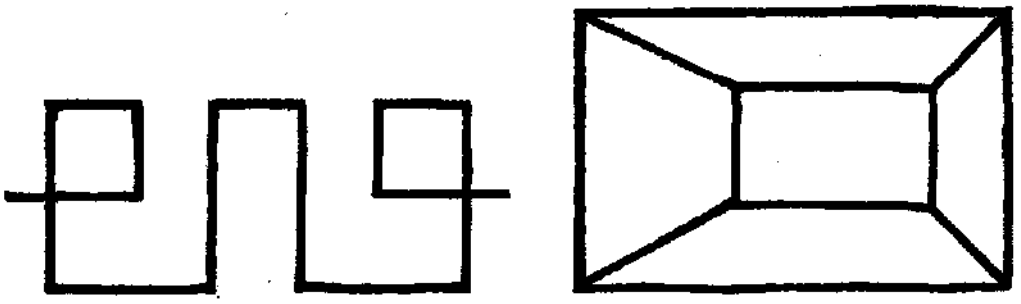


PLATE VII

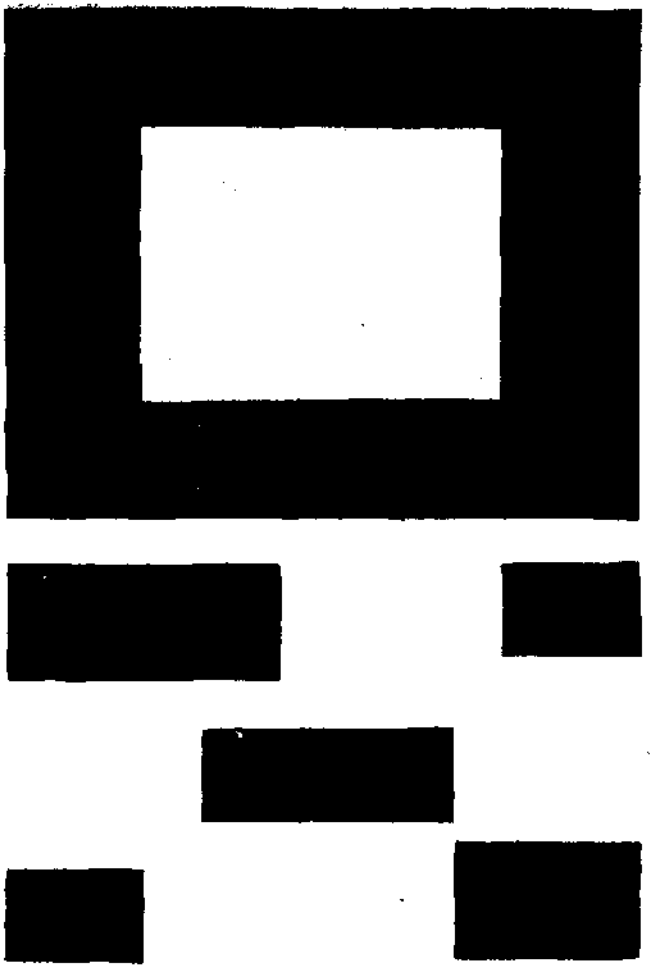


PLATE VIII

the for
at an early hour
we park started

to asked lesson
my I have teacher
correct my

a defends
good dog his
master bravely

PLATE IX

a	*d*	*g*
b	*e*	*h*
c	*f*	*i*

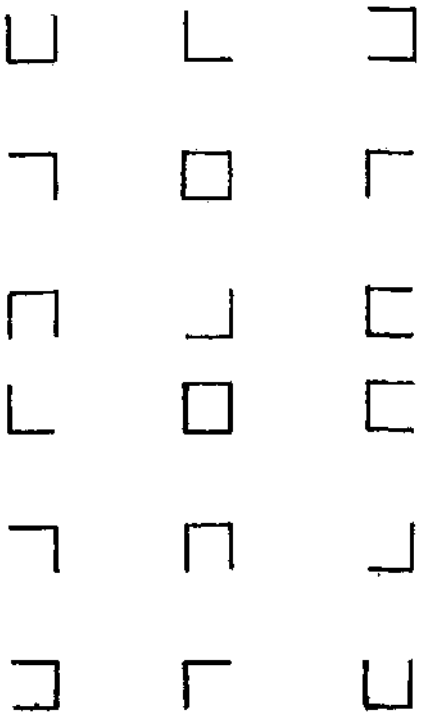


PLATE IX

a	*d*	*g*
b	*e*	*h*
c	*f*	*i*

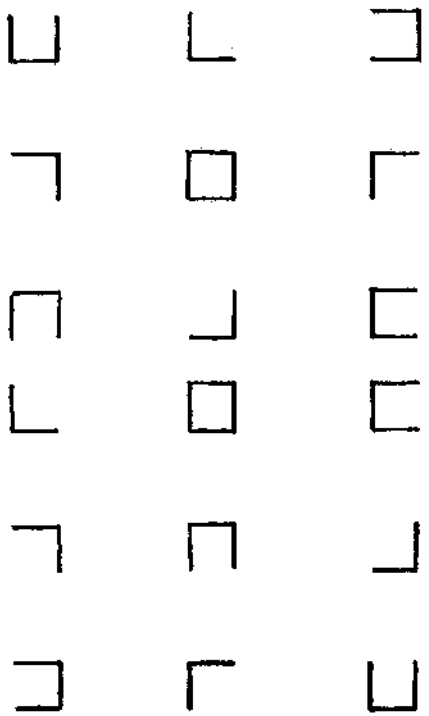


PLATE X

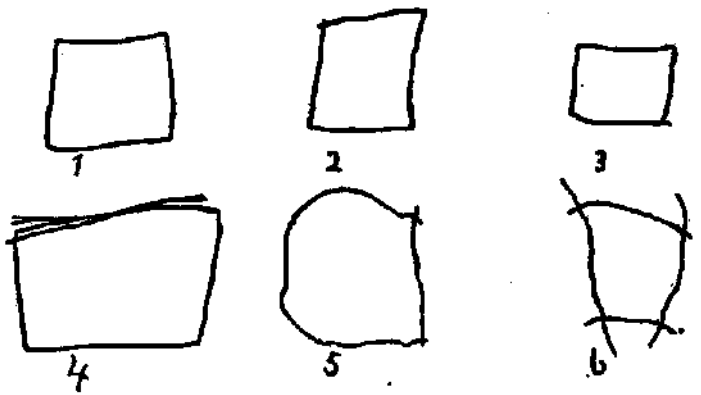


PLATE XI