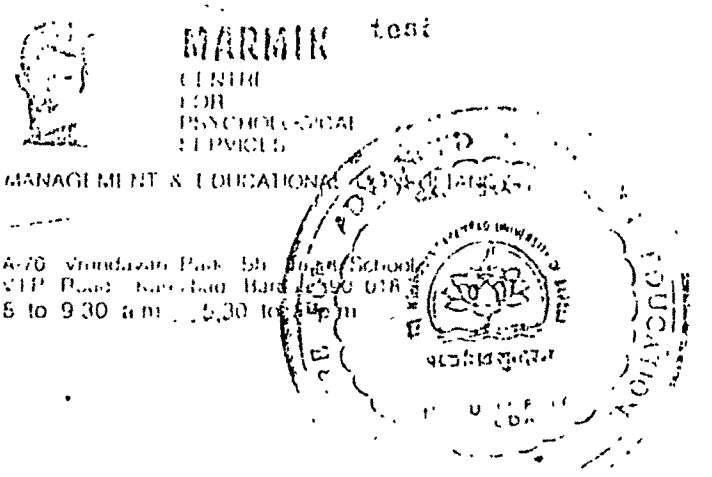
APPENDIX (IV)

RAVEN'S PROGRESSIVE MATRICES (MANUAL)



G U I D E

TO THE

// STANDARD PROGRESSIVE MATRICES //

SETS A, B, C, D and E

J.C. RAVEN
1960

The Standard Progressive Matrices, Sets A, B, C, D and E is a test of a person's capacity at the time of test to apprehend meaningless figures presented for his observation, see the relations between them, conceive the nature of the figure completing each system of relations presented, and, by so doing, develop a systematic method of reasoning.

The scale consists of 60 problems divided into five sets of 12. In each set the first problem is as nearly as possible self-evident. The problems which follow become progressively more difficult. The order of the tests provides the standard training in the method of working. The five sets provide five opportunities for grasping the method and five progressive assessments of a person's capacity for intellectual activity. To ensure sustained interest and freedom from fatigue, the figures in each problem are boldly presented, accurately drawn and, as far as possible, pleasing to look at. The scale is intended to cover the whole range of intellectual development from the time a child is able to grasp the idea of finding a missing piece to complete a pattern, and to be sufficiently long to assess a person's maximum capacity to form comparisons and reason by analogy without being unduly exhausting or unwieldy. The scores obtained by adults tend to cluster in the upper half of the scale, but there are enough difficult problems to differentiate satisfactorily between them.

Everyone, whatever his age, is given exactly the same series of problems in the same order and is asked to work at his own speed, without interruption, from the beginning to the end of the scale.) As the order of the problem provides the standard training in the method of working, the scale can be given either as an individual, a self-administered or as a group test. (A person's total score provides an index of his intellectual capacity, whatever his nationality or education. The contribution assessing the consistency of the estimate and the psychological significance of discrepancies in the test results.)

It is often useful to describe the scale as a test of observation and clear thinking. By itself it is not a test of " general intelligence" and it is always a mistake to describe it as such. Each problem in the scale is really the " mother " or " source " of a system of thought- hence the name " Progressive Matrices ". The scale has a re-test reliability varying, with age, from 0.83 to 0.93. It correlates 0.80 with the Terman-Merrill scale, and has been found to have a " g " saturation of 0.82.

Young children, mentally defective persons and very old people are not expected to solve more than the problems in Sets A and B of the scale and the easier problems of Sets C and D, where reasoning by analogy is not essential. After they can no longer solve the problems, they may still choose the correct answer for other reasons. For normal adults, Sets A and B provide little more than training in the method of working. If an adult is allowed only a limited time and does not complete the easy problems of Sets D and E before stopping, the total estimate is not necessarily valid. When the 1938 scale was constructed these limitations were known. In practice, as an untimed " capacity" test and even as a 20-minute", speed" or " efficiency " test, the results have been found to be more reliable and psychologically valid than one might expect from sixty problems arranged in five sets of overlapping difficulty. It must, however, be kept in mind that the scale is intended to span the whole of intellectual development, rather than to differentiate clearly

For comparative purposes the Standard Scale is now used internationally, and no general revision of it has yet appeared necessary. In 1947 a small correction was made to the original item D.8, to improve its absolute order of difficulty and effective problematic range. In the same year two derivatives of the standard scale were also prepared for further experimental work and comparative studies. In 1950 the problems constituting the 1938 series were rearranged to give a more uniform giobit distribution. The alternatives between which choice had to be made were also rearranged to give a more uniform distribution of common and uncommon errors of judgement. No other change has been made in the scale, and in no case has the original position of the correct solution to a problem been changed. At the same time the two 1947 derivatives of the standard scale were revised and rearranged, one for routine use with young children and for clinical work; the other as a test of intellectual efficiency suitable for use with adults of average or more than average intellectual capacity.

The Coloured Progressive Matrices, Sets A, Ab, B provides a valuable test for young children and old people, for anthropological studies and for clinical work. It can be used satisfactorily with people who for any reason, cannot understand or speak the English language, suffer from physical disabilities, are intellectually sub-normal or have deteriorated. Success in Set Ab depends upon the apprehension of discrete figures as spatially related " wholes " and with Sets A and B adequately cover all the cognitive pro-cesses of which children under 11 years of age are usually capable.

To make the test independent of verbal instruction, the problems are printed on coloured backgrounds and the scale arranged so that it can be presented in the form of illustrations printed in a book or as boards with movable pieces. When the latter form is used, a person has simply to be shown that each of the movable pieces fits the gap in the board but that only one completes the design. By placing a selected piece in position, a person sees the results of his judgements. This trains him in the method of working and teaches him to be careful. Solutions by trial and error can be clearly distinguished from solutions by direct perception and inference. By omitting the Former, the results obtained with Sets A, Ab, B can be compared with the results obtained with the Standard Scale.

Before the capcity to form comparisions and reason by analogy has matured, or in cases where it has become impaired, Sets A, Ab, B can be used to assess the degree to which a person's capacity for observation and clear thinking has developed or the level to which it has deteriorated. After the capacity to reason by analogy has developed, Progressive Matrices(1938) is the more suitable scale to use. If, on using Sets A, Ab, B these prove to be too easy, they can be immediately followed by Sets C, D and E of the Standard Scale. By omitting a person's score on Set Ab, his total score on Sets A, B, C, D and E can be used to assess his percentile grade from the published norms for this test.

INSTRUCTIONS FOR USING PROGRESSIVE MATRICES

Sets A, B, C, D and E

THE INDIVIDUAL TEST

Particulars of the person to be tested are filled in on the record form. The person giving the test opens the book at the first illustration, A.1, and says: " Look at this (pointing to the upper figure). It is a pattern with bit taken out. Each of these bits below(he points to each in turn) is the right shape to fit the space but they do not all complete the pattern." He explains why numbers 1, 2 and 3 are wrong and why number 6 is nearly right. He then says: " Point to the piece which is quite right." If the person does not point to the right peice he continues his explantion untill the nature of the problem to be solved is clearly grasped.

The person giving the test explains that on every page there is a pattern with part left out, and says. " All you have to do is to point each time to the bit which is the right one to complete the pattern." As he turn to illustration A. 2, he says: " They are simple at the beginning and get harder as you go on. If you pay attention to the way the easy ones go, you will find the later ones less difficult. Just point to the piece which completes the pttern. Now carry on at your own pace. See how many you can get right. You can have as much time as you like. There is no need to hurry. Be careful. Remember each time only one bit is quite right."

The person giving the test records the number of the piece pointed to in each test in the appropriate place on the record form. He sees that the pages are turned over one at a time. If necessary, he guides the person's attention to each problem is its standard order. Apart from this, he gives no assistance in the method of working, as the standard order in which the problems are presented provides the necessary training.

THE SELF-ADMINISTERED OR GROUP TEST

Materials:

A set of test books is required. These can be used repeatedly. Each person requires a record from and pencil. Illustrations of the record form and test A. 1, drawn twice the original size, can be used for demonstration purposes. Stencil keys facilitate rapid marking.

Accommodation.

The test can be given to a group of any size according to accommodation. Approximately one hour must be allowed for each group tested. Persons to be tested are seated comfortably at tables with room for books and record forms and sufficiently apart to prevent copying. Space is left so that supervisors can pass easily between people without disturbing them. They should all face the person in charge. When a person does the test by himself he should be seated comfortably at a table ina quite room.

Procedure:

Pencils and record forms are distributed. The people to be tested are asked to fill in particulars about themselves on the record form. When this has been done the test books are given out. They are asked not to open the books until everyone is ready.

The person in charge says: " Open your books to the first page. It is like this. " He opens a book or demonstration enlargement for the group to see. " at the top it says Set A and you have a column A here, on your scoring form. This is A. 1, You see what it is. The upper part is pattern with a bit missing. Each of these bits below(he points to each in turn) is the right shape to fit the space, but they do not all complete the pattern. Number 1 (he points to the bit and then to the pattern) is quite the wrong pattern, Numbers 2 and 3 are wrong; they fit the space, but they are not the right pattern. What about number 4? It is the right pattern(he illustrates that the pattern is the same as the pattern above) but it doesn ot go all over, But you finger on the one that is necessary qui te right." The person in charge notices if this is done correc If the right necessary he gives further explanation and then says" Yes, numb 4 is the right one. So the answer to A. 1 is 4- write 4 here, against numbe 1 in column A on your scoring form. Do not turn over yet."

The person in charge waits for everyone to finish and continues:" On every page in your book there is a pattern with a bit missing. You have t decide each time which of the bits below is the right one to complete the pattern above. When you have found the right bit you write the number of it down on your scoring form against the number of the pattern. They are simple at the beginning and get harder as you go on. There is no catch. If you pay attention to the way the easy ones go you will find the later ones less difficult. Try each in turn, from the beginning right to the end of the book. Work at your own pace. Do not miss any out, Do not turn back. See how many you can get right. You can have as much time as you like. Turn over and do the next one. "

When sufficient time has been allowed for everyone to write down the answer to A.2, the person in charge says." The right one of course is number 5. See that you have written the figure 5 against number 2 in column on your form. Go on like that by yourselves until you got to the end of the book. "

Supervision.

Mistakes occur in filling up the record form. Supervisors should see that each person has entered correctly on his form his own solutions to the first five problems. Once a person has grasped the nature of the initial problems, supervisors give no further assistance in the method of reasoning but see that each person records his own choices correctly.

People frequently omit a problem. Fifteen minutes after the commencement of the test, supervisors see that each person is still recording his choices against the correct numbers on his record form.

After about half an hour people are asked to indicate when they have finished. When they do, supervisors see the record form has been filled up correctly and that every problem has been attempted. As people finish they are asked to give in their books and go out, or to proceed to the next test if there is one.

For purposes of timing, the test is taken to begin when the person in charge says: " Turn over and do the next one (A.2)yourself." The time of ending the test is noted as scoring forms are handed in.

RIDDLES AND TASKS

When the series is given as an individual test, the person recording results enters on the form the number of each piece pointed to. If a person points to more than one piece, the piece he finally points to counts right or wrong. If a person given the group test enters more than one number against any item in the scale, he must be told to cross out all but the right one. If the mistake is not observed until after the test is over, the number on the extremest right one is considered, whether the other numbers are right or wrong.

The standard record form is arranged so that it can be quickly and accurately marked by superimposing a stencil marking key.

A person's score on the scale is the total number of problems he solves correctly when he is allowed to work quickly through the series from the beginning to the end.

By inward subtracting from a person's score on each of the five sets the score normally expected on each set for the same total score on the scale, the consistency of his work can be measured. The score to be expected is given in TABLE I or II. The difference between the score a person obtains on each set and that normally expected for his total score can be shown numerically as follows:-

E Discrepancies 0.-1, + 2, -2, + 1. "

If a person's score on one of the sets deviates by more than 2, his total score on the scale cannot be accepted at its face value as a consistent estimate of his general capacity for intellectual activity. For general purposes the total score appears to be relatively valid even when discrepancies of more than 2 points occur in the break-up.

In a certain proportion of cases a person selects a right figure by chance. When a person is allowed to complete the whole of the scale, the number of chance selections will be proportional to the number of problems in which he fails. People who obtain low scores have a proportionately greater number of successes by pure chance. To this extent low total scores are always less consistent and reliable than high scores.

The most satisfactory method of interpreting the significance of a persons total score is to consider it in terms of the frequency with which a similar score is found to occur amongst people of his own age. This method shows at once his intellectual capacity relative to other people of his own age and the frequency with which one should expect to find people of similar capacity. It has the advantage that no a priori assumption is made that in childhood the development of intellectual capacity is necessarily uniform, or that at maturity it is necessarily distributed symmetrically throughout the general population.

For practical purposes it is convenient to take certain fixed percentages of the population and to group people as their scores fall between them. In this way it is possible to classify a person according to the score he obtains as:-

GRADE I or" intellectually superior", if his score lies at or above the 95 th percentile for people of his age.

II "definitely above the average in intellectual capacity." if his score lies at or above the 75 th percentile.

II +, if his score lies at or above the 90th percentile.

III "intellectually average," if his score lies between the 25th and 75th percentiles;

III+, if his score is greater than the median or 50th percentile for his age;

III-, if his score is lower than the median.

IV "definitely below average in intellectual capacity", if his score lies at or below the 25th percentile;

IV-, if his score lies at or below the 10th percentile.

V " intellectually defective", if his score lies at or below the 5th percentile for his age-group.

The necessary percentile scores for the individual and group tests between the ages of 6 and 65 are shown in TABLES III, IV and V. The individual test appears to introduce emotional factors which are less operative when a person is allowed to work quietly at his own speed. The self-administered or group test appears to provide a more reliable sample of a person's output of intellectual activity during the test. People over 30 years of age can be grade I, II, III or IV, but there is at present insufficient data to distinguish between people who are Grade IV and those who are Grade IV. or Grade V.

The consistency of an estimate, the total score obtained, the time required and the grade reached are conveniently summarized as follows:-

Total score.....46 Discrepancies...0,+1,-2, +2, -1,

Grade.....III+ Time..... 38 minutes.

For reasons already given, the Standard Progressive Matrices Scale does not differentiate very closely between young children, or between adults of superior intellectual capacity. It cannot be given satisfactorily with a time-limit and takes up to 45 minutes to complete. These appear to be the chief criticisms of the scale. Neither shortening the test, making it longer, dividing it, making it continuous, nor re-arranging the problems overcomes them, without limiting the usefulness of the scale as whole. By using the appropriate derivative of the 1938 scale it is however possible to overcome each of these limitations separately.

K E Y

To 1956 Revised Order of Problems

	Set				
	A	B	C	D	E
1	4	2	8	3	7
2	5	6	2	4	6
3	1	1	3	3	8
4	2	2	8	7	2
5	6	1	7	8	1
6	3	3	4	6	5
7	6	5	5	5	1
8	2	6	1	4	6
9	1	4	7	1	3
10	3	3	6	2	2
11	4	4	1	5	4
12	5	5	2	6	5

HORAM SCOTIC COMPOSITON

TABLE I- THE INDIVIDUAL TEST.

		Total Score									
		10	15	20	25	30	35	40	45	50	55
Expected Score on Each Set.	A	6	8	9	10	10	10	10	12	12	12
	B	2	4	6	7	8	8	9	10	11	11
	C	1	2	3	4	6	7	8	10	10	11
	D	1	1	2	3	4	7	9	9	10	11
	E	0	0	0	1	2	3	4	5	7	10

TABLE II-THE SELF ADMINISTERED or GROUP TEST.

Total	A	B	C	D	E	Total	A	B	C	D	E	Total	A	B	C	D	E
15	8	4	2	1	0	30	10	7	6	5	2	45	12	10	9	9	5
16	8	4	3	1	0	31	10	7	7	5	2	46	12	10	10	9	5
17	8	5	3	1	0	32	10	8	7	5	2	47	12	10	10	9	5
18	8	5	3	2	0	33	11	8	7	5	2	48	12	11	10	9	6
19	8	6	3	2	0	34	11	8	7	6	2	49	12	11	10	10	6
20	8	6	3	2	1	35	11	8	7	7	2	50	12	11	10	10	7
21	8	6	4	2	1	36	11	8	8	7	2	51	12	11	11	10	7
22	9	6	4	2	1	37	11	9	8	7	2	52	12	11	11	10	8
23	9	7	4	2	1	38	11	9	8	8	2	53	12	11	11	11	8
24	9	7	4	3	1	39	11	9	8	8	3	54	12	12	11	11	8
25	10	7	4	3	1	40	11	10	8	8	3	55	12	12	11	11	9
26	10	7	5	3	1	41	11	10	9	8	3	56	12	12	12	11	9
27	10	7	5	4	1	42	11	10	9	9	3	57	12	12	12	11	10
28	10	7	6	4	1	43	12	10	9	9	3	58	12	12	12	12	10
29	10	7	6	5	1	44	12	10	9	9	4	59	12	12	12	12	11

N O R M S

TABLE III. INDIVIDUAL TEST

ing percentile points calculated from the natural scores fo 735 colchester children.

ntile o.	Chronological Age in Years.														
	6	6½	7	7½	8	8½	9	9½	10	10½	11	11½	12	12½	13
95	19	22	25	28	33	37	39	40	42	44	47	50	52	53	54
90	17	20	22	24	28	33	35	36	38	41	44	48	49	4	50
75	15	17	19	21	23	26	29	31	33	35	38	42	43	45	46
50	13	14	16	17	19	21	22	24	26	29	31	35	37	38	40
25	-	-	13	14	14	16	17	18	20	23	26	28	30	31	3
10	-	-	-	-	-	13	13	14	14	15	20	21	23	24	25
5	-	-	-	-	-	-	-	-	13	14	16	18	19	20	21

TABLE IV.-THE SELF ADMINISTERED or GROUP TEST (CHILDREN)

Working percentile points calculated from the natural scores of 1,407 children.

Percentile Points.	Chronological age in Years												
	8	8½	9	9½	10	10½	11	11½	12	12½	13	13½	14
95	38	39	41	43	45	48	50	51	51	52	52	53	53
90	34	36	38	41	43	45	47	49	49	50	50	51	52
75	24	29	32	34	37	39	41	43	46	48	47	48	48
50	18	21	24	28	30	33	35	37	39	41	43	44	44
25	-	14	16	18	20	23	26	29	32	34	35	37	38
10	-	-	-	13	13	15	16	18	22	25	27	28	28
5	-	-	-	-	-	13	14	15	16	17	19	21	23

TABLE V.-THE SELF ADMINISTERED or GROUP TEST (A D U L T S)

Working percentile points calculated from the natural scores of 3,665 Militiamen and 2,192 Civilians

percentile Points.	Chronological Age in Years.									
	20	25	30	35	40	45	50	55	60	65
95	55	55	54	53	52	50	48	46	44	42
90	54	54	53	51	49	47	45	43	41	39
75	49	49	47	45	43	41	39	37	35	33
50	44	44	42	40	38	35	33	30	27	24
25	37	37	34	30	27	24	21	18	15	13
10	28	28	25	-	-	-	-	-	-	-
5	23	23	19	-	-	-	-	-	-	-

T A B L E: VI.

Retest reliability and intercorrelation of the Progressive Matrices and the Mill Hill Vocabulary Scales, at different ages.

Age range (years)	Matrices Test Mean Score	Matrices Test Retest Reliability		Vocabulary Test Mean Score	Vocabulary Test Retest Reliability		Correlation between P.M. & M.H.V. score	
13 ± 1	41	0.88		38	0.87		0.57	
Under 30	48	0.93		41	0.97		0.60	
30-39	37	0.88	P.E. 0.02	33	0.91	P.E. 0.02	0.51	P.E. 0.06
40.49	35	0.87		31	0.98		0.45	
50 and over	29	0.83		31	0.90		0.44	

T A B L E - VII.

Relationship between Percentile Grade and Terman Merrill Intelligence Quotient for a clinic group of 301 children given each test indidually.

Progressive Matrices(1938 Percentile Group	Grade	Terman Merrill I.Q. Under 73	Under 89	89 to 111	Over 111	Over 127	Total
95 and over	I	-	-	6	6		29
75 and over	II	-	3	20	19	14	56
over 25 and under 75	III	2	20	85	15	10	
25and under...	IV	9	23	16	-	-	48
5and under ...	V	26	9	1	-	-	36
TOTAL		37	55	128	40	41	301