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What is the possibility of pre-determining success or failure in the first two years in high school science through Terman Group Intelligence Tests.

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WHAT IS THE POSSIBILITY OF PRE-DETERMINING SUCCESS OR FAILURE IN THE FIRST TWO YEARS IN HIGH SCHOOL SCIENCE THROUGH TERMAN GROUP INTELLIGENCE TESTS

QUIRK - 1940

PROBLEM: WHAT IS THE POSSIBILITY OF PRE-DETERMINING SUCCESS OR FAILURE IN THE FIRST TWO YEARS IN HIGH SCHOOL SCIENCE THROUGH TERMAN GROUP INTELLIGENCE TESTS.

BY

JOHN M. QUIRK

IN SATISFACTION OF THE PROBLEM REQUIREMENT FOR THE DEGREE OF MASTER OF SCIENCE AT MASSACHUSETTS STATE COLLEGE.

CONTENTS

CHAPTER I

INTRODUCTION

The purpose of this problem is to find the possibility of predetermining success or failure in the first two years of high school science through Terman Group Intelligence Tests.

Many people have little faith in aptitude tests and probably with much justification feel that it is utterly impossible to measure with any degree of accuracy such fundamental aptitudes as good study habits, interest, etc., and they are even doubtful that any test can be devised which will accurately measure the capabilities of the human mind.

If individual aptitude tests or the grouping by means of aptitude tests are of real value then towns and cities could be saved a good deal of money. The Oakland plan of grouping the bright, the average, and the slow for separate instruction according to their needs, offers, perhaps, the most practical solution of the problem of grouping pupils. "At present, ten per cent of the cost of tuition in most schools (public) is for repeated instruction." (Manual of Terman Tests). This involves systematic training of children in the habits of failure. Each pupil ought to be allowed to progress continuously and at a speed which is normal for him.

The three-track system, or some other method of adjusting the work to the capacity of the pupil, is inevitable. A given pupil, who is doing only fair school work, may be shown by the test either to have only fair ability or to be a superior student. Another who is failing may have anything from very inferior to very superior intelligence. In no case is appropriate action necessary without knowledge of the facts. Beside the tests, careful study of the health,

interests, habits, and social status should be taken into consideration." Terman Group Test of Mental Ability.

The relationship between mental ability tests and aptitude for science in grades 9 and 10, in particular, has not so far as the writer has been able to find out, been established, in such way as to merit recognition as a worth-while idea. Attempts at the correlation of marks in general, with the Terman Tests, seem to have met with some degree of success. (See median table page 13)

The writer of this problem desires to find out how the marks of his students in General Science and Biology in the Agawam High School correlate with the I. Q. of the same students determined through the use of the Terman Group Mental Tests.

CHAPTER II

STATEMENT OF PROCEEDURE

The problem then, is an attempt to forecast success or failure in the first two years of high-school science by means of Terman Group Mental Tests.

On April, 1940, the pupils in General Science and Biology were given the Terman Group Tests with the following objectives in mind:

I. To find median of test marks of pupils in Biology in grades 9, 10, 11, and 12, and compare with medians of 40,000 pupils in all subjects.

II. To correlate Teachers' marks of whole group with I. Q. of Terman Tests.

III. To find the coefficient of correlation of Teachers' marks of each different period whether General Science or Biology and I. Q. of Terman Group Tests.

IV. To find the coefficient of correlation of the College, Agricultural, General, and Commercial groups in Science and Biology between the Teachers' marks and I. Q.

V. Coefficient of correlation between Freshmen, Sophomores, Juniors, and Seniors--the groups--and Teachers' Marks.

VI. To attempt to see if scientific skill can be forecast from all or smaller group of Terman Tests.

It should be noted here that pupils receiving a mark between 70-75 are to be considered failures or probably classified by the Regents of State of New York as the "Time Spent Group".

In New York it was discovered that only two pupils out of every five were able to pass the Regents examination and graduate from high school. The others have been classified as "The Time

Spent Group", and an attempt to do something for them is already under way.

The Intelligence Quotient was secured by dividing the mental age secured from a table provided in Terman Group Manual, by the chronological age. The coefficient of correlation was computed by the Pearson Rank Method (Experiments in Education Psychology, by Starch) where the formula is:

$$r = 1 \quad \frac{6 \text{ Sum } d^2}{n\,(n^2 - I)}$$

In this formula, 'r' stands for coefficient of correlation, 'd', for numerical difference in rank between corresponding measurements, and 'n' stands for the number of cases considered.

Teachers' marks are perhaps unreliable as a source of comparison, yet they are about the only available information that it is possible to use.

Mr. Williams, former principal of the Agawam High School, tested the reliability of teachers and marks in comparison with an average distribution and he found that the writer's marks were very near the general curve. There was a slight tendency to give too much 'C' marks and not enough 'U's'.

CHAPTER III

TABULATION OF MARKS

IN TERMAN TESTS

TERMAN GROUP TEST OF MENTAL ABILITY FOR GENERAL SCIENCE

Record Sheet for Period 1--Grades 9 to 12

Agawam High School — Agawam, Massachusetts

Name	Age		Score in each of the 10 tests										Total Score
	Yrs.	Mos.	1	2	3	4	5	6	7	8	9	10	
Pupil 1	18	3	19	22	26	20	18	14	20	13	16	22	190
Pupil 2	17	4	18	20	18	16	14	18	18	14	15	20	171
Pupil 3	17	5	20	22	22	12	18	10	19	10	17	20	170
Pupil 4	14	10	20	22	25	17	12	10	18	14	13	18	169
Pupil 5	15	9	15	16	9	14	12	16	18	16	14	20	164
Pupil 6	17	5	16	18	24	15	12	10	18	10	14	20	157
Pupil 7	16	12	15	22	18	17	14	8	16	4	13	20	148
Pupil 8	15	12	15	22	20	11	8	13	15	6	15	16	145
Pupil 9	18	1	19	20	8	16	12	16	14	8	15	14	141
Pupil 10	16	3	15	22	18	15	4	12	17	4	15	18	140
Pupil 11	17	7	14	14	16	14	16	4	18	2	16	20	134
Pupil 12	17	11	14	20	12	14	10	10	15	6	14	16	131
Pupil 13	18	4	18	22	8	14	8	12	9	8	14	12	125
Pupil 14	16	7	16	18	20	12	12	0	15	2	15	16	124
Pupil 15	14	1	8	10	12	10	13	11	13	12	16	16	121
Pupil 16	18	1	20	20	10	11	14	6	10	6	14	10	121
Pupil 17	17	1	14	11	8	8	8	8	15	6	14	18	121
Pupil 18	16	3	12	22	0	10	16	12	9	12	11	10	114
Pupil 19	15	6	14	20	10	14	12	0	14	0	14	14	112
Pupil 20	15	1	12	18	0	9	6	7	17	4	13	22	111
Pupil 21	15	9	17	2	22	16	8	4	15	8	14	10	108
Pupil 22	16	7	10	16	12	11	6	8	11	14	9	4	101
Pupil 23	15	10	15	14	0	13	4	0	13	10	14	14	97
Pupil 24	16	10	5	16	0	4	8	16	9	6	13	12	89
Pupil 25	14	10	13	16	0	10	4	8	13	8	14	6	88
Pupil 26	15	1	5	6	0	4	10	4	17	0	15	22	83
Pupil 27	16	1	14	16	12	9	2	0	10	0	11	8	82
Pupil 28	17	7	13	20	0	8	4	8	7	0	14	4	78

TERMAN GROUP TEST OF MENTAL ABILITY FOR BIOLOGY

Record Sheet for Period 2--Grades 9 to 12

Agawam High School — Agawam, Massachusetts

Name	Age		Score in each of the 10 tests										Total Score
	Yrs.	Mos.	1	2	3	4	5	6	7	8	9	10	
Pupil 1	16	12	19	22	42	18	14	14	19	18	15	18	199
Pupil 2	15	10	19	22	30	14	8	18	17	16	16	12	173
Pupil 3	17	0	18	18	10	12	20	19	17	14	16	18	162
Pupil 4	18	4	14	20	16	11	8	20	15	12	15	8	131
Pupil 5	16	1	14	18	16	10	6	20	15	8	12	10	129
Pupil 6	18	1	15	18	18	9	4	10	14	8	16	16	128
Pupil 7	14	10	11	10	20	15	2	4	15	11	13	22	123
Pupil 8	16	8	14	20	8	14	10	10	14	0	15	16	121
Pupil 9	16	9	9	18	8	15	10	14	10	8	13	6	101
Pupil 10	16	8	9	14	8	13	12	4	11	10	14	12	97
Pupil 11	16	10	18	16	2	9	4	2	16	6	11	6	90
Pupil 12	15	3	10	12	2	11	8	0	10	2	10	16	81

TERMAN GROUP TEST OF MENTAL ABILITY FOR BIOLOGY

Record Sheet for Period 3--Grades 9 to 12

Agawam High School — Agawam, Massachusetts

Name	Age		Score in each of the 10 tests										Total Score
	Yrs.	Mos.	1	2	3	4	5	6	7	8	9	10	
Pupil 1	14	9	15	22	16	15	20	18	19	12	15	22	178
Pupil 2	15	7	20	18	28	17	10	18	16	6	16	20	171
Pupil 3	15	4	18	22	20	16	8	16	19	8	15	18	160
Pupil 4	14	3	19	20	14	12	12	8	15	14	16	16	146
Pupil 5	14	12	17	20	12	14	10	16	17	10	16	14	146
Pupil 6	14	8	17	22	10	10	12	18	15	13	16	12	145
Pupil 7	14	8	17	22	16	13	16	2	19	6	18	14	143
Pupil 8	14	7	17	22	12	11	2	16	17	4	15	24	140
Pupil 9	14	1	18	20	14	16	10	10	15	6	15	10	134
Pupil 10	16	8	15	16	20	11	8	10	12	2	17	12	133
Pupil 11	17	9	9	18	20	10	4	12	17	10	11	22	133
Pupil 12	17	1	10	14	12	9	8	0	13	0	7	18	131
Pupil 13	14	8	16	22	6	11	10	10	18	4	14	18	129
Pupil 14	14	9	16	18	4	12	14	12	13	7	13	14	126
Pupil 15	14	9	19	20	8	14	12	2	13	0	16	20	124
Pupil 16	16	5	17	16	16	17	10	8	14	12	13	0	123
Pupil 17	15	4	12	12	16	14	6	14	12	10	13	14	123
Pupil 18	14	2	15	19	14	6	10	12	14	2	15	18	122
Pupil 19	15	10	16	22	14	12	12	8	16	6	14	8	120
Pupil 20	16	7	16	20	10	12	8	12	4	14	4	6	116
Pupil 21	14	8	12	16	13	13	10	10	10	0	14	14	112
Pupil 22	16	3	17	22	10	7	12	0	17	0	14	12	111
Pupil 23	14	11	8	14	2	10	10	14	15	0	15	20	108
Pupil 24	14	3	16	18	2	14	6	8	10	8	12	12	106
Pupil 25	15	8	11	14	0	7	14	6	14	0	11	20	97
Pupil 26	17	1	38	16	0	11	16	0	11	0	16	18	96
Pupil 27	17	10	8	18	10	13	2	2	6	6	15	10	90
Pupil 28	14	5	7	18	4	6	0	12	13	2	13	8	81
Pupil 29	16	2	8	18	0	11	10	6	8	0	14	2	77
Pupil 30	15	5	12	14	6	6	2	8	9	0	11	6	74
Pupil 31	15	8	12	12	0	6	8	0	6	0	12	4	66
Pupil 32	15	10	6	6	6	0	8	0	12	0	13	14	65
Pupil 33	14	7	6	10	0	7	4	4	5	9	9	10	64

TERMAN GROUP TEST OF MENTAL ABILITY FOR GENERAL SCIENCE

Record Sheet for Period 4--Grades 9 to 12

Agawam High School — Agawam, Massachusetts

Name	Age		Score in each of the 10 tests										Total Score
	Yrs.	Mos.	1	2	3	4	5	6	7	8	9	10	
Pupil 1	15	6	18	22	13	18	16	14	15	3	15	22	156
Pupil 2	14	5	18	22	13	18	8	16	16	12	15	18	155
Pupil 3	15	1	14	20	16	10	14	16	16	6	16	14	142
Pupil 4	17	11	19	22	16	12	6	8	16	12	16	12	139
Pupil 5	17	10	19	14	22	13	10	10	11	14	10	15	138
Pupil 6	15	2	16	16	16	16	6	10	13	12	14	18	137
Pupil 7	17	9	16	20	14	20	6	7	14	10	13	16	136
Pupil 8	17	8	13	20	11	15	16	9	14	3	15	20	136
Pupil 9	15	3	19	18	14	15	14	1	15	7	14	12	129
Pupil 10	16	5	15	20	2	13	14	4	19	10	15	16	128
Pupil 11	?	?	17	18	8	12	8	12	17	4	15	10	126
Pupil 12	17	5	14	18	13	16	8	8	7	10	14	16	124
Pupil 13	17	12	18	18	10	9	6	17	13	8	18	12	123
Pupil 14	18	8	16	16	14	14	2	13	18	5	13	12	123
Pupil 15	15	5	15	12	20	5	8	0	16	10	13	18	121
Pupil 16	16	8	16	14	12	12	8	12	16	4	16	10	120
Pupil 17	16	12	15	18	14	17	10	4	17	10	12	0	117
Pupil 18	17	4	15	20	12	14	10	12	15	4	13	12	117
Pupil 19	14	5	19	22	2	12	10	0	15	6	14	12	110
Pupil 20	17	7	16	18	6	9	12	11	12	2	13	10	108
Pupil 21	14	2	15	16	10	11	0	2	16	6	13	20	108
Pupil 22	15	3	15	16	9	9	6	10	12	8	12	8	105
Pupil 23	15	6	13	16	2	9	12	12	11	2	12	16	105
Pupil 24	16	5	19	22	6	10	10	0	11	0	13	14	105
Pupil 25	15	?	15	20	4	8	4	10	15	10	0	10	101
Pupil 26	17	6	14	20	10	4	14	11	15	8	13	2	101
Pupil 27	15	7	15	22	6	13	6	3	14	2	12	10	100
Pupil 28	15	6	12	14	6	9	6	6	11	4	14	14	96
Pupil 29	15	8	17	20	2	9	10	9	9	1	12	4	96
Pupil 30	14	10	17	20	6	15	12	0	11	2	12	0	95
Pupil 31	14	12	11	18	12	9	8	2	13	0	10	12	95
Pupil 32	16	1	17	20	0	10	6	8	6	0	14	12	93
Pupil 33	14	1	8	14	11	8	2	7	11	6	14	10	91
Pupil 34	16	5	10	16	4	11	3	6	7	5	14	12	88
Pupil 35	19	9	11	14	8	10	6	8	10	5	14	0	86
Pupil 36	17	8	16	14	16	4	4	0	9	9	0	12	85
Pupil 37	14	10	12	14	4	4	8	4	10	14	12	2	84
Pupil 38	14	7	11	18	0	9	6	6	8	8	13	0	79
Pupil 39	15	8	14	20	0	7	4	8	8	2	12	2	77
Pupil 40	15	6	10	10	0	7	6	8	11	2	15	8	76
Pupil 41	16	11	11	12	0	5	6	12	10	0	29	12	75
Pupil 42	17	1	11	18	0	5	4	14	9	0	14	0	75
Pupil 43	15	8	5	16	8	11	2	4	13	0	4	8	61
Pupil 44	16	9	4	12	0	7	6	0	5	0	9	8	51

TERMAN GROUP TEST OF MENTAL ABILITY FOR BIOLOGY

Record Sheet for Period 5--Grades 9 to 12

Agawam High School — Agawam, Massachusetts

Name	Age		Score in each of the 10 tests										Total Score
	Yrs.	Mos.	1	2	3	4	5	6	7	8	9	10	
Pupil 1	17	2	20	22	28	19	8	18	7	20	17	22	192
Pupil 2	18	2	17	20	28	18	10	18	16	20	17	24	188
Pupil 3	19	10	19	22	24	18	10	18	12	20	12	24	185
Pupil 4	14	11	12	18	12	15	18	20	14	19	16	18	162
Pupil 5	14	0	18	22	14	13	12	11	12	16	13	20	151
Pupil 6	15	4	16	22	18	16	14	14	14	18	15	14	151
Pupil 7	15	2	12	22	10	13	6	16	14	17	16	18	145
Pupil 8	16	7	19	20	16	11	10	8	8	16	12	14	136
Pupil 9	14	5	16	20	12	12	6	9	9	15	15	20	134
Pupil 10	15	6	18	18	16	10	6	12	2	16	14	20	132
Pupil 11	15	1	18	16	8	12	6	14	10	11	17	16	126
Pupil 12	17	4	18	22	10	14	4	2	6	10	13	12	115
Pupil 13	14	3	16	22	14	11	6	4	16	15	17	12	113
Pupil 14	17	5	16	18	10	11	10	12	36	12	14	8	107
Pupil 15	16	5	14	16	7	10	10	0	3	11	13	16	100
Pupil 16	15	8	6	12	0	5	8	11	15	8	8	22	95
Pupil 17	14	6	17	18	2	12	0	11	4	7	11	14	92
Pupil 18	15	8	16	8	0	9	0	6	10	12	12	6	89
Pupil 19	16	8	6	12	19		8	11	6	8	11	4	78

TERMAN GROUP TEST OF MENTAL ABILITY FOR BIOLOGY

Record Sheet for Period 6--Grades 9 to 12

Agawam High School — Agawam, Massachusetts

Name	Age		Score in each of 10 tests										Total Score
	Yrs.	Mos.	1	2	3	4	5	6	7	8	9	10	
Pupil 1	16	1	19	22	28	18	14	18	20	18	18	10	191
Pupil 2	16	3	18	22	30	16	20	12	19	14	14	22	187
Pupil 3	14	4	17	20	24	17	18	14	18	10	15	18	172
Pupil 4	14	11	20	22	28	20	10	6	13	10	15	18	162
Pupil 5	15	11	18	20	18	17	12	14	18	10	17	18	162
Pupil 6	14	1	14	22	12	14	14	10	13	8	16	20	142
Pupil 7	18	2	18	20	26	16	8	2	12	12	17	8	139
Pupil 8	14	9	16	22	18	12	6	6	16	10	15	14	135
Pupil 9	14	1	15	18	14	16	8	12	18	2	15	16	134
Pupil 10	14	11	13	18	8	12	10	4	17	4	14	14	133
Pupil 11	14	3	15	18	8	13	16	4	16	10	15	18	133
Pupil 12	14	7	19	18	14	12	8	14	15	4	14	14	132
Pupil 13	14	3	15	20	6	14	6	10	16	8	14	18	129
Pupil 14	16	5	13	20	12	13	12	8	18	0	13	12	122
Pupil 15	14	2	17	22	6	13	14	8	15	0	14	12	121
Pupil 16	15	9	17	22	4	11	6	12	14	10	14	6	117
Pupil 17	14	6	14	20	4	12	12	0	16	4	16	16	114
Pupil 18	14	11	14	18	14	8	4	6	16	14	2	14	114
Pupil 19	14	9	10	12	6	12	4	12	20	4	14	12	106
Pupil 20	14	1	12	16	0	12	10	6	16	8	15	10	105
Pupil 21	15	?	16	20	4	8	4	10	11	4	13	12	102
Pupil 22	14	3	6	16	14	12	14	0	12	0	14	11	99
Pupil 23	14	10	11	10	2	11	8	8	12	6	15	8	97
Pupil 24	14	3	14	20	6	13	8	0	12	4	15	2	94
Pupil 25	16	3	15	16	6	0	6	8	10	2	16	10	89
Pupil 26	15	6	13	18	0	11	14	6	10	2	11	4	89
Pupil 27	14	8	7	12	8	8	6	10	13	2	16	6	88
Pupil 28	14	12	13	16	6	11	4	0	15	10	13	0	88
Pupil 29	16	2	15	14	9	13	10	6	9	2	14	20	87
Pupil 30	16	9	13	20	2	9	4	8	7	12	10	2	87
Pupil 31	15	4	8	14	4	7	10	4	6	4	13	10	70

CHAPTER IV

TO FIND THE MEDIAN FOR FRESHMEN, SOPHOMORES, JUNIORS, AND SENIORS IN GENERAL SCIENCE AND BIOLOGY AND COMPARE WITH 40,000 PUPILS IN ALL SUBJECTS

GRADE NORMS (1)

as for each grade the scores which were equaled or
r cent, 2½ per cent, etc., of pupils of each grade.
-percentile score of each grade is the norm for that
rms were revised in October, 1922, and are based on
es. About two thirds of these were from California
r were chiefly from the Middle West. Norms for the
le would probably be slightly lower, and doubtless
he states which have relatively poor schools or a
of relatively inferior population groups. The
Indian, and Mexican children will usually be found
of white children of the same grade or age. Con-
ences are found also between schools in good and
the same city. City schools usually make a better
al or village schools, and in this connection it
that our norms are chiefly from city schools.

Table 1. Percentile Scores By Grade

Grade.....	7	8	9	10	11	12
t equal or exceed...	147	170	181	194	203	207
" " "	134	159	172	185	196	200
" " "	122	148	164	177	189	194
" " "	109	135	151	166	180	185
" " "	100	126	142	159	174	179
" " "	93	118	135	152	168	174
" " "	**88**	**112**	**128**	**147**	**163**	**169**
" " "	83	107	123	141	158	165
" " "	75	97	113	131	147	156
" " "	**68**	**89**	**104**	**122**	**138**	**147**
" " "	61	81	95	113	128	138
" " "	54	73	86	103	118	128
" " "	**51**	**69**	**81**	**98**	**112**	**122**
" " "	47	64	76	92	105	115
" " "	43	58	71	86	99	109
" " "	38	52	63	79	90	100
" " "	31	43	53	67	77	86
" " "	25	36	44	58	66	74
" " "	20	30	35	48	55	63
es for each grade...	5582	9087	10887	6730	4206	4886

er of cases, 41,241. The norms apply to February.

ewis M. Terman Group Test of Mental Ability, World
any, Yonkers-on-Hudson, 1920.

TABLE II

To find the Median for the Freshmen of Agawam and compare it with that of 10,881 pupils in Grade 9.

Terman Test Mark	No. of Cases
190	
180	
170	3
160	4
150	2
140	6
130	7
120	15
110	11
100	10
90	16
80	13
70	9
60	4
50	1
	101

107.5 is the median for the Freshmen of Agawam in General Science and Biology.

Median for 10,881 pupils is 104

TABLE III

To find the Median for the Sophomores of Agawam and compare it with that of 6,730 pupils in Grade IO.

Terman Test Mark	No. of Cases
180	
170	2
160	2
150	2
140	2
130	5
120	8
110	3
100	3
90	2
80	2
70	1
	32

127.5 is the Median for the Sophomores of Agawam in General Science and Biology.

Median for 6,730 pupils is 122

TABLE IV

To find the Median for the Juniors of Agawam and compare it with that of 4,206 pupils in Grade II.

Terman Test Mark	No. of Cases
200	
190	
180	
170	
160	1
150	1
140	2
130	3
120	2
110	2
100	2
90	1
80	1
	15

125 is the Median for the Juniors of Agawam in General Science and Biology.

Median for 4,206 is 138

Norm for 40,000 Grade II		Agawam
1 %	203	None
2½%	196	None
5 %	189	None
10 %	180	None
15 %	174	None
20 %	168	None
25 %	163	None
40 %	147	20%
50 %	138	33%
70 %	118	60%
80 %	105	80%
95 %	77	100%

TABLE V

To find the Median for the Seniors of Agawam and compare it with that of 4,886 pupils in Grade 12.

Terman Test Mark	No. of Cases
200	
190	3
180	3
170	2
160	
150	
140	1
130	4
120	4
110	
100	2
	19

138.75 is the median for the Seniors of Agawam in General Science and Biology.

Median for 4,886 pupils is 147

Norm for 40,000 Grade 12 — Agawam

1 %	207	None
2½%	200	None
5 %	194	None
10 %	185	31%
15 %	170	42%
50 %	147	42%
70 %	128	73%
90 %	101	100%

CHAPTER V

TO FIND COEFFICIENT OF CORRELATION OF WHOLE GROUP AND TEACHERS' MARKS

TABLE VI

Correlation of Whole Group
Page 2

Pupil	I. Q.	Average	I.Q. Rank	Ave. Rank	Difference	Sq.of Diff.
A	112	87	28½	33½	5	25
B	112	78	28½	118½	90	8100
C	112	92	28½	3½	25	625
D	111	79	32½	103½	71	5041
E	111	85	32½	41½	9	81
F	111	79	32½	103½	71	5041
G	111	83	32½	61½	29	841
H	110	85	37½	41½	4	16
I	110	78	37½	118	80½	6480¼
J	110	70	37½	161	123½	15252
K	110	85	37½	41½	4	16
L	110	88	37½	25½	12	144
M	110	84	37½	51½	14	196
N	109	78	42	118	76	5776
O	109	70	42	161	119	14161
P	109	90	42	13	29	741
Q	108	82	44½	75½	31	961
R	108	85	44½	41½	3	9
S	107	79	46	103½	57½	3306¼
T	106	89	49	18	31	961
U	106	84	49	51½	2½	6¼
V	106	90	49	13	36	1296
W	106	88	49	25½	23½	552¼
X	106	78	49	118	69	4761
Y	105	80	53	97	44	1936
						86307.3/4

Computation of coefficient of correlation between I. Q. and Mark obtained in General Science and Biology of Whole Group.

Pupil	I. Q.	Average	I. Q. Rank	Ave. Rank	Difference	Sq. of Diff.
A	105	82	53	75½	22½	506¼
B	105	88	53	25½	27½	650¼
C	104	84	59	57½	1½	2¼
D	104	85	59	41½	17½	306¼
E	104	81	59	89	30	900
F	104	78	89	118	59	3481
G	104	79	59	103½	44½	1980¼
H	104	90	59	13	46	2116
I	104	87	59	33½	25½	650¼
J	104	72	59	144½	85½	7310¼
K	104	83	59	61½	2½	6¼
L	103	84	66	51½	14½	210¼
M	103	88	66	25½	40½	1640¼
N	103	88	66	25½	40½	1640¼
O	103	82	66	75½	9½	90¼
P	103	88	66	25½	62½	3906¼
Q	102	80	71½	97	25½	650¼
R	102	79	71½	103½	32	1024
S	102	85	71½	41½	30	900
T	102	77	71½	133½	62	3844
U	102	82	71½	75½	4	16
V	102	78	71½	118	46	2116
W	101	88	76½	25½	51	2601
X	101	85	76½	41½	35	1225
						37,772½

Computation of coefficient of correlation between I. Q. and Mark obtained in General Science and Biology of Whole Group.

Pupil	I. Q.	Average	I. Q. Rank	Ave. Rank	Difference	Sq. of Diff.
A	101	78	76½	118	41½	1722¼
B	101	78	76½	118	41½	1722¼
C	100	48	81	161	80	6400
D	100	82	81	75½	5½	30¼
E	100	78	81	118	37	2369
F	100	82	81	89	8	64
G	100	78	81	118	37	1369
H	99	90	85	13	72	5184
I	99	70	85	161	76	5776
J	99	82	85	75½	9½	90¼
K	99	77	92½	133½	41	1681
L	99	70	92½	161	68½	4692¼
M	99	72	92½	146½	54	2916
N	99	82	92½	75½	17	289
O	99	87	92½	33½	59	3481
P	99	78	92½	118	25½	650¼
Q	99	82	92½	75½	17	289
R	99	78	92½	118	25½	650¼
S	99	83	92½	61½	31	96
T	99	83	92½	61½	31	961
U	99	78	92½	118	25½	650¼
V	99	82	92½	75½	17	280
W	97	85	103	41½	61½	3782¼
X	97	78	103	118	15	225
Y	97	91	103	7½	95½	9120¼

Cont.

Computation of coefficient of correlation between I. Q. and Mark obtained in General Science and Biology of Whole Group.

Pupil	I. Q.	Average	I. Q. Rank	Ave. Rank	Difference	Sq. of Diff.
Z	97	77	103	133½	30½	930¼
						54,429¾

Computation of coefficient of correlation between I. Q. and Mark obtained in General Science and Biology of Whole Group.

Pupil	I. Q.	Average	I. Q. Rank	Ave. Rank	Difference	Sq. of Diff.
A	97	90	103	13	90	8102½
B	97	82	103	75½	27½	743¾
C	97	83	103	61½	41½	1722¼
D	97	88	103	25½	77½	5256¼
E	97	78	103	118	15	225
F	96	81	109½	89	20½	420¼
G	96	72	109½	146½	35	1225
H	96	80	109½	97	12½	156¼
I	96	88	109½	25½	84	7056
J	95	82	113½	75½	38	1444
K	95	82	113½	75½	38	1444
L	95	83	113½	61½	52	2704
M	95	70	113½	161	47½	2256¼
N	94	79	118½	103½	15	225
O	94	72	118½	146½	28	784
P	94	82	118½	75½	43	1849
Q	94	82	118½	75½	43	1849
R	94	82	118½	75½	43	1849
S	94	72	118½	144½	26	676
T	93	70	123½	161	37½	1406¼
						42,391¼

Computation of coefficient of correlation between I. Q. and Mark obtained in General Science and Biology of Whole Group.

Pupil	I. Q.	Average	I. Q. Rank	Ave. Rank	Difference	Sq. of Diff.
A	93	80	123½	97	25½	650¼
B	93	77	123½	133½	9½	90¼
C	93	80	123½	97	25½	650¼
D	92	81	128	89	39	1531
E	92	75	128	139½	10½	11¼
F	92	77	128	133½	4½	20¼
G	92	72	128	144½	15½	240¼
H	92	70	128	161	33	1089
I	91	83	133½	61½	72	5184
J	91	84	133½	51½	82	6724
K	91	70	133½	161	27½	756¼
L	91	85	133½	41½	92	8464
M	91	82	133½	75½	58	3344
N	91	73	133½	139½	6	36
O	90	75	137	139½	1½	2¼
P	89	77	138	133½	4½	20¼
Q	88	78	140½	118	31½	1332¼
R	88	78	140½	118	31½	1332¼
S	88	78	140½	118	31½	1332¼
T	88	81	140½	89	50½	2550¼
U	87	73	145½	139½	6	36
V	87	72	145½	146½	1	1
W	87	78	145½	118	26½	677¼
						36,074½

Commutation of coefficient of correlation between I. Q. and Mark obtained in General Science and Biology of Whole Group

Pupil	I. Q.	Average	I. Q. Rank	Ave. Rank	Difference	Sq. of Diff.
A	87	78	145½	118	27½	756¼
B	87	81	145½	89	56½	3192¼
C	87	72	145½	146½	1	1
D	86	86	149½	36	113½	12882¼
E	86	70	149½	161	11½	132¼
F	85	71	152½	152	½	¼
G	85	77	152½	133½	19	361
H	85	70	152½	161	8½	72¼
I	85	81	152½	89	63½	4107¼
J	84	82	155½	75½	80	6400
K	84	70	155½	161	5½	30¼
L	83	81	159	89	70	4900
M	83	72	159	146½	12½	156¼
N	83	78	159	118	41	1681
O	83	81	159	89	70	4900
P	83	80	159	97	62	3844
Q	82	80	162	97	65	4225
R	79	70	163	161	2	4
S	73	77	164	133½	30	900
T	72	73	165	141	24	576
U	49	70	166	161	5	25
						49,146½
						13,630¾

$$1-6\ \frac{\text{Sum } d^2}{n\ (n^2\ 1)}$$

$$1-\frac{2019784}{4557396}$$

1-.44 or .56

CHAPTER VI

TO FIND COEFFICIENT OF CORRELATION OF EACH DIFFERENT PERIOD WHETHER GENERAL SCIENCE OR BIOLOGY

TABLE VII

Computation of coefficient of correlation between I. Q. and Mark in General Science, period I

Pupil	I. Q.	Average	I. Q. Rank	Ave. Rank	Difference	Sq. of Diff.
A	123	92	1	1	0	0
B	122	85	2	9	7	49
C	117	88	3	5	2	4
D	113	83	4	13½	9½	90¼
E	112	78	5	21½	16½	272¼
F	109	70	6	27	21	441
G	107	90	7	2½	4½	20¼
H	106	88	8	5	3	9
I	104	84	9½	11½	2	4
J	104	85	9½	9	½	¼
K	102	85	11	9	2	4
L	100	78	13½	21½	8	64
M	100	82	13½	17	3½	12¼
N	100	78	13½	21½	8	64
O	100	82	13½	17	3½	12¼
P	98	82	17	17	0	0
Q	98	72	17	25	8	64
R	98	83	17	13½	3½	12¼
S	97	90	19	2	17	289
T	96	88	20½	5	15½	240¼
U	96	72	20½	25	4½	20¼
V	91	84	22½	11½	11	121
W	91	82	22½	17	5½	30¼
X	89	86	24	7	17	289
Y	88	78	25	21½	3½	12¼
Z	87	72	26	25	1	1
A'	84	82	27	17	10	100
						2227 3/4

$$1-\frac{6 \text{ Sum } d^2}{N\ (N-1)}$$

$$1-\frac{6 \times 2227\ 3/4}{27\ (729-1)}$$

$$1-\frac{13366\frac{1}{2}}{27\ (729-1)}$$

$$1-\frac{13366\frac{1}{2}}{19656}$$

$$\frac{6333\frac{1}{2}}{19656} \quad \text{or} \quad .32$$

TABLE VIII

Computation of coefficient of correlation between I. Q. and Mark obtained in Biology, Period 2.

Pupil	I. Q.	Average	I. Q. Rank	Ave. Rank	Difference	Sq. of Diff.
A	112	92	1	1	0	0
B	111	79	$2\frac{1}{2}$	6	$3\frac{1}{2}$	$12\frac{1}{4}$
C	111	85	$2\frac{1}{2}$	4	$1\frac{1}{2}$	$2\frac{1}{4}$
D	110	78	4	8	4	16
E	101	88	$5\frac{1}{2}$	4	$1\frac{1}{2}$	$2\frac{1}{4}$
F	101	85	$5\frac{1}{2}$	4	$1\frac{1}{2}$	$2\frac{1}{4}$
G	98	78	7	8	1	1
H	92	75	8	12	4	16
I	91	85	9	4	5	25
J	89	77	10	11	1	1
K	88	78	11	8	3	9
L	61	78	12	8	4	16
						103

$$1-\frac{6 \times 103}{12 \times (12^2 - 1)}$$

$$1-\frac{618}{1716}$$

$$1-.36=.64$$

CHAPTER IX

Computation of coefficient of correlation between I.Q. and Mark obtained in Biology Period 3

Pupil	I.Q.	Average	I.Q. Rank	Ave. Rank	Difference	sq. of Diff.
A	124	87	1	6	5	25
B	119	91	2	1	1	1
C	118	89	3	3	0	0
D	114	91	4½	1	3½	12¼
E	114	88	4½	4	½	¼
F	113	84	6	9	3	9
G	110	85	7	8	1	1
H	105	80	8	16	8	64
I	103	78	9	19½	10½	110¼
J	102	79	10	17	7	49
K	101	78	11	19½	8½	72¼
L	98	87	12	6	6	36
M	97	82	14	12½	1½	2¼
N	97	88	14	4	10	90¼
O	97	83	14	10½	3½	12¼
P	95	82	16½	12½	4	16
Q	95	83	16½	10½	6	36
R	94	72	18	24	6	42¼
S	92	77	19	22½	3½	12¼
T	91	70	20	26	6	42¼
U	87	78	21	19½	1½	2¼
V	85	77	22½	22½	0	0
W	85	81	22½	14½	8	64
X	83	81	25	14½	10½	110¼
Y	83	78	25	19½	5½	30¼
Z	83	72	25	24½	1½	2¼
A'	79	70	27	26½	½	¼
						840

$$1 - \frac{6 \text{ Sum } d^2}{N\,(N^2-1)}$$

$$1 - \frac{6\,(840)}{27\,(27^2-1)}$$

$$1 - \frac{5040}{12376}$$

1-.40 or .60

TABLE X

Computation of coefficient of correlation between I.Q. and Mark obtained in General Science, period 4

Pupil	I.Q.	Average	I.Q. Rank	Ave. Rank	Difference	sq. of Diff.
A	124	93	1	1	0	4¼
B	116	84	2	7½	5½	30¼
C	110	70	3	40	37	1369
D	109	78	4	27	23	529
E	106	78	5	22½	17½	306¼
F	104	79	7	22½	15½	240
G	104	90	7	3½	3½	12¼
H	104	78	7	27	20	400
I	103	84	10	7½	2½	6¼
J	103	88	10	5½	4½	20
K	103	88	10	5½	4½	20
L	102	77	12	32	20	400
M	101	78	13	27	14	196
N	100	48	14	43	29	841
O	99	82	16	12½	3½	12¼
P	99	90	16	3½	12½	156¼
Q	99	70	16	40	24	567
R	98	82	20	12½	7½	56¼
S	98	78	20	27	7	49
T	98	82	20	12½	7½	56¼
U	98	83	20	9	11	121
V	98	70	20	40	20	400
W	97	91	24	2	22	484
X	97	78	24	27	3	9
Y	97	77	24	32	8	64
Z	95	70	26½	40	13½	182¼
A'	95	82	26½	12½	14	196
B'	94	79	29½	27	2½	6¼
C'	94	82	29½	12½	17	289
D'	94	72	29½	37	7½	56¼
E'	94	82	29½	12½	17	289
F'	93	80	32	20½	11½	132¼
G'	92	81	33	17½	15½	240¼
H'	91	73	34	25	1	1
I'	88	81	35	17½	17½	306¼
J'	87	73	37	35	2	4
K'	87	78	37	27	10	100
L'	87	81	37	17½	19½	380¼
M'	86	70	39	40	1	1
N'	83	80	40½	20½	20	400
O'	83	81	40½	17½	23	529
P'	73	77	42	32	10	100
Q'	61	73	43	35	8	64
						14806¼

$$1-\frac{6 \text{ Sum } d^2}{N\,(N^2-1)}$$

$$1-\frac{88837\ 1/2}{79464} = 1-1.15 = -.15$$

TABLE XI

Computation of coefficient of correlation between I.Q. and Mark obtained in Biology, period 5

Pupil	I.Q.	Average	I.Q. Rank	Ave. Rank	Difference	sq. of Diff.
A	124	78	1	18	17	289
B	122	92	2	1	1	1
C	121	90	3	3	0	0
D	120	91	4	2	2	4
E	118	84	5	7½	2½	6¼
F	117	78	6	18	12	144
G	114	83	7	9½	2½	6¼
H	111	79	8	15½	7½	56¼
I	110	84	9	7½	1½	2¼
J	108	85	10	5	5	25
K	107	79	11	15½	4½	20¼
L	105	82	12	11½	½	¼
M	104	72	13½	22	8½	72¼
N	104	83	13½	9½	4	16
O	103	88	15	4	11	121
P	102	78	16	18	2	4
Q	98	77	17½	20	2½	6¼
R	98	73	17½	22	4½	20¼
S	97	85	19	5½	13½	182¼
T	96	81	20	13	7	49
U	94	82	21	11½	9½	90¼
V	93	70	22½	26½	4	16
W	93	80	22½	14	8½	72¼
X	92	70	24½	25½	2	4
						1208

Page 2
Period 5, cont'd.

Pupil	I.Q.	Average	I.Q. Rank	Ave. Rank	Difference	sq. of Diff.
Y	92	72	$24\frac{1}{2}$	22	$1\frac{1}{2}$	$2\frac{1}{4}$
Z	85	71	$26\frac{1}{2}$	24	$2\frac{1}{2}$	$6\ \frac{1}{4}$
A'	85	70	$26\frac{1}{2}$	$26\frac{1}{2}$	0	0
B'	84	70	28	$26\frac{1}{2}$	$1\frac{1}{2}$	$\frac{2\frac{1}{4}}{10\frac{3}{4}}$

$$1-\frac{6 \text{ sum } d^2}{N\ (N^2-1)} = 1-\frac{6\ (1218\frac{3}{4})}{28\ (28^2-1)} = \frac{1-7312.5}{22924} = 1-.318 \text{ or } .682$$

TABLE XII

Computation of coefficient of correlation between I. Q. and Mark obtained in Biology, period 6

Pupil	I. Q.	Average	I. Q. Rank	Ave. Rank	Difference	Sq. of Diff.
A	122	88	1½	7	5½	30¼
B	122	89	1½	4½	3	9
C	120	92	3	1	2	4
D	117	84	4	13	9	81
E	114	82	5½	19½	14	196
F	114	83	5½	16	10½	110¼
G	113	84	7	13	6	36
H	112	87	8½	9½	1	1
I	112	90	8½	2½	6	36
J	111	83	10	16	6	36
K	110	85	11½	11	½	¼
L	110	88	11½	7	4½	20¼
M	109	90	13	2½	10½	110¼
N	108	82	14	19½	5½	30¼
O	106	89	15½	4½	11	121
P	106	84	15½	13	2½	6¼
Q	105	88	17	7	10	100
R	104	87	18½	9½	9	81
S	104	81	18½	22	3½	12¼
T	103	82	20	19½	½	¼
U	102	82	21½	19½	2	4
V	102	80	21½	24	2½	6¼
W	97	78	23	26½	3½	12¼
X	96	80	24	24	0	0
Y	93	77	25	28	3	9
Z	91	83	26	16	10	100
						1152 3/4

Page 2
Biology, period 6 cont'd

Pupil	I.Q.	Average	I.Q. Rank	Ave. Rank	Difference	Sq. of Diff.
A'	90	75	27	29	2	4
B'	88	78	28	26½	1½	2¼
D'	87	72	29	30	1	1
C'	82	80	30	24	6	36
E'	49	70	31	31	0	0
						43¼
						1152 3/4
						1196

$$1 - \frac{6 \text{ sum } d^2}{n(n^2-1)}$$

$$1 - \frac{6\ (1196)}{31.(31^2-1)}$$

1 - .24 or .76

CHAPTER VII

TO FIND COEFFICIENT OF CORRELATION BETWEEN AGRICULTURAL, COMMERCIAL, GENERAL, AND COLLEGE GROUPS AND TEACHERS MARKS.

Table 13

Computation of coefficient of correlation between I. Q. and Mark of Agricultural Group in Biology and General Science.

Pupil	I. Q.	Average	I. Q. Rank	Ave. Rank	Difference	Sq. of Diff.
A	102	77	I	$3\frac{1}{2}$	$2\frac{1}{2}$	$6\frac{1}{4}$
B	99	78	2	$I\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{4}$
C	98	70	$3\frac{1}{2}$	II	$7\frac{1}{2}$	$56\frac{1}{4}$
D	98	72	$3\frac{1}{2}$	7	$3\frac{1}{2}$	$12\frac{1}{4}$
E	97	78	5	$1\frac{1}{2}$	$3\frac{1}{2}$	$12\frac{1}{4}$
F	96	72	6	7	1	1
G	95	70	7	11	4	16
H	92	70	8	11	3	9
I	91	73	9	5	4	16
J	89	77	10	$3\frac{1}{2}$	$6\frac{1}{2}$	$42\frac{1}{4}$
K	86	70	11	11	0	0
L	84	70	12	11	1	1
M	72	72	13	7	6	36

-0-

$$I-\frac{6 \text{ Sum } d^2}{n(n^2-I)} \qquad I-6\ (\underline{208\tfrac{1}{2}}) \qquad I-\underline{I25I} \qquad I-.57 \qquad .43$$

$$13\ (169-I) \qquad 2I84$$

Table 14

Computation of coefficient of correlation between I. Q. and Mark obtained by College Group in General Science and Biology.

Pupil	I. Q.	Average	I. Q. Rank	Ave. Rank	Difference	Sq. of Diff.
A	124	87	1½	12½	11	122
B	124	93	1½	1	½	¼
C	122	92	3½	3	½	¼
D	122	88	3½	10	6½	42¼
E	121	90	5	7	2	4
F	120	91	6½	5½	1	1
G	120	92	6½	3	3½	12¼
H	119	91	8	5½	2½	6¼
I	118	89	9	8	1	1
J	116	84	10	17	7	49
K	112	92	11	3	8	64
L	111	85	12	15	3	9
M	110	70	14	24	10	100
N	110	78	14	22	8	64
O	110	85	14	15	1	1
P	108	82	16	18½	2½	6¼
Q	105	82	17	18½	1½	2¼
R	104	87	18	12½	5½	30¼
S	101	78	19	22	3	9
T	97	85	20½	15	5½	30¼
U	97	88	20½	10	9½	90¼
V	96	88	22	10	12	144
W	92	81	23	20	3	9
X	88	78	24	22	2	4
						800¼

$$1-\frac{6 \text{ sum } d^2}{n(n^2-1)} = 1-\frac{4801.5}{13800} = 1-.34 \text{ or } .66$$

Table 15

Computation of coefficient of correlation between I. Q. and Mark obtained by Commercial Course Group in General Science and Biology.

Pupil	I. Q.	Average	I. Q. Rank	Ave. Rank	Difference	Sq. of Diff.
A	122	85	1	5	4	16
B	113	83	2	9	7	49
C	112	78	3	25½	22½	506¼
D	110	84	4	7	3	9
E	109	70	5	43	38	1444
F	106	89	6½	2	4½	20¼
G	106	88	6½	3½	3	9
H	104	84	9	7	2	4
I	104	79	9	19	10	100
J	104	72	9	40	31	961
K	103	88	11½	3½	8	64
L	103	78	11½	25½	14	196
M	101	78	13	25½	12½	156¼
N	100	78	15½	25½	10	100
O	100	82	15½	13	12½	156¼
P	100	81	15½	17½	2	4
Q	100	78	15½	25½	10	100
R	99	78	19	25½	6½	42¼
S	99	82	19	13	6	36
T	99	78	19	25½	6½	42¼
U	97	82	22½	13	9½	90¼
V	97	78	22½	25½	3	9
W	97	90	22½	1	21½	462¼
						4577

Table 16

Computation of coefficient of correlation between I. Q. and Mark obtained by Commercial Course Group in General Science and Biology.

Pupil	I. Q.	Average	I. Q. Rank	Ave. Rank	Difference	Sq. of Diff.
A	97	77	22½	34	11½	132¼
B	95	82	26	13	13	169
C	94	82	26	13	13	169
D	94	72	26	40	14	196
E	93	77	28	34	6	36
F	92	77	29	34	5	25
G	91	84	30½	7	23½	552¼
H	91	82	30½	13	17½	306¼
I	90	75	32	37	5	25
J	88	78	33½	25½	8	64
K	88	78	33½	25½	8	64
L	87	78	36½	25½	11	121
M	87	81	36½	17½	19	361
N	87	73	36½	38	1½	2¼
O	87	72	36½	40	3½	12¼
P	85	77	39½	34	5½	30¼
Q	85	71	39½	42	3½	12¼
R	84	82	41	13	28	784
S	83	78	42	25½	16½	272¼
T	73	77	43	34	9	81
						3415

$$1-\frac{6 \text{ sum } d^2}{n(n^2-1)}$$

$$1-\frac{485520}{79464}$$

1-.601 or .399

Table 17

Computation of Coefficient of Correlation between I. Q. and Mark obtained by General Group in General Science and Biology.

Pupil	I. Q.	Average	I. Q. Rank	Ave. Rank	Difference	Sq. of Diff.
A	97	90	22½	1	21½	462½
B	95	82	25	13	12	144
C	94	72	26½	39	13½	182¼
D	94	82	26½	13	13½	182¼
E	93	77	28	33½	5½	30¼
F	92	77	29	33½	4½	20¼
G	91	84	30½	7	23½	552¼
H	91	82	30½	13	17½	306¼
I	90	75	32	36	4	16
J	88	78	33½	25½	8	64
K	88	78	33½	25½	8	64
L	87	72	36½	39	2½	6¼
M	87	73	36½	37	1½	2¼
N	87	78	36½	25½	11	121
O	87	81	36½	17½	19	361
P	85	71	39½	41	1½	2¼
Q	85	77	39½	33½	6	36
R	84	82	41	13	28	784
S	83	78	42	25½	16½	272¼
T	73	77	43	33½	9½	90¼
						3699

Table 18

Computation of coefficient of correlation between I. Q. and Mark obtained by General Group in General Science and Biology.

Pupil	I. Q.	Average	I. Q. Rank	Ave. Rank	Difference	Sq. of Diff.
A	122	85	1	5	4	16
B	113	83	2	9	7	49
C	112	78	3	25½	22½	506¼
D	110	84	4	7	3	9
E	109	70	5	42	37	1369
F	106	88	6½	3½	3	9
G	106	89	6½	2	4½	20¼
H	104	84	9	7	2	4
I	104	72	9	39	30	900
J	104	79	9	19	10	100
K	103	78	11½	25½	14	196
L	103	88	11½	3½	8	64
M	101	78	13	25½	12½	156¼
N	100	78	15½	25½	12	144
O	100	81	15½	17½	2	4
P	100	78	15½	25½	10	100
Q	100	82	15½	13	2½	6¼
R	99	78	19	25½	6½	42¼
S	99	82	19	13	6	36
T	99	78	19	25½	6½	42¼
U	97	82	22½	13	9½	90¼
V	97	78	22½	25½	3	9
W	97	77	22½	33½	11	121
						3993½

$$1-\frac{6 \text{ sum } d^2}{n(n^2-1)}$$

$$1-\frac{46155}{63760} = 1-.72 \text{ or } .28$$

$$\frac{3699}{7692\frac{1}{2}}$$

CHAPTER VIII

To find coefficient of correlation between Freshmen, Sophomores, Juniors and Seniors in General Science and Biology and Teachers Mark.

Table 19

Computation of coefficient of correlation between I. Q. and Mark obtained by Seniors, Grade 12, in General Science and Biology.

Pupil	I. Q.	Average	I. Q. Rank	Ave. Rank	Difference	Sq. of Diff.
A	122	92	2	2	0	0
B	122	88	2	8½	6½	42¼
C	122	85	2	12	10	100
D	121	90	4	5½	1½	2¼
E	120	92	5½	2	3½	12¼
F	120	91	5½	4	1½	2¼
G	112	92	7	2	5	25
H	104	84	9	13½	4½	20¼
I	104	87	9	11	2	4
J	104	90	9	5½	3½	12¼
K	103	88	11	8½	2½	6¼
L	101	88	12	8½	3½	12¼
M	100	82	13	16	3	9
N	99	82	14½	16	1½	2¼
O	99	78	14½	18	3½	12¼
P	97	88	16	8½	7½	56¼
Q	94	82	17	13	4	16
R	87	72	18	19	1	1
S	61	84	19	13½	5½	30¼
						366

$$1-\frac{6 \text{ sum } d^2}{n(n^2-1)}$$

$$1-\frac{2196}{6840} \text{ or } 1-.32 \text{ or } .68$$

Table 20

Computation of coefficient of correlation between I. Q. and Mark obtained by Juniors, Grade II, in General Science and Biology.

Pupil	I. Q.	Average	I. Q. Rank	Ave. Rank	Difference	Sq. of Diff.
A	110	78	1	12	11	121
B	109	70	2	16	14	196
C	106	90	$3\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$	$2\frac{1}{4}$
D	104	85	$4\frac{1}{2}$	6	$1\frac{1}{2}$	$2\frac{1}{4}$
E	104	79	$4\frac{1}{2}$	10	$5\frac{1}{2}$	$30\frac{1}{4}$
F	103	88	6	3	3	9
G	102	85	7	6	1	1
H	100	78	8	12	4	16
I	99	78	10	12	2	4
J	99	83	10	8	2	4
K	99	90	10	$1\frac{1}{2}$	$8\frac{1}{2}$	$72\frac{1}{4}$
L	94	82	12	9	3	9
M	92	72	13	15	2	4
N	91	85	14	6	8	64
O	87	73	15	14	1	1
P	86	86	16	4	12	144
						680

$$1-\frac{6 \text{ sum } d^2}{n(n^2-1)}$$

$$1-\frac{4080}{4080} \text{ or } o$$

Table 21

Computation of coefficient of correlation between I. Q. and Mark obtained by Sophomores, Grade 10, in General Science and Biology.

Pupil	I. Q.	Average	I. Q. Rank	Ave. Rank	Difference	Sq. of Diff.
A	118	89	1	1	0	0
B	116	84	2	7½	5½	30¼
C	114	83	3	10½	7½	56¼
D	113	83	4	10½	6½	42¼
E	111	79	5½	19	13½	729
F	111	85	5½	5	½	¼
G	110	84	7½	7½	0	0
H	110	70	7½	31½	24	576
I	106	88	9	2½	6½	42¼
J	105	82	10	14½	4½	20¼
K	103	88	11½	2½	9	81
L	103	78	11½	23½	12	144
M	101	78	13	23½	10½	110¼
N	101	85	13	5	8	64
O	101	78	13	23½	10½	110¼
P	100	78	15½	23½	8	64
Q	100	81	15½	17½	2	4
R	99	78	18	23½	5½	30¼
S	99	82	18	14½	3½	12¼
T	99	83	18	10½	7½	56¼
U	98	70	20	3½	16½	272¼
V	97	85	22	5	17	289
W	97	82	22	14½	7½	56¼
X	97	83	22	10½	11½	132¼
Y	95	82	24	14½	9½	90¼

Table 21, Cont'd

Computation of coefficient of correlation between I. Q. and Mark obtained by Sophomores, Grade 10, in General Science and Biology.

Pupil	I. Q.	Average	I. Q. Rank	Ave. Rank	Difference	Sq. of Diff.

30123/4

Table XXII

Computation of co-efficient of correlation between I. Q. and Mark obtained by Freshmen, Grade 9, in General Science and Biology.

Pupil	I. Q.	Average	I. Q. Rank	Ave. Rank	Difference	Sq. of Dif.
A	124	93	2	1	1	1
B	124	87	2	17	15	225
C	124	78	2	66½	63½	4032¼
D	123	92	4	2	2	4
E	122	89	5	9½	3½	12¼
F	119	91	6	4	2	4
G	118	84	7	25	18	324
H	117	84	9	25	16	256
I	117	88	9	13	4	16
J	117	78	9	66½	56½	3192¼
K	114	83	12½	31	18½	342¼
L	114	91	12½	4	7½	56¼
M	114	88	12½	13	½	¼
N	114	82	12½	38½	26	676
O	113	84	15½	25	9½	90¼
P	113	84	15½	25	9½	90¼
Q	112	78	18	66½	48½	2352¼
R	112	90	18	7	11	121
S	112	87	18	17	1	1
T	111	79	20½	58½	38	1444
U	111	83	20½	31	50½	2550¼
V	110	85	23	20	3	9
W	110	88	23	13	10	100
						15899¼

Table XXIII

Computation of co-efficient of correlation between I. Q. and Mark obtained by Freshmen, Grade 9, in General Science and Biology.

Pupil	I. Q.	Average	I. Q. Rank	Ave. Rank	Difference	Sq. of Dif.
A'	110	85	23	20	3	9
B'	109	90	25½	7	18½	342¼
C'	109	78	25½	66½	41	1681
D'	108	85	27½	20	7½	56¼
E'	108	82	27½	38½	11	121
F'	107	79	29	58½	29½	870¼
G'	106	89	31	9½	21½	462¼
H'	106	84	31	25	6	36
I'	106	78	31	66½	35½	1260¼
J'	105	80	33½	53	19½	380¼
K'	105	88	33½	13	20½	420¼
L'	104	81	36½	46½	10	100
M'	104	72	36½	84½	48½	2352¼
N'	104	78	36½	66½	30	900
O'	104	83	36½	31	5½	30¼
P'	103	82	39½	38½	1	1
Q'	103	84	39½	25	14½	210½
R'	102	80	43	53	10	100
S'	102	79	43	58½	15½	240¼
T'	102	78	43	66½	23½	552¼
U'	102	77	43	76	33	1089
V'	102	82	43	38½	4½	20¼
						8740¼

Table XXIV

Computation of coefficient of correlation between I. Q. and Mark obtained by Freshmen, Grade 9, in General Science and Biology.

Pupil	I. Q.	Average	I. Q. Rank	Ave. Rank	Difference	Sq. of Diff.
A''	100	48	46	100	54	2916
B''	99	82	48½	38½	10	100
C''	99	82	48½	38½	10	100
D''	99	87	38½	17	31	992¼
E''	99	70	48½	94½	46	2116
F''	98	72	51½	84½	33	1089
G''	98	77	51½	78	24½	600¼
H''	97	91	55	4	51	2601
I''	97	90	55	7	48	2304
J''	97	78	55	76	21	441
K''	97	77	55	66½	11½	132¼
L''	97	78	55	66½	11½	132¼
M''	96	81	59½	46½	13½	182¼
N''	96	80	59½	53	6½	42¼
O''	96	83	59½	13	46½	2162¼
P''	96	72	59½	84½	25	625
Q''	95	82	63	38½	24½	600¼
R''	95	83	63	31	32	1024
S''	95	70	63	94½	31½	992¼
T''	94	72	66½	84½	18	324
U''	94	79	66½	58½	8	64
V''	94	82	66½	38½	28	784
W''	94	72	66½	84½	18	324
						20648¼

Table 25

Computation of coefficient of correlation between I. Q. and Mark obtained by Freshmen, Grade 9, in General Science and Biology.

Pupil	I. Q.	Average	I. Q. Rank	Ave. Rank	Difference	Sq. of Diff.
A'''	93	80	70½	53	17½	306¼
B'''	93	80	70½	53	17½	306¼
C'''	93	70	70½	94½	24	576
D'''	93	77	70½	76	5½	30¼
E'''	92	77	73½	76	2½	6¼
F'''	92	70	73½	94½	21	441
G'''	91	84	77	25	52	2704
H'''	91	70	77	94½	14½	210¼
I'''	91	82	77	38½	29½	870¼
J'''	91	73	77	81	4	16
K'''	91	83	77	31	46	2116
L'''	90	75	80	80	0	0
M'''	88	81	82	46½	35½	1260¼
N'''	88	78	82	66½	15½	240¼
O'''	88	78	82	66½	15½	240¼
P'''	87	81	85	46½	38½	1482¼
Q'''	87	72	85	84½	½	¼
R'''	87	78	85	66½	18½	342¼
S'''	86	70	87	94½	7½	56¼
T'''	85	71	89½	88	1½	2¼
U'''	85	77	89½	76	13½	182¼
V'''	85	81	89½	46½	43	1849
W'''	85	70	89½	84½	5	25
						11597 3/4

Table XXVI

Computation of coefficient of correlation between I. Q. and Mark obtained by Freshmen, Grade 9, in General Science and Biology.

Pupil	I. Q.	Average	I. Q. Rank	Ave. Rank	Difference	Sq. of Diff.
A''''	84	70	92½	94½	2	4
B''''	84	82	92½	38½	54	2916
C''''	83	80	95	53	42	1764
D''''	83	81	95	46½	48½	2702¼
E''''	83	81	95	46½	48½	2702¼
F''''	82	80	97	53	44	1936
G''''	79	70	98	94½	3½	12¼
H''''	73	77	99	76	23	529
I''''	72	72	100	84½	15½	480¼
J''''	49	70	101	84½	16½	542¼
					Total	13588¼
						70433¼

$$1-\frac{6 \text{ Sum } d^2}{N\,(N^2-1)}$$

$1-\frac{422782\frac{1}{2}}{1030200}$ = 1-.49 = ..51 is the coefficient of correlation

Table XXVII

TEST ANALYSIS

The writer had some difficulty in evolving a system of showing the individual results of these tests. A letter to the Division of Research and Test Service of the World Book Company, the firm from whom the Terman Tests were purchased, asking how scientific aptitude could be forecast, brought the answer that while the Terman Tests are a conceded measure of general mental ability, no one so far as the writer of the letter is concerned, had ever attempted to use them as a method of predicting success or failure in General Science and Biology and they would be interested in the results of this experiment. This letter is on the following page.

Some sort of a system of visualizing the individual results seemed necessary as a step to finding out how the tests would look and also get the proper idea of their success or failure. Finally the idea was evolved that by thinking of every 10 points of the I. Q. as a point, and having all of the cases within this range spray on to the teacher's marks, some idea of the efficiency of these tests might be gained. "RED" indicates Failure--"BLACK"--Success.

Percentages were used to find how accurate a forecast of success can be made and also the same with failure. Individual tests do not seem to indicate any special forecast of aptitude for science so far as the writer can ascertain, and by individual tests the writer means, one or a group of the Terman Group Tests other than the whole group.

WORLD BOOK COMPANY Publishers

Division of Research and Test Service
Editor N. Durost, Ph.D. Director-Arthur S. Otis Ph.d. Con
Roger T. Lannon, M.A. Editor-Marion A. Young, M.A., Editor

LWB BO HO

Yonkers-on-Hudson, New York
7 May 1940

Mr. John M. Quirk
Agawam High School
Agawam
Massachusetts

Dear Mr. Quirk:

The Terman Group Tests of Mental Ability are designed to give a measure of a pupil's "general mental ability," that is, his general verbal ability. It is obvious that this test covers many factors that are necessary for successful work in biology and general science, such as the ability to read, to draw conclusions and do certain types of reasoning. There are other factors, however, not covered by the Terman Tests, that help determine a pupil's ability to succeed in these subjects.

If success in general science and biology depends to a greater degree upon a pupil's general mental ability than it does to specific aptitudes or skills, then the Terman Tests might be used as a means of forecasting a pupil's possible success or failure in these subjects.

I am sorry we do not have any specific data we can offer you on this subject, nor do we know of any studies which have been made with the Terman Tests that would help anwser your question. If you are doing some experimenting with the Terman Tests and can determine to what extent they are able to predict a pupil's success in biology and general science, we shall certainly be glad to hear of your results.

Very truly yours,

Marian A. Young
Division of Research and Test Service

MAY: KS/dict.

Chart I.

I. Q. 120-124

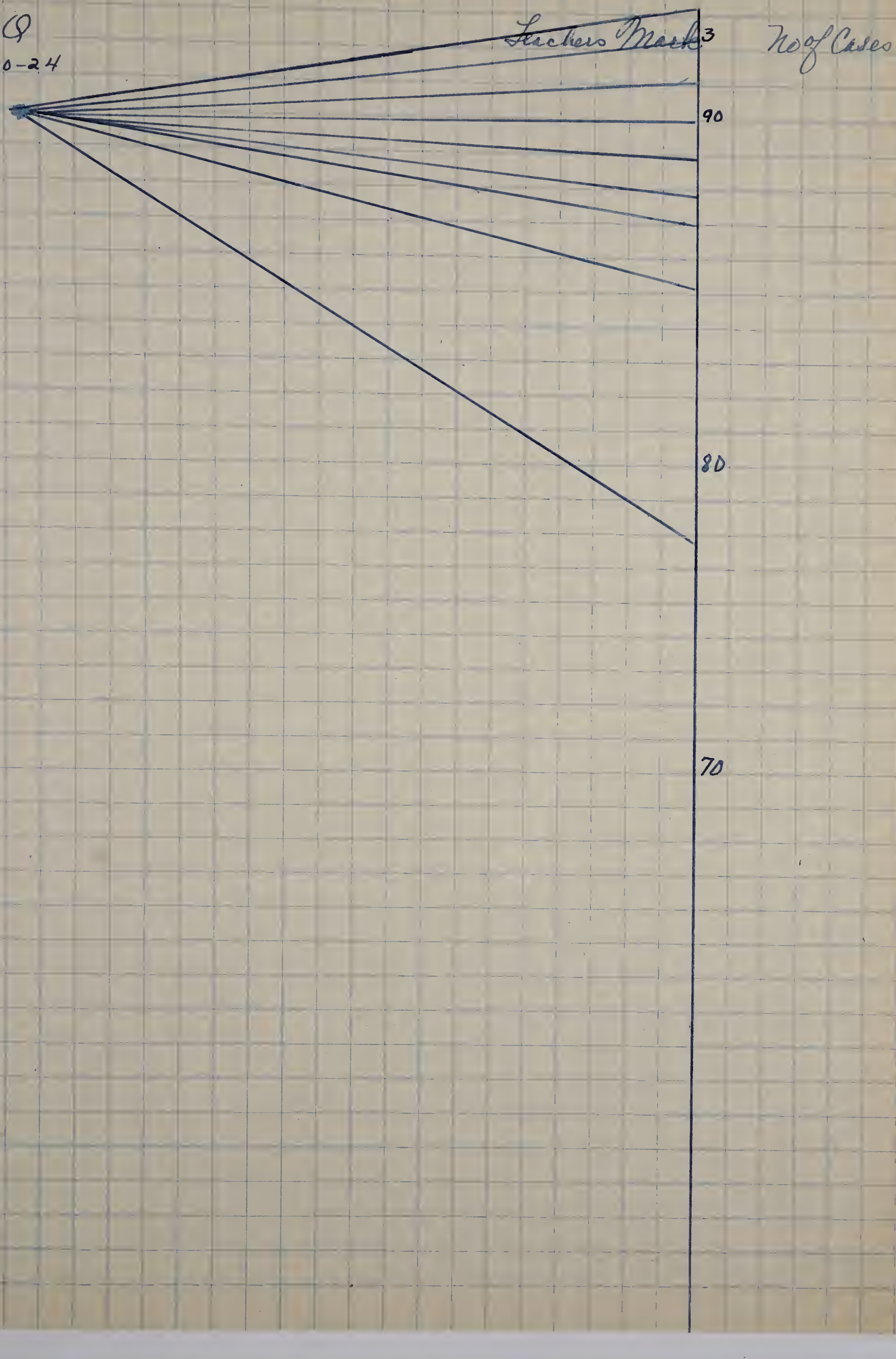


Chart II

D. Q 110-119

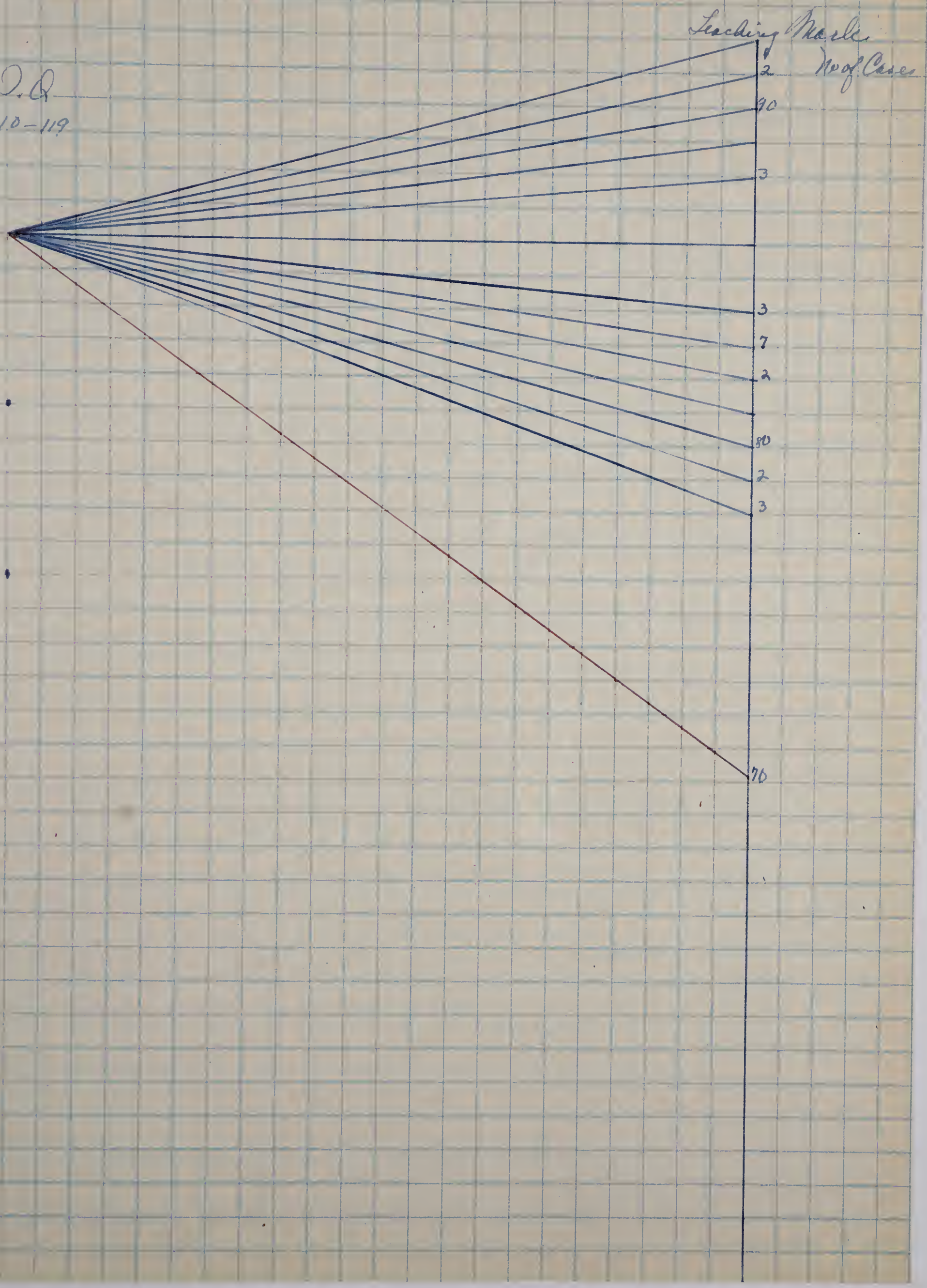


Chart III I. Q. 100-109

Teacher's Mark No. of Cases

I. Q.
No. of Cases 100-109

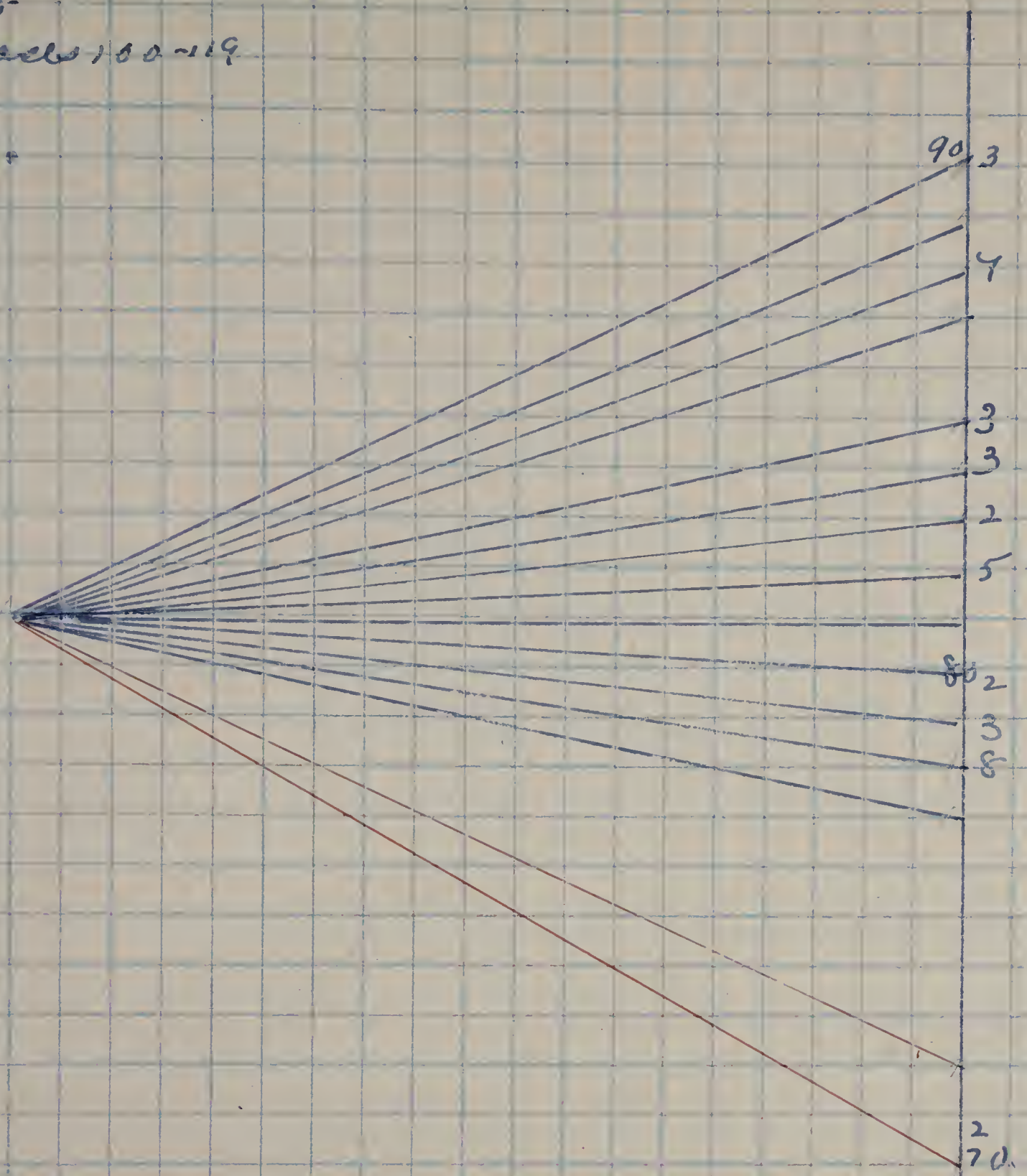


Chart IV

I. Q. 90-99

No. of Cases I. Q. 90-99

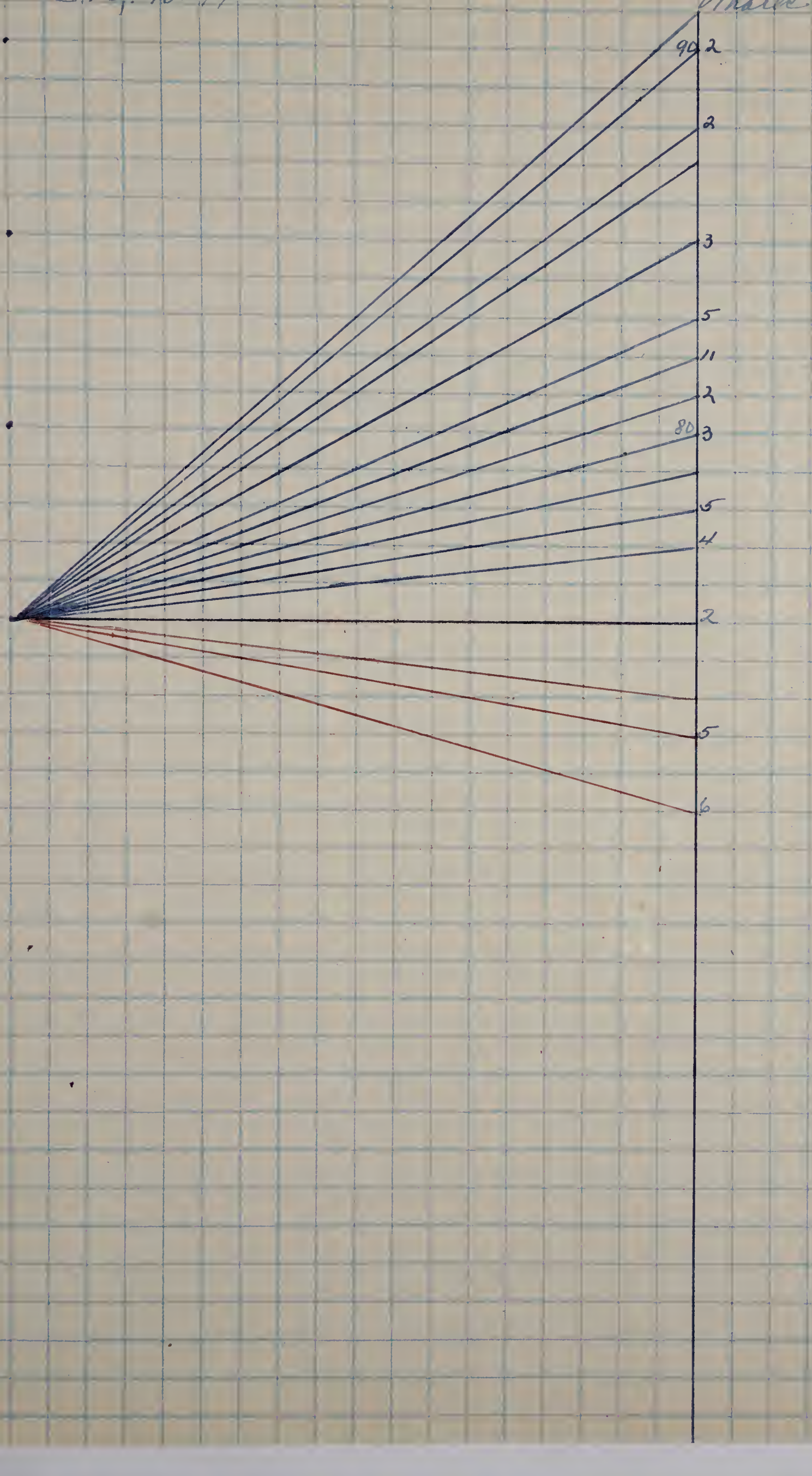


Chart V -58-

No. of Cases D. G. 80-89

D. G. 80-89 Mark No. of Cases

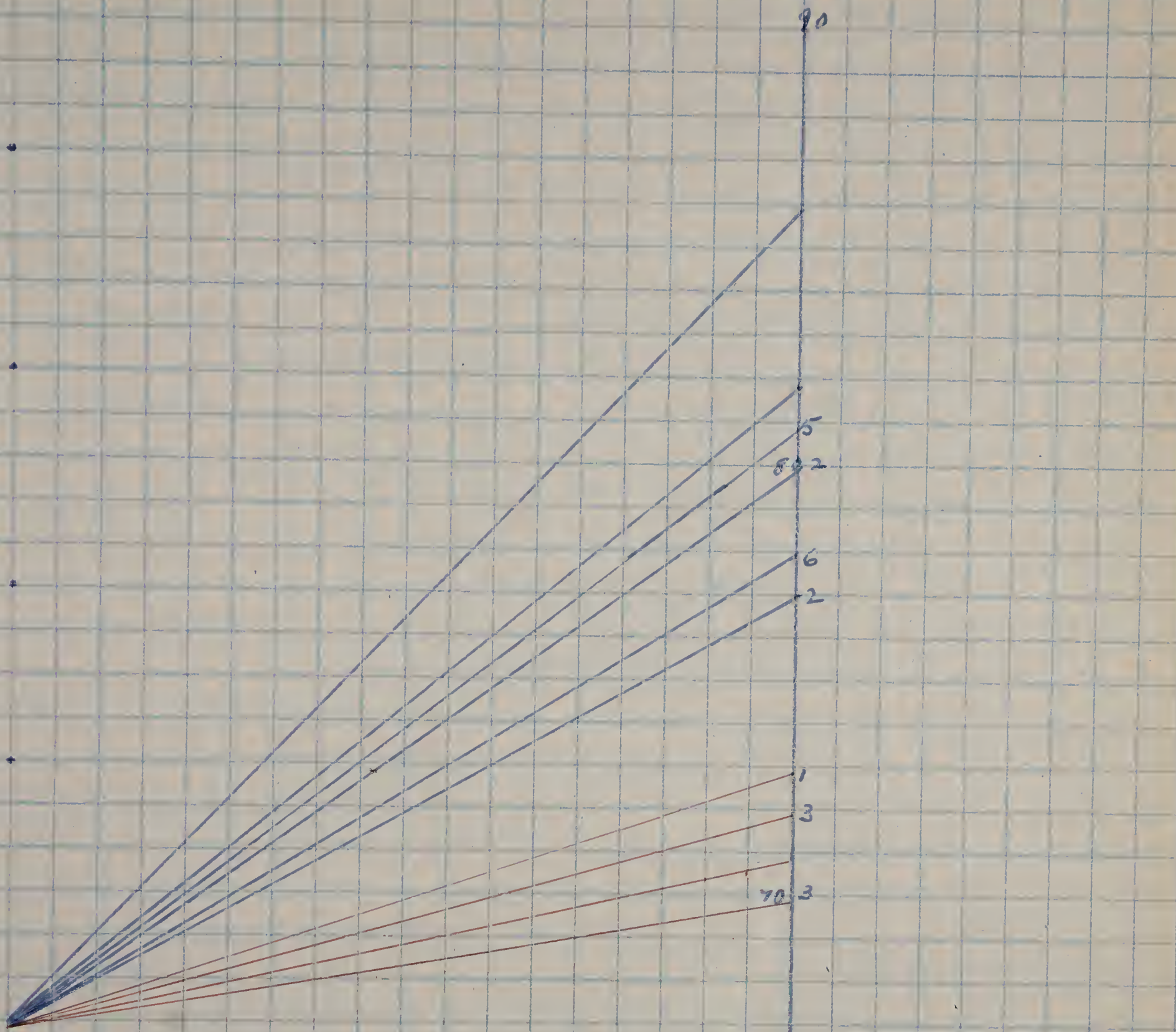
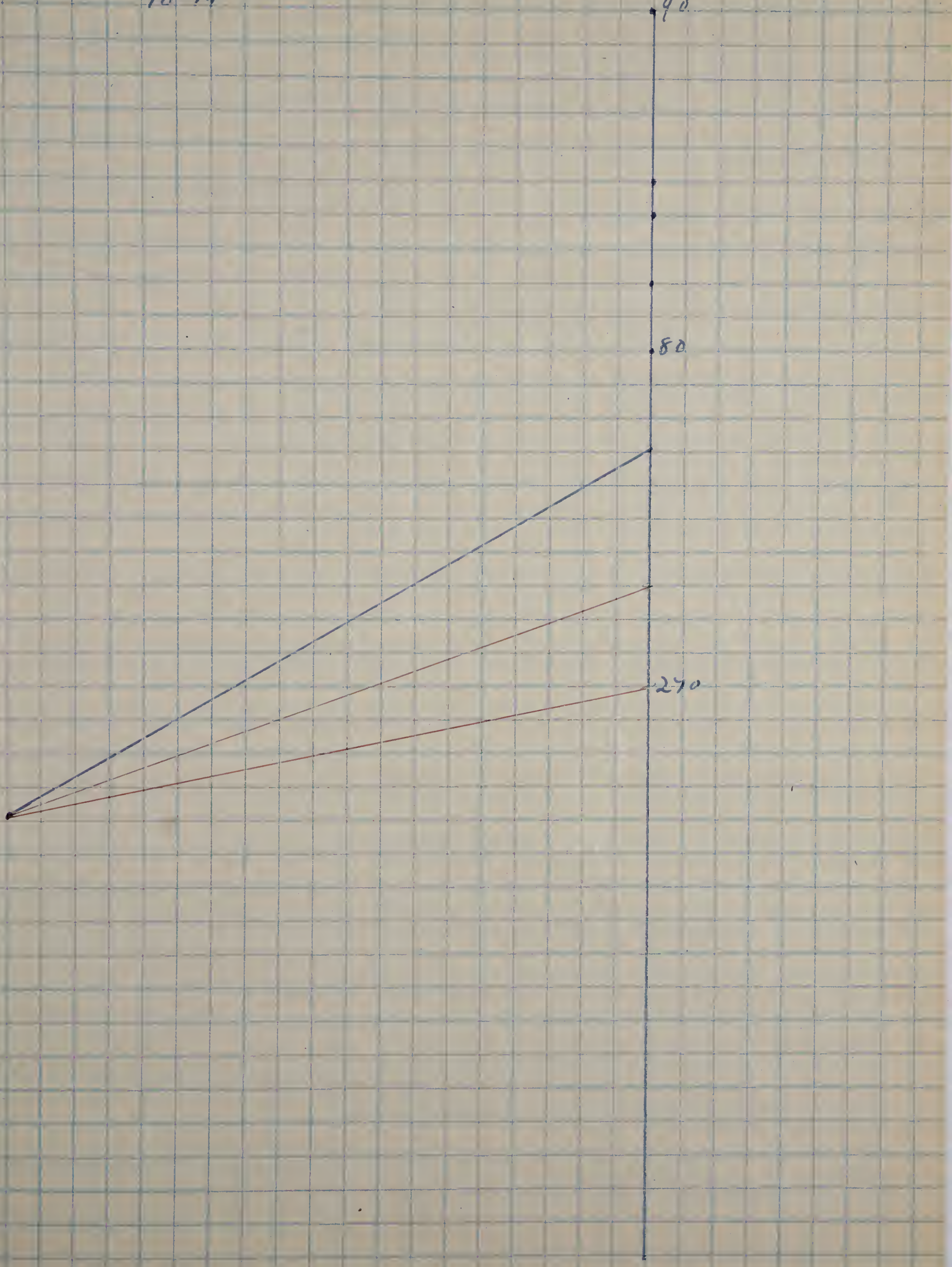


Chart VI

I. Q. 70-79

No. of Cases I. Q. 70-79

Mark No. of Cases



TEST ANALYSIS (Continued Biology and General Science)

I. Q.	Success	Failure	Total
120-24	11	0	11
110-19	28	1	29
100-109	40	3	43
90-99	40	14	54
80-89	17	8	25
70-79	1	3	4
	137	29	166

Forecast of Success or Failure in General Science and Biology

Pupils with I. Q's of Success	Forecast of Failure
120-24----------100%	70-79-------75%
110-19----------96%	80-89-------32%
100-109----------93.02%	90-99-------26%
90-99----------74.07%	100-109----6.98%
80-89----------68%	110-19--------4%
70-79----------25%	120-24--------0%

TEST ANALYSIS (Continued)

BIOLOGY

I. Q.	Success	Failure	Total
120-24	8	0	8
110-19	24	0	24
100-109	22	1	23
90-99	19	7	26
80-89	9	5	14
70-79	1	2	3
	83	15	98

Forecast of Success or Failure in Biology

Pupils with I. Q's of	Forecast of Success	Forecast of Failure
120-24	100%	70-79--66 2/3
110-19	100%	80-89----45%
100-109	95%	90-99--26.3%
90-99	73.7%	100-109----5%
80-89	55%	110-119----0%
70-79	33 1/3%	120-24-----0%

TEST ANALYSIS (Continued)

GENERAL SCIENCE

I. Q.	Success	Failure	Total
120-124	3	0	3
110-119	4	1	5
100-109	19	3	22
90-99	19	7	26
80-89	8	2	10
70-79	1	1	2
	54	14	68

Forecast of Success or Failure in General Science

Pupils with I. Q's of	Forecast of Success	Forecast of Failure
120-24	100%	70-79--50%
110-119	80%	80-89--80%
100-109	95%	90-99--27%
90-99	73%	100-109--5%
80-89	80%	110-119-20%
70-79	50%	120-124--0%

Table XXVIII

TABLE OF RESULTS

Agawam Freshmen Median----------107.5

Median for 10,881 Freshmen----------104.

Agawam Sophomore Median----------127.5

Median for 6,730 Sophomores----------122.

Median for Agawam Juniors----------125

Median for 4,206 Juniors----------138

Median for Agawam Seniors----------138.75

Median for 4,888----------147

Correlation of I. Q. and Teachers' Marks for Whole Group----------.56

Correlation of I. Q. and Teachers' Marks for Period I, Gen. Sci.-------.32

Correlation of I. Q. and Teachers' Marks for Period II, Biology--------.64

Correlation of I. Q. and Teachers' Marks for Period III, Biology-------.60

Correlation of I. Q. and Teachers' Marks for Period IV, Gen. Sci.------.15

Correlation of I. Q. and Teachers' Marks for Period V, Biology---------.68

Correlation of I. Q. and Teachers' Marks for Period VI, Biology--------.76

Correlation between I. Q. and Teachers' Marks of Agriculture Group in General Science and Biology----------.43

Correlation between I. Q. and Teachers' Marks of College Group in General Science and Biology----------.66

Correlation between I. Q. and Teachers' Marks of Commercial Group in General Science and Biology----------.389

Correlation between I. Q. and Teachers' Marks of General Group in General Science and Biology----------.28

TABLE OF RESULTS (Continued)

Correlation of I. Q. and Teachers' Marks obtained by Seniors in General Science and Biology----------.68

Correlation of I. Q. and Teachers' Marks obtained by Juniors in General Science and Biology----------.00

Correlation of I. Q. and Teachers' Marks obtained by Sophomores in General Science and Biology----------.46

Correlation of I. Q. and Teachers' Marks obtained by Freshmen in General Science and Biology----------.51

Forecast of Success or Failure in General Science and Biology

Pupils with I. Q's	Forecast of Success	Forecast of Failure
120-24	100%	70-79---75%
110-19	96%	80-89---32%
100-109	93.02%	90-99---26%
90-99	74.07%	100-109---6.98%
80-89	68%	110-19---4%
70-79	25%	120-24---0%

Forecast of Success or Failure in Biology

Pupils with I. Q's	Forecast of Success	Forecast of Failure
120-24	100%	70-79---$66^{2/3}$%
110-19	100%	80-89---45%
100-109	95%	90-99---26.3%
90-99	73.7%	100-109---5%
80-89	55%	110-19---0%
70-79	$33^{1/3}$%	120-24---0%

TABLE OF RESULTS (Continued)

Forecast of Success or Failure in General Science

Pupils with I. Q.	Forecast of Success	Forecast of Failure
120-24	100%	70-79---50%
110-119	80%	80-89---20%
100-109	95%	90-99---27%
90-99	73%	100-109---5%
80-89	80%	110-119---20%
70-79	50%	120-124---0%

CHAPTER IX

CONCLUSIONS AND RECOMMENDATIONS

The results of this study which attempted to find out whether or not aptitude for the study of the first two years of Science in High School, namely; General Science and Biology, could be predicted by means of The Terman Group Tests of Mental Ability and for which six definite objectives were set up, are as follows:

1. The Median of the Freshmen and Sophomore classes (Table I) of the Agawam High School is above those for the Country as a whole, as indicated by the table provided by the Terman Group Test of Mental Ability manual. The Median for the Juniors and Seniors (Table II) of the Agawam High School is below that of the Country as a whole. This latter condition is easily explainable because of the fact that many of the Juniors and Seniors are taking General Science in order to avoid Chemistry or Physics and probably belong to a large degree to the so-called 'Time Spent Group.'

2. The correlation of .56 (Table IV) between the I.Q. and Teachers' Marks of the whole group shows a fair degree of closeness to the results of the Table No. VI Terman Group Tests.

3. The correlation of .32 (Table VII) and .15 (Table X) in General Science indicates there is something wrong. The correlation in Biology of .64 (Table VIII), .60 (Table IX), .68 (Table XXI), and .76 (Table XII), shows an exceptionally high degree of similarity and correlation.

4. The College Group .66 (Table XV) appears to show a

CONCLUSIONS AND RECOMMENDATIONS (Continued)

much better correlation with the Teachers' Marks than either the Agricultural .43 (Table XIV) the Commercial .38 (Table or the General .28 (Table XVI).

5. The correlation of the Senior Group .68 (Table XI) is exceptionally high and the Junior Group .0 is low.

6. The Biology forecast and the Whole Group forecast seems to indicate that the Terman Group Test of Mental Ability may be used as an aptitude test for both. The General Science forecast indicates that either some desirable aptitude or aptitudes were not measured or else the Teachers' Marks were not right. The correlation between I. Q. and Mark in General Science .32 (Table VII) and .15 (Table X) appears to corroborate this. Biology having a large number of pupils and a very good correlation probably drew the poorly correlated General Science group into the Whole Group in such a way that the Whole Group appeared to be predictable, when as a matter of fact, the breaking down of the Whole Group into its parts showed General Science to be unpredictable.

It would seem to the writer then that the only conclusion which can be drawn is that the Terman Group Test of Mental Ability appear to show the possibility of forecasting Success or Failure in Biology but that the same does not hold true of General Science.

If as it appears, Biology marks can be forecast to a great degree, the value of these tests would be to serve as the basis for re-grouping the pupils so that those with low I. Q's might be given a modified form of the work in order that

CONCLUSIONS AND RECOMMENDATIONS (Continued)

they may have a higher degree of success. From a strictly individual point of view it would be extremely dangerous to predict the failure or success of any one pupil. The chances however of the individual could be estimated.

In so far as the writer can find out this is an original problem and consequently needs further study and research; particularly a tremendous increase in the number of cases to improve validity of theuse of the tests for this purpose.

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Approved by:

T. H. Wells

Date May 28, 1940

Approved by:

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Thesis Committee

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