A STATISTICAL STUDY IN RELATIVE GRADING

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By

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PREFACE

It has been the purpose of the writer to verify previous findings in subjectibe markings of the traditional or essay examination. Educators who are pioneers in testing are divided in their opinion on this problem. Although the material in this manuscript is purely experimental, the problem, which is dealt with herein, is a very important one in educational circles. The writer is unbiased in her opinion and has attempted at all times to keep a scientific attitude. No doubt the traditional examination, the new type tests and the standard tests will continue to exist side by side.

ACKNOWLEDGMENT

The writer wishes to take this opportunity to express her gratitude to Dr. Herbert P. Patterson for his advice, which has been invaluable in her search for knowledge, and to express her obligations and thanks to Dr. S. L. Reed for his untiring effort in guiding and assisting in the preparation of this manuscript.

M. K.

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CHAPTER I

THE HISTORY OF THE EXPERIMENT

The problem of variation of marks in subjective grading in the public schools and colleges has attracted the attention of educators for the past three or four decades. Numerous experiments relative to this subject have been conducted in various parts of the country. The first to arouse the most interest was a series of three experiments conducted by Starch and Elliott at the University of Wisconsin. Their first experiment dealt with the grading of high school English papers.

Two final examination papers in English, together with the questions, were obtained from one of the largest high schools in Wisconsin. Exact copies of these two papers, together with the questions, were sent to two hundred high schools in the North Central Association, with the request that the principal teacher of that particular year of English grade these papers according to the practices and standards of the school. Starch and Elliott make the following remarks on the grading:

> That the grading was done carefully is evident from the fact that, with a few exceptions separate marks and comments were given upon the answer to each question. There was a tremendously wide range of variation. The range of marks given by different teachers to the same paper may be as large as 35 or 40 points. [1]

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[1] Daniel Starch and Edward C. Elliott, "Reliability in Grading High School Work in English," School Review, Vol. 20.

Two similar experiments were conducted by Starch
and Elliott with a history and a geometry paper. The
grades for the English papers ranged from 50 to 98, for
the geometry paper from 28 to 92, and for the history
paper from 43 to 90. The range for the poorer paper in
English was wider than for the better paper, since it had
more room for variation in the upper marks. The better
paper was nearer the 100 mark and therefore it was more
limited on that side of the distribution surface.

> This investigation has established two con-
> clusions: first, that teachers differ enormously
> in evaluating the same piece of work in terms
> of the ordinary percentage scale; and second,
> that they differ as much in one subject as in
> another. They disagree as much in evaluating
> a paper in mathematics as in English or history.
> Apparently mathematical papers are not marked
> with mathematical precision any more than any
> other papers. [2]

Professor Harold Jacoby of Columbia University
made a similar investigation. He submitted eleven
astronomy papers to six professors of astronomy. Pro-
fessor Jacoby makes the following comment on the result:

> It would appear.......that the marking system is
> more precise than some critics would have us
> believe. Possibly, this may be due to the fact
> that astronomy is an exact science. [3]

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[2]

Fredrick E. Bolton, "Do Teachers' Marks Vary
as Much as Supposed?", Education, Vol. 48, September 27,
pp. 33-39.

[3]

Harold Jacoby, "Note on the Marking System in the
Astronomical Course at Columbia College," Science,
Vol. 31, p. 819.

Fredrick E. Bolton of the University of Washington, at Seattle, was very skeptical regarding the conclusions drawn by Starch and Elliott; therefore, he devised an experiment to test the validity of the conclusion that there is no reliance to be placed upon teachers' marks.

> An attempt was made to secure everyday work and to have teachers feel a certain responsibility for the grades assigned. Teachers giving instruction in the content of the examination were purposely selected instead of a heterogeneous group --------The answers were given in per cents or points, each perfect paper counting 100 points or per cent........The bulk of the variation is so slight that it is the uniformity that is striking rather than the diversity. The greatest variation in this study is found in the case of poor pupils. Evidently many teachers are more in doubt about the low grade pupil than the high grade one and hence at times give those low grade ones the benefit of the doubt. In other cases they evidently recognize that the pupil deserves a grade below passing and grade the paper hastily knowing that the grade will be below passing anyway and consequently seem to think it will not make much difference whether the grade is a little below or very far below. The ratings show very great uniformity in the case of high grade and medium pupils. [4]

Bolton, also, analyzed some of the data by Starch and Elliott and as a result claimed that they actually show decided uniformity in marking.

Another early investigation was conducted by Max Meyer of the University of Missouri,who collected the reports of forty teachers of the university during a five-year period, all with two exceptions were professors or assistant professors and most of them were connected

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4 Fredrick E. Bolton, op. cit.

with the College of Arts and Science. Meyer concluded
that:

> There is no uniformity of grading, but the
> greatest divergence...........It is admitted
> openly, that a student in order to win honors
> must select his work under certain teachers and
> avoid others. [5]

Johnson, Principal of the University High School of
Chicago, tells of a graduate class in high school ad-
ministration, composed of principals and experienced
teachers,which was to report the items which it consider-
ed as a basis for assigning marks. Forty-three indi-
viduals reported more than seventy-five items. Johnson
summarized his findings as follows:

> The whole situation would be greatly clari-
> fied if achievement were made the sole basis for
> marks. By achievement should be meant the ability
> to apply the knowledge of facts and principles and
> the skills acquired to problems appropriate to the
> subject under consideration. [6]

Another observation made by Johnson was that

> English teachers fail almost three times as
> many pupils as do domestic science teachers and
> give but half as many A's. A pupil's chance
> of getting an A in German is approximately twice
> as great as his getting one in French. [7]

In connection with this topic of variation of
grades, Wood [8] relates an interesting incident. One of

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[5]
Max Meyer, "The Grading of Students," Science,
Vol. 28.

[6]
J. W. Johnson, Administration and Supervision, p. 279.

[7]
G. M. Ruch, The Improvement of the Written Exami-
nation, p. 45.

[8]
B. D. Wood, Measurement in Higher Education, p. 8.

group of college professors of history reading entrance examination papers in that subject prepared, for his own convenience, a set of what he considered model answers. This paper became mixed with the other papers and was rated by several of the group of readers. The marks given it ranged from 40 to 90 per cent although the man preparing it considered it 100 per cent.

Wood, also, gave an account of the grading of entrance examination papers in algebra and geometry by two different readers. The results show that 30 per cent were failed by each reader; the chances are less than 60 per cent of those failed by one reader will be the same as those failed by the other reader. In other words, of those failed by either reader, more than 40 per cent were passed by the other one.

Many reasons have been assigned for such variation in marks. Ruch[9] concluded: "One of the most important sources of error in the assignment arises from the fact that each teacher has her own standard of values."

Trabue[10] says:

> Each teacher may develop certain tendencies which will make her marks mean something entirely different from the marks of another teacher..... not differences in actual accomplishment of the pupils, but by differences in standards used by teachers in making their judgment......Teachers differ in the qualities they hope to test by the questions used in examining their pupils.

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[9] G. M. Ruch, Ibid.

[10] M. R. Trabue, Measuring Results in Education.

Odell[11] is of the opinion that some teachers measure their achievement, others their ability to perform, or their effort put forth, or their behavior, and other factors.

In consequence there is a difference of opinion. The following passage is a citation from Odell:

> Those who do not admit validity of the conclusions drawn maintain the marks collected and used were not assigned under ordinary school circumstances, but rather under conditions which produce much greater variation than is the case in general school practice.[12]

This quotation is also taken from Odell: [13]

> Not only has it been shown that the marks assigned are decidedly inaccurate, but also that many, if not most, examinations are given without any clear conception of their function.

On the other hand, Bolton maintains that in the marking of a single problem almost a third of the teachers agree with average rating exactly and that not more than another third differed by not over one per cent. The average variation was approximately five per cent.

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[12]
    Charles W. Odell, Op. Cit.
[13]
    Charles W. Odell, Educational Measurement in High School. pp. 439-262.

CHAPTER II

THE EXPERIMENT

The data for this experiment was secured from the seventh grade pupils of the Emerson Junior High School in Enid, Oklahoma. The test which was used was composed of twelve verbal problems; some of which involved several steps in the solution; others involved delicate decisions as is the case in verbal problems dealing with percentage. This test was given in the regular class period which was 50 minutes in length. Each paper was identified by number rather than by name. Of the eight groups of seventh grade children in this school, five groups containing 171 children took the test. Of the five groups, four were enrolled in the writer's classes and the fifth group, which was enrolled under another teacher, had been used in a previous experiment. These groups have been designated by 1, 4, 5, 7, 8. The class having the lowest mentality is indicated by 1 and the highest is indicated by 8. Therefore, the two highest groups, the two middle groups, and the lowest mentality group, were included in this experiment. As it can readily be seen, the distribution of pupils is not normal, and the curve of the distribution is skewed away from the upper portion or toward the left.

The writer (M) graded the papers according to the customs and standards of the school, and secured the

services of one other teacher (N) of the mathematics department in the same school in grading the papers. The papers were then taken to the Education Department of the Oklahoma Agricultural and Mechanical College at Stillwater, where twelve additional graders (O, P, Q, R, S, T, U, V, W, X, Y, Z) were secured from the graduate class. Of the fourteen teachers included in this experiment, two have never taught any kind of mathematics, and four others have never taught seventh grade mathematics. Of the eight remaining teachers who have taught seventh grade arithmetic, only two are teaching it at the present time. With such a wide variation of qualifications, one would expect a low coefficient of correlation between grading and regrading the papers. However, this is not true for the majority of the teachers had a coefficient of correlation above 0.90. But the coefficient of correlation between accuracy and years of service was only .09 for the teachers taking part in this experiment.

In grading the papers no marks were made upon the papers themselves, but the grades were placed upon small slips of paper having numbers corresponding to the numbers upon the papers. Each grader assigned independent numerical marks to each of the 171 papers. No grader knew the marks given by any other grader.

After a time interval of approximately one month, the graders were reconvened and cooperation was asked in a second marking of the papers. Without an exception, each grader agreed to assist in the remarking. The papers were now reduced to 100 in number. Group 1, which was the lowest in mentality, was eliminated, and a sufficient number was discarded from the beginning of each remaining group in order to have exactly 25 papers left in each of the four groups. As before the marks were placed upon slips of paper having numbers corresponding to the numbers on the papers. The results are tabulated in Table I.

The arithmetical mean, the standard deviation, and the coefficient of correlation were found for each grader. Since this group is far above normal, the normal frequency curve was skewed according to that portion of the probability integral table given by Symonds.

> In some schools there is a general tendency to skew the distribution of marks away from the higher marks, that is to give a greater percentage of A's and B's than D's and F's.......
> one could use a table of probability integral to determine the sigma limits for the different marks. The precise procedure for this will not be described here. [1]

Symonds gives this table:

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[1] Percival M. Symonds, Measurement in Secondary Education, p. 516.

A = 12% above ∓ 1.14 sigma
B = 22% from ∓ .40 sigma to ∓ 1.14 sigma
C = 42% from -.69 sigma to ∓ .40 sigma
D = 20% from -1.68 sigma to -.69 sigma
F = 4% below -1.68 sigma

By use of the above method the relative numerical grades for both gradings were converted into relative letter grades for each of the graders. In order to examine the critical points more carefully, the B's, C's and D's were subdivided into three parts, that is, B∓ B, B-; C∓, C, C-; and D∓, D, D- and the A's were subdivided into two parts A's and A-'s.

To make the horizontal grades comparable with the vertical, both the vertical and horizontal grades were tallied by orders. Perfect agreement was counted as zero order; disagreement of one-third standard deviation was counted as first order, that is, B- and C∓ or B and B-; disagreement of two-thirds standard deviation was counted as second order, that is B∓ and B-; disagreement of three-thirds standard deviation or one sigma was counted as third order, that is, C∓ and D∓. In like manner any further orders needed were counted. The number of grades of the first order was multiplied by one; those of the second order by two; those of the third order by three, etc. In this manner the amount of deviation was found for each one-third sigma or each one-third grade for both the graders and the papers.

Although arithmetic is considered an objective subject, verbal problems involving several steps were chosen to counteract this objectivity and make the test more subjective and more in harmony with the average school situation. When a pupil's decision must be made as to the number of steps involved in the solution of a problem, the attitude of the grader may be entirely different from that of one grading a drill problem. Should the pupil not have credit for knowing the steps, although the result is incorrect?

TABLE I

NUMERICAL AND RELATIVE GRADES OF 100 PAPERS

Paper No.	Grading							Grader							
		M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
43	First	60	88	75	74	75	87	86	75	79	42	75	66 2/3	83	82
		C-	B‡	B	B-	B-	B	B-	B-	B	D‡	B-	B-	C-	C‡
	Second	70	80	75	65	75	94	90	75	66	84	83 1/3	66 2/3	83	83
		C	C‡	B	C‡	B-	A-	B	B-	C‡	B‡	B	B-	B	B
44	First	70	59	70	70	50	70	72	50	58	59	50	41 2/3	73 2/3	75
		C	C-	B-	B-	C-	C‡	C	C-	C	C	C-	C-	C‡	C
	Second	72	55	45	50	43	68	72	50	42	50	75	41 2/3	66	58
		C	D‡	D‡	C-	D‡	C	C	D‡	C-	C-	B-	C-	C‡	C-
45	First	81	84	75	75	75	82	88	79	79	75	75	75	80	82
		B-	B	B	B	B-	B-	B-	B	B	B	B-	B	B-	C‡
	Second	81	84	75	70	75	87	86	75	75	75	83 1/3	75	78	88
		B-	B-	B	B-	B-	B	B-	B-	B	B-	B	B	B-	B‡
46	First	86	78	75	75	75	80	90	79	79	75	83 1/3	66 2/3	87	92
		B	B-	B	B	B-	B-	B	B	B	B-	B‡	B-	B	B
	Second	91	90	70	78	75	78	94	73	75	75	91 2/3	66 2/3	79	87
		B‡	B‡	B-	B‡	B-	B-	B‡	B-	B	B-	A-	B-	B	B
47	First	80	72	60	63	62	79	88	56	64	62	50	50	74	76
		B-	C‡	C	C‡	C	B-	B-	C	C‡	C‡	C-	C	C‡	C‡
	Second	82	78	50	60	60	79	84	57	66	58	91 2/3	66 2/3	65	76
		B-	C‡	C-	C‡	C	B-	C‡	C-	C‡	C	A-	B-	C‡	C‡
48	First	38	41	40	40	50	63	52	33	42	38	66 2/3	41 2/3	49	60
		D-	D	D‡	D‡	C-	C	D	D	D‡	D‡	C‡	C-	D‡	D‡
	Second	46	51	45	40	42½	34	54	37	33	38	41 2/3	41 2/3	42	60
		D	D	D‡	D‡	D‡	D-	D	D	D	D‡	D‡	C-	D‡	C-

TABLE I (Continued)

NUMERICAL AND RELATIVE GRADES OF 100 PAPERS

Paper No.	Grading								Grader						
		M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
49	First	98	96	90	95	92	93	96	92	92	92	91 2/3	91 2/3	95	98
		A	A-	A-	A	A-	B‡	B‡	A-	A-	A-	A-	A	B‡	B‡
	Second	97	96	92	95	92	95	97	92	92	92	83 1/3	91 2/3	96	96
		A-	A-	A-	A	A-	A-	B‡	A-	A-	A-	B	A	A-	A-
50	First	82	78	70	75	68	77	82	71	71	75	58 2/3	66 2/3	81	82
		B-	B-	B-	B	C‡	C‡	C‡	B-	C‡	B-	C	B-	B	C‡
	Second	82	80	70	63	67	71	84	69	66	75	81 1/3	66 2/3	67	78
		B-	C‡	B-	C‡	C‡	C‡	C‡	C‡	C‡	B-	B	B-	C‡	B-
51	First	65	73	75	78	75	76	76	75	75	75	75	66 2/3	71	74
		C	C‡	B	B	B-	C‡	C	B-	B-	B-	B-	B-	C	C
	Second	75	75	75	83	75	75	76	71	75	75	83 1/3	66 2/3	75	75
		C‡	C‡	B	A-	B-	C‡	C	B-	B	B-	B	B-	B-	C‡
52	First	99	96	90	93	96	94	97	96	86	96	91 2/3	91 2/3	96	98
		A	A-	A-	A-	A	A-	B‡	A	B‡	A	A-	A	A-	B‡
	Second	100	92	92	87	83	96	97	96	90	92	100	100	74	96
		A	B‡	A-	A-	B‡	A-	B‡	A	A-	A-	A	A	B-	A-
53	First	87	78	80	85	70	90	88	83	68	80	75	75	91	92
		B	B-	B‡	B‡	C‡	B‡	B-	B‡	C‡	B	B-	B	B‡	B
	Second	91	88	78	70	83	85	90	81	75	87	83 1/3	75	76	86
		B‡	B	B	B-	B‡	B	B	B‡	B	A-	B	B	B-	B
54	First	90	88	85	35	83	92	94	75	75	88	83 1/3	75	85	96
		B‡	B‡	A-	B‡	B‡	B‡	B‡	B-	B-	A-	B‡	B	B	B‡
	Second	94	88	85	80	87	87	94	79	66	83	83 1/3	75	93	96
		B‡	B	B‡	B‡	B‡	B	B‡	B	C‡	B‡	B	B	A-	A-

TABLE I (continued)

NUMERICAL AND RELATIVE GRADES OF 100 PAPERS

Paper No.	Grading	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
55	First	83	70	65	60	60	65	86	52	56	71	50	50	80	91
		B-	C+	C+	C	C	C	B-	C	C	B-	C-	C	B-	B
	Second	95	72	60	58	54	72	84	65	50	50	83 1/3	50	77	76
		B+	C	C	C	C	C+	C+	C+	C-	C-	B	C	B-	C+
56	First	61	50	35	37	35	56	62	37	46	40	33 1/3	33 1/3	60	66
		C-	D+	D	D	D	C-	D+	D+	D+	D+	D	D+	C-	C-
	Second	66	65	35	45	35	46	60	35	33	33	50	33 1/3	37	52
		C	C-	D	C-	D	D+	D+	D	D	D	C-	D+	D	D+
57	First	93	90	85	80	83	90	94	87	87	84	75	83 1/3	83 1/3	96
		B+	B+	A-	B	B+	B+	B+	A-	B+	B+	B-	A-	B-	B+
	Second	92	92	83	76	87	92	94	95	83	92	91 2/3	83 1/3	85	92
		B+	B+	B+	B	B+	B+	B+	A	B+	A	A-	A-	B+	B+
58	First	68	67	65	65	55	70	68	62	62	75	58 1/3	50	71	72
		C	C	C+	C+	C	C+	C-	C+	C	B-	C	C	C	C
	Second	73	66	65	50	60	76	74	63	58	67	66 2/3	58 1/3	64	69
		C+	C-	C+	C-	C	C+	C	C	C	C+	C+	C+	C	C
59	First	83	77	75	78	70	84	82	79	79	84	75	75	81 1/3	81
		B-	B-	B	B	C+	B	C+	B	B	B+	B-	B	B-	C
	Second	93	79	70	68	79	82	80	77	75	83	83 1/3	75	80	75
		B+	C+	B-	B-	B	B-	C+	B	B	B+	B	B	B	C+
60	First	25	20	25	30	17	32	38	17	17	25	25	25	14 2/3	32
		F	F	D-	D-	F	D-	F	F	F	D-	D-	D-	F	F
	Second	24	20	25	26	17	25	34	25	17	25	25	25	17	40
		F	F	F	D-	F	F	F	D-	F	D-	F	D	F	D-

TABLE I (continued)

NUMERICAL AND RELATIVE GRADES OF 100 PAPERS

Paper No.	Grad-ing							Grader							
		M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
61	First	61	80	70	68	70	84	82	67	50	71	66 2/3	66 2/3	60	92
		C-	B-	B-	C‡	C‡	B	C‡	C‡	C-	B-	C‡	B-	C-	B
	Second	83	58	75	53	68	57	84	67	66	66	66 2/3	66 2/3	50	83
		B-	D‡	B	C	C‡	C-	C‡	C‡	C‡	C‡	C‡	B-	C-	B
62	First	84	79	75	75	75	87	82	75	75	75	75	66 2/3	75	79
		B	B-	B	B	B-	B	C‡	B-	B-	B-	B-	B-	C‡	C‡
	Second	80	88	75	63	75	76	82	75	75	75	75	66 2/3	79	75
		B-	B	B	C‡	B-	C‡	C‡	B-	B	B-	B-	B-	B	C‡
63	First	76	62	35	40	55	50	66	39	45	45	33 1/3	33 1/3	81	76
		C	C	D	D‡	C	D‡	C-	D‡	D‡	C-	D	D‡	D-	C‡
	Second	64	63	50	35	42	56	76	43	33	33	58 1/3	33 1/3	55	55
		C-	C-	C-	D	D‡	C-	C‡	D‡	D	D	C	D‡	C-	D‡
64	First	97	89	90	93	92	95	97	92	92	100	83 2/3	83 2/3	95	98
		A-	A	A-	A-	A-	A-	B‡	A-	A-	A	B‡	A-	B‡	B‡
	Second	96	96	92	82	95	100	97	92	92	92	100	83 1/3	96	95
		B‡	A-	A-	B‡	A	A	B‡	A-	A-	A-	A	A-	A	A-
65	First	82	65	65	60	60	61	82	64	66	62	58 2/3	58 1/3	78 1/3	82
		B-	C	C‡	C	C	C-	C‡	C‡	C‡	C‡	C	C‡	C‡	C‡
	Second	82	75	60	60	60	68	82	64	58	58	66 2/3	58 1/3	75	73
		B-	C‡	C	C‡	C	C	C‡	C	C	C	C‡	C‡	B-	C‡
66	First	87	52	70	70	70	80	84	64	66	54	58 1/3	58 1/3	84	85
		B	D‡	B-	B-	C	B-	C‡	C‡	C‡	C	C	C‡	B-	B-
	Second	86	67	70	63	64	74	82	58	58	58	65	58 1/3	77	80
		B	C	B-	C‡	C‡	C‡	C‡	C-	C	C	B-	C‡	B-	B-

TABLE I (continued)

NUMERICAL AND RELATIVE GRADES OF 100 PAPERS

Paper No.	Grading	Grader													
		M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
67	First	78 C‡	75 C‡	65 C‡	68 C‡	75 B-	69 C	78 C‡	67 C‡	69 B	71 B-	75 B-	66 2/3 B-	83 1/3 B-	88 B-
	Second	78 C‡	75 C‡	70 B-	60 C‡	75 B-	72 C‡	86 B-	69 C‡	75 B	66 C‡	83 1/3 B	66 2/3 B-	72 C‡	83 1/3 B
77	First	65 C	62 C	40 D‡	45 D‡	55 C	50 D‡	76 C	54 C	58 C	50 C-	50 C-	41 2/3 C-	54 D‡	79 C‡
	Second	69 C	60 C-	50 C-	53 C	50 C-	55 C-	68 C-	50 D‡	50 C-	50 C-	66 2/3 C‡	50 C	55 C-	70 C
78	First	98 A	96 A-	90 A-	93 A-	92 A-	93 B‡	97 B‡	92 A-	92 A-	91 2/3 A-	83 1/3 B‡	91 2/3 A	95 B‡	98 B‡
	Second	96 B‡	96 A-	92 A-	90 A-	92 A-	92 B‡	95 B‡	92 A-	92 A-	92 A-	100 A	91 2/3 A	95 A	96 A-
79	First	69 C	60 C-	45 D‡	50 C-	50 C-	50 D‡	74 C	46 C-	56 C	46 C-	33 1/3 D	33 1/3 D‡	59 C-	73 C
	Second	71 C	68 C	50 C-	53 C	45 C-	55 C-	70 C-	46 D‡	42 C-	50 C-	58 1/3 C	41 2/3 C-	50 C-	63 C
80	First	2 F	0 F	10 F	12 F	0 F	0 F	5 F	0 F	0 F	0 F	0 F	0 F	0 F	8 F
	Second	2 F	13 F	10 F	12 F	0 F	0 F	5 F	0 F	0 F	0 F	0 F	0 F'	0 F	0 F
81	First	56 D‡	49 D‡	35 D	35 D	42 D‡	60 C-	58 D	38 D‡	49 C-	41 2/3 D‡	33 1/3 D	33 1/3 D‡	40 D-	53 D
	Second	55 D‡	42 D-	35 D	35 D	42 D‡	50 D‡	58 D‡	37 D	33 D	37 D‡	50 C-	33 1/3 D‡	47 D‡	62 C-

TABLE I (continued)

NUMERICAL AND RELATIVE GRADES OF 100 PAPERS

Paper No.	Grading	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
82	First	30 F	20 F	10 F	15 F	17 F	20 F	38 F	10 F	16 2/3 F	16 2/3 F	8 1/3 F	8 1/3 F	10 F	30 F
82	Second	33 F	34 F	10 F	12 F	9½ F	23 F	34 F	12 F	8 1/3 F	8 1/3 F	17 1/3 F	8 1/3 F	10 F	25 F
83	First	63 C-	55 C-	45 D∓	45 D∓	50 C-	50 D∓	62 D∓	42 D∓	50 C-	46 C-	41 2/3 D∓	58 1/3 C∓	49 D∓	64 C-
83	Second	64 C-	55 D∓	40 D	45 C-	50 C-	47 D∓	94 B∓	50 D∓	42 C-	43 C-	41 2/3 D	41 2/3 C-	46 D∓	63 C
84	First	71 C∓	76 B-	65 C∓	68 C∓	65 C∓	75 C∓	82 C∓	64 C∓	68 C∓	63 C∓	50 C-	58 1/3 C∓	70 C	21 F
84	Second	82 B-	80 C∓	60 C	55 C	67 C∓	70 C∓	82 C∓	61 C	58 C	66 2/3 C∓	83 1/3 B	58 1/3 C∓	67 C∓	78 B
85	First	36 F	35 D-	25 D-	25 D-	25 D-	50 D∓	48 D-	29 D	31 D-	25 D-	33 1/3 D	25 D-	51 D∓	45 D-
85	Second	34 F	45 D-	35 D	38 D∓	25 D-	20 F	46 D-	25 D-	25 D-	25 D-	25 F	25 D	38 D	44 D
86	First	61 C-	42 D	35 D	38 D	21 F	50 D∓	66 C-	31 D	39 D	29 D	25 D-	25 D-	53 D∓	67 C-
86	Second	70 C	55 D∓	30 D-	33 D	33 D	50 D∓	62 D∓	31 D	25 D-	29 D	58 1/3 C	25 D	47 D∓	47 D
87	First	75 C∓	67 C	50 C-	53 C-	70 C∓	74 C∓	86 B-	66 C∓	64 C∓	58 1/3 C	58 C-	50 C	68 C	92 B
87	Second	75 C∓	84 B-	50 C-	53 C	67 C∓	85 B	74 C	58 C-	42 C-	47 C-	66 2/3 C∓	50 C	63 C	84 B

TABLE I (continued)

NUMERICAL AND RELATIVE GRADES OF 100 PAPERS

Paper No.	Grading	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
88	First	78 C‡	60 C-	50 C-	55 C	47 C-	60 C-	74 C	44 C-	60 C	35 D	41 2/3 D‡	41 1/3 C-	60 C-	73 C
	Second	78 C‡	72 C	45 D‡	45 C-	42 D‡	50 D‡	70 C-	46 D‡	42 C-	43 D‡	58 1/3 C	41 1/3 C-	46 D‡	63 C
89	First	73 C‡	60 C-	60 C	60 C	50 C-	45 D	70 C-	58 C	58 C	41 2/3 D‡	58 1/3 C	50 C	62 C-	73 C
	Second	67 C	70 C	50 C-	53 C	50 C-	58 C-	66 C-	58 C-	50 C-	50 C-	58 1/3 C	50 C	54 C-	78 B-
91	First	72 C‡	60 C-	45 D‡	45 D‡	35 D	55 C-	82 C‡	54 C	56 C	41 1/3 D‡	41 1/3 D‡	41 2/3 C-	70 C	80 C‡
	Second	74 C‡	64 C-	45 D‡	43 D‡	50 C-	57 C-	80 C‡	44 D‡	42 C-	50 C-	58 1/3 C	33 1/3 D‡	56 C	66 C
92	First	40 D-	32 F	25 D-	28 D-	17 F	36 D-	56 D	29 D	33 D	25 D-	33 1/3 D	25 D-	33 F	50 D
	Second	20 F	40 F	25 F	25 D-	30 D	33 D-	42 F	25 D-	25 D-	25 D-	33 2/3 D-	25 D	30 D-	39 D-
93	First	78 C‡	60 C-	60 C	63 C‡	55 C	50 C-	84 C‡	56 C	64 C‡	58 1/3 C	50 C-	41 2/3 C-	69 C	82 C‡
	Second	77 C‡	68 C	55 C	58 C	58 C	65 C	80 C‡	41 D	50 C-	50 C-	66 2/3 C‡	33 1/3 D‡	61 C	66 C
94	First	48 D	33 D-	25 D-	25 D-	33 D	38 D-	52 D-	27 D-	37 D	33 1/3 D	25 D-	25 D-	43 D	52 D
	Second	45 D	45 D-	20 F	25 D-	29 D	35 D-	50 D-	33 D	25 D-	25 D-	25 F	25 D	57 C	38 D

TABLE I (continued)

NUMERICAL AND RELATIVE GRADES OF 100 PAPERS

Paper No.	Grading	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
95	First	64 C	48 D‡	35 D	40 D‡	38 D	32 D-	70 C-	32 D	45 D‡	41 2/3 D‡	41 2/3 D‡	25 D-	57 C-	66 C-
	Second	67 C	60 C-	35 D	38 D‡	33 D	43 D	68 C-	41 D	25 D-	25 D-	41 2/3 D-	25 D	49 C-	47 D‡
96	First	27 F	29 F	20 F	18 F	17 F	20 F	40 F	21 D-	25 F	16 2/3 F	25 D-	16 2/3 F	21 F	26 F
	Second	35 F	38 F	25 F	30 D-	17 F	25 F	38 F	25 D-	17 F	16 2/3 F	17 1/3 F	16 2/3 D-	13 F	33 F
97	First	55 D‡	48 D‡	35 D	35 D	38 D‡	45 D	68 C-	33 D	43 D‡	54 C	33 1/3 D‡	33 1/3 D‡	43 D	67 C-
	Second	52 D‡	72 C	35 D	38 D‡	33 D	60 C	56 D	33 D	33 D	33 1/3 D	41 2/3 D	33 1/3 D‡	37 D	48 D
98	First	75 C‡	62 C	45 D‡	48 C-	50 C-	60 C-	84 C‡	50 C-	52 C-	45 C-	41 2/3 D‡	41 2/3 C-	55 D‡	83 C‡
	Second	76 C‡	72 C	45 D‡	50 C-	54 C	64 C	80 C‡	50 D‡	42 C-	33 1/3 D	50 C-	41 2/3 C-	53 C-	62 C-
99	First	44 D	37 D-	20 F	20 F	33 D	40 D	54 D	27 D-	33 D	29 D	25 D-	25 D-	32 F	70 C
	Second	48 D	47 D	30 D-	30 D-	33 D	38 D	44 F	25 D-	25 D-	25 D-	41 2/3 D	25 D	36 D	34 F
100	First	92 B‡	88 B‡	60 C	60 C	75 B-	90 B‡	90 B	81 B‡	83 B‡	66 2/3 C‡	75 B-	66 2/3 B-	80 B-	95 B‡
	Second	91 B‡	84 B-	70 B-	73 B	85 B-	86 B	90 B	62 C	66 C‡	75 B-	83 1/3 B	66 2/3 B-	78 B-	86 B‡

TABLE I (continued)

NUMERICAL AND RELATIVE GRADES OF 100 PAPERS

Paper No.	Grading						Grader								
		M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
101	First	88	80	70	73	75	75	90	75	81	66 2/3	83 1/3	66 2/3	81	93
		B	B-	B-	B-	B-	C‡	B	B-	B	C‡	B‡	B-	B-	B
	Second	82	84	75	79	79	84	90	71	66	75	91	66 2/3	75	80
		B-	B-	B	B‡	B	B	B	B-	C‡	B-	A-	B-	B-	B-
102	First	75	75	70	65	80	78	86	68	81	75	75	66 2/3	74	86
		C‡	C‡	B-	C‡	B	YB-	B-	C‡	B	B-	B-	B-	C‡	B-
	Second	82	80	75	78	85	80	82	75	75	75	75	66 2/3	75	80
		B-	C‡	B	B‡	B‡	B-	C‡	B-	B	B	B-	B	B-	B-
112	First	40	34	30	35	33	38	46	35	33	35	25	25	29	47
		D-	D-	D-	D	D	D-	F	D‡	D	D	D-	D-	F	D
	Second	40	39	40	38	37	36	46	37	33	33	17	25	30	42
		D-	F	D	D‡	D‡	D-	D	D	D	D	F	D	D-	D-
113	First	49	55	55	50	43	55	66	44	50	45	41 2/3	41 2/3	51	63
		D	C-	C	C-	D‡	C-	C-	C-	C-	C-	D‡	C-	D‡	C-
	Second	62	57	45	45	42	58	64	52	42	43	33 1/3	41 2/3	50	52
		C-	D‡	D‡	C-	D‡	C-	C-	D‡	C-	C-	D-	C-	C-	D‡
114	First	69	61	60	60	60	60	70	58	62	58 1/3	66 2/3	58 1/3	67	50
		C	C	C	C‡	C	C-	C-	C-	C	C	C‡	C‡	C	D
	Second	68	67	60	63	50	60	70	58	58	58	91 2/3	58 1/3	51	66
		C	C	C	C‡	C-	C	C-	C	C	C	A-	C‡	C-	C
115	First	22	34	20	25	17	40	48	12	22	45	41 2/3	8 1/3	30	68
		F	D-	F	D-	F	D	D-	F	F	C-	D‡	F	F	C-
	Second	29	58	20	0	25	40	40	20	8 1/3	16 2/3	58 2/3	8 1/3	15	40
		F	D‡	F	F	D	D	F	F	F	F	C	F	F	D-

TABLE I (continued)

NUMERICAL AND RELATIVE GRADES OF 100 PAPERS

Paper No.	Grading	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
117	First	95	96	90	85	92	95	97	92	87	83 1/3	100	91 2/3	95	98
		A-	A-	A-	BŦ	A-	A-	BŦ	A-	BŦ	BŦ	A	A	BŦ	BŦ
	Second	96	96	90	90	96	95	96	92	83	83	91 2/3	91 2/3	94	96
		BŦ	A-	A-	A-	A	A-	BŦ	A-	BŦ	BŦ	A-	A	A-	A-
118	First	58	51	45	45	50	46	78	44	50	16 2/3	41 2/3	50	59	48
		C-	DŦ	DŦ	DŦ	C-	D	C	C-	C-	F	DŦ	C	C-	D
	Second	58	55	50	45	50	60	56	50	42	43	41 2/3	41 2/3	50	50
		C-	DŦ	C-	C-	C-	C	D	DŦ	C-	C-	D	C-	C-	DŦ
119	First	69	49	40	43	43	45	70	37	47	20	33 1/3	33 1/3	58	73
		C	DŦ	DŦ	DŦ	DŦ	D	C-	DŦ	DŦ	F	D	DŦ	C-	C
	Second	68	59	50	33	42	58	68	43	33	33 1/3	50	33 1/3	44	65
		C	DŦ	C-	D	DŦ	C-	C-	DŦ	D	D	C-	DŦ	DŦ	C
120	First	82	84	65	60	80	80	90	77	79	79	66 2/3	66 2/3	71	90
		B-	B	CŦ	C	B	B-	B	B	CŦ	B-	B-	B-	B	CŦ
	Second	78	88	70	65	80	80	86	75	66	75	75	66 2/3	79	77
		CŦ	B	B-	CŦ	B	B-	B-	B-	CŦ	B-	B-	B-	B	CŦ
121	First	59	64	45	45	45	53	74	48	50	45	41 2/3	41 2/3	58	58
		C-	C	DŦ	DŦ	C-	DŦ	C	C-	C-	C-	DŦ	C-	C-	dŦ
	Second	65	64	45	45	46	52	70	46	42	43	50	41 2/3	46	54
		C	C-	DŦ	C-	C-	C-	C-	DŦ	C-	C-	C-	C-	DŦ	DŦ
122	First	99	96	90	93	92	100	95	95	99	95	83 1/3	100	98	96
		A	A-	A-	A-	A-	A	BŦ	A	A	A	BŦ	A	A	BŦ
	Second	99	98	85	83	100	95	96	100	92	95	100	100	100	98
		A-	A	BŦ	A-	A	A-	BŦ	A	A-	A	A	A	A	A

TABLE I (continued)

NUMERICAL AND RELATIVE GRADES OF 100 PAPERS

Paper No.	Grading	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
123	First	40 D-	24 F	10 F	12 F	8½ F	23 F	42 F	12 F	14 F	13 F	8 1/3 F	12 1/2 F	23 F	30 F
123	Second	36 F	32 F	15 F	32 D	17 F	24 F	40 F	12 F	8 F	8 1/3 F	58 1/3 C	8 1/3 F	14 F	43 D
124	First	14 F	43 D	25 D-	30 D-	17 F	30 F	36 F	25 D-	21 F	16 2/3 F	16 2/3 F	16 1/2 F	12 F	48 D
124	Second	17 F	46 D-	20 F	15 F	25 D-	34 D-	44 F	17 F	17 F	16 2/3 F	25 F	16 2/3 F	18 F	43 D
125	First	45 D	38 D-	25 D-	25 D-	37 D∓	48 D∓	48 D-	25 D-	25 F	33 D	25 D-	29 1/6 D	25 F	45 D-
125	Second	43 D-	42 D-	25 F	30 D-	38 D∓	0 F	50 D-	29 D-	33 D	33 1/3 D	58 1/3 C	16 2/3 D-	40 D∓	30 F
126	First	68 C	65 C	60 C	60 C	58 C	60 C-	64 D∓	58 C	54 C-	58 C	41 2/3 D∓	74 1/3 B	55 D∓	59 D∓
126	Second	60 C-	42 D-	45 D∓	56 C	58 C	60 C	46 D-	58 C-	58 C	58 C	50 C	58 1/3 C∓	59 C	53 D∓
127	First	79 B-	88 B∓	60 C	63 C∓	53 C-	77 C∓	88 B-	68 C∓	74 B-	75 B-	75 B-	58 1/3 C∓	72 C∓	67 C-
127	Second	78 C∓	80 C∓	60 C	60 C∓	67 C∓	73 C∓	82 C∓	66 C∓	58 C	66 2/3 C∓	58 1/3 C	58 1/3 C∓	80 B	75 C∓
128	First	68 C	61 C	50 C-	55 C	60 C	55 C-	54 D∓	54 C	54 C-	62 C∓	75 B-	33 1/3 D∓	55 D∓	46 D-
128	Second	65 C	67 C	70 B-	50 C-	46 C-	55 C-	66 C-	54 C-	50 C-	50 C-	66 2/3 C∓	50 C	50 C-	64 C

TABLE I (continued)

NUMERICAL AND RELATIVE GRADES OF 100 PAPERS

Paper No.	Grading	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
129	First	46 D	40 D	20 F	20 F	27 D-	20 F	50 D-	29 D	28 D-	33 1/3 D	16 2/3 F	25 D-	43 D	48 D
	Second	47 D	42 D-	30 D-	30 D-	33 D	25 F	52 D	29 D-	25 D-	28 D-	25 F	25 D	43 D∓	44 D
130	First	56 D∓	46 D∓	25 D-	30 D-	35 D	22 F	54 D	25 D-	25 F	30 D	33 1/3 D	55 C	43 D	36 F
	Second	51 D∓	49 D∓	30 D-	35 D	25 D-	36 D-	58 D∓	29 D-	33 D	25 D-	33 1/3 D-	25 D	25 D-	34 F
131	First	67 C	71 C∓	55 C	58 C	60 C	87 B	68 C-	71 B-	58 C	54 C	66 2/3 C∓	66 2/3 B-	72 C∓	34 F
	Second	72 C	72 C	60 C	63 C∓	76 C∓	82 B-	78 C∓	67 C∓	66 C∓	66 2/3 C∓	58 1/3 C	58 1/3 C∓	72 2/3 C∓	71 C∓
132	First	76 C∓	72 C∓	45 D∓	45 D∓	53 C-	62 C	84 C∓	50 C-	62 C	66 2/3 C∓	41 2/3 D∓	50 C	70 C	67 C-
	Second	74 C∓	74 C∓	50 C-	50 C-	58 C	75 C∓	82 C∓	56 C-	42 C-	43 C-	66 2/3 C∓	33 1/3 D∓	70 C	63 C
133	First	49 D	66 C	40 D∓	45 D∓	42 D∓	45 D	68 C-	41 D∓	37 D	45 C-	33 1/3 D	33 1/3 D∓	53 D∓	58 D∓
	Second	54 D∓	53 D∓	40 D∓	40 D∓	42 D∓	68 C	62 D∓	52 D∓	33 D	33 1/3 D	33 1/3 D-	33 1/3 D∓	44 D∓	50 D∓
134	First	68 C	66 C	50 C-	60 C	60 C∓	62 C	80 C∓	62 C∓	62 C	62 C∓	50 C-	50 C	67 C	80 C∓
	Second	73 C∓	76 C∓	60 C	50 C-	58 C	54 C-	66 C-	58 C-	50 C-	54 C	66 2/3 C∓	50 C	60 C	56 C-

TABLE I (continued)

NUMERICAL AND RELATIVE GRADES OF 100 PAPERS

Paper No.	Grading	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
135	First	85	82	60	60	60	67	84	62	66	72	66 2/3	58 1/3	65	74
		B	B	C	C	C	C	C‡	C‡	C‡	B-	C‡	C‡	C	C
	Second	80	84	60	58	67	75	82	66	58	59	66 2/3	58 1/3	67	72
		B-	B-	C	C	C‡	C‡	C‡	C‡	C	C	C‡	C‡	C‡	C‡
136	First	30	43	25	25	29	50	50	29	29	30	25		25	40	33
		F	D	D-	D-	D-	D‡	D-	D	D-	D	D-		D-	D-	F
	Second	29	54	33	26	29	37	50	29	25	25	33 1/3	25	29	48
		F	D‡	D-	D-	D	D	D-	D-	D-	D-	D-	D	D-	D
137	First	72	78	70	75	75	87	80	75	75	75	66 3/2	66 2/3	78	84
		C‡	B-	B-	B	B-	B	C‡	B-	B-	B-	C‡	B-	C‡	B-
	Second	85	84	75	53	25	78	90	75	66	66 2/3	58 1/3	66 2/3	70	75
		B-	B-	B	C	D-	B-	B	B-	C‡	C‡	C	B-	C‡	C‡
147	First	98	100	98	100	100	100	100	100	100	100	100	91 2/3	100	99
		A	A	A	A	A	A	A	A	A	A	A	A	A	A-
	Second	100	100	98	100	100	100	100	100	100	100	100	91 2/3	100	100
		A	A	A	A	A	A	A	A	A	A	A	A	A	A
148	First	91	90	75	80	83	86	95	83	84	75	83 1/3	75	87	92
		B‡	B‡	B	B	B‡	B	B‡	B‡	B‡	B-	B‡	B	B	B
	Second	94	96	75	83	84	72	96	83	83	75	83 1/3	75	84	91 2/3
		B‡	A-	B	A-	B‡	C‡	B‡	B‡	B‡	B-	B	B	B‡	B‡
149	First	80	82	75	70	75	80	92	79	79	84	83 1/3	75	88	69
		B-	B	B	B-	B-	B-	B	B	B	B‡	B‡	B	B	C
	Second	80	88	75	75	79	78	88	79	75	83	75	75	70	79
		B-	B	B	B	B	B-	B-	B	B	B‡	B-	B	C‡	B-

TABLE I (continued)

NUMERICAL AND RELATIVE GRADES OF 100 PAPERS

Paper No.	Grading	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
150	First	83 B-	68 C‡	60 C	65 C‡	58 C	67 C	86 B-	68 C‡	68 C‡	62 C‡	58 1/3 C	58 1/3 C‡	70 C	74 C
	Second	74 C‡	60 C-	60 C	56 C	58 C	75 C‡	86 B-	62 C	58 C	66 2/3 C‡	58 1/3 C	58 1/3 C‡	73 B-	63 C
151	First	85 B	88 B‡	80 B‡	80 B	83 B‡	85 B	88 B-	75 B-	87 B‡	88 A-	83 1/3 B‡	75 B	87 B	90 B
	Second	88 B	88 B	85 B‡	83 A-	86 B‡	92 B‡	90 B	83 B‡	83 B‡	83 B‡	83 1/3 B	75 B	86 B‡	86 B
152	First	76 C‡	82 B	60 C	60 C‡	60 C	70 C‡	86 B-	58 C	64 C‡	60 C	58 1/3 C	50 C	74 C‡	92 B
	Second	75 C‡	80 C‡	65 C‡	59 C	67 C‡	69 C‡	82 C‡	62 C	58 C	58 C	66 2/3 C‡	50 C	65 C‡	75 C‡
153	First	89 B‡	92 B‡	80 B‡	80 B	90 A-	88 B‡	94 B‡	83 B‡	87 B‡	75 B-	83 1/3 B‡	83 1/3 A-	89 B	91 B
	Second	90 B	92 B‡	90 A-	82 B‡	84 B‡	88 B‡	97 B‡	83 B‡	83 B‡	83 B‡	75 B-	83 1/3 A-	84 B‡	90 B‡
154	First	81 B-	92 B‡	80 B‡	80 B	92 A-	93 B‡	94 B‡	83 B‡	96 A	92 A-	91 2/3 A-	83 1/3 A-	92 B‡	89 B
	Second	86 B	96 A-	90 A-	90 A-	92 A-	96 A-	95 B‡	92 A-	92 A-	92 A-	91 2/3 A-	83 1/3 A-	92 A-	94 A-
155	First	98 A	100 A	98 A	100 A	100 A	100 A	100 A	100 A	100 A	100 A	100 A	100 A	100 A	100 A
	Second	100 A	100 A	98 A	98 A	100 A	100 A	100 A	100 A	100 A	100 A	100 A	100 A	95 A-	98 A

TABLE I (continued)

NUMERICAL AND RELATIVE GRADES OF 100 PAPERS

Paper No.	Grading	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
156	First	60	72	40	45	60	60	82	50	54	54	41 2/3	50	67	84
		C-	C∓	D-	D∓	C	C-	C∓	C-	C-	C	D∓	C	C	B-
	Second	69	68	50	54	50	56	84	50	50	58	41 2/3	50	48	70
		C	C	C-	C	C-	C-	C∓	D∓	C-	C	D∓	C	C-	C
157	First	70	70	60	58	60	66	84	58	54	50	58 2/3	50	67	76
		C	C∓	C	C	C	C	C∓	C	C-	C-	C	C	C	C∓
	Second	76	76	60	53	58	64	80	58	50	58	58 1/3	50	51	75
		C∓	C∓	C	C	C	C	C∓	C-	C-	C	C	C	C-	C∓
158	First	86	90	80	83	83	84	95	83	83	84	83 1/3	75	88	82
		B	B∓	B∓	B∓	B∓	B	B∓	B∓	B∓	B∓	B∓	B	B	C∓
	Second	84	92	85	80	92	84	95	83	83	75	83 1/3	75	83	83
		B-	B∓	B∓	B∓	B∓	B	B∓	B∓	B∓	B-	B	B	B	B
159	First	91	92	90	95	92	93	95	87	89	92	91 2/3	83 1/3	97	92
		B∓	B∓	A-	A	A-	B∓	B∓	A-	A-	A-	A-	A-	A-	B
	Second	94	92	85	90	86	85	94	83	92	92	100	83 1/3	92	93
		B∓	B∓	B∓	A-	B∓	B	B∓	B∓	A-	A-	A	A-	A-	A-
160	First	83	80	70	75	67	81	84	70	71	75	75	66 2/3	78	80
		B-	B-	B-	B	C∓	B-	C∓	B-	C∓	B-	B-	B-	C∓	C∓
	Second	85	80	70	65	71	75	86	71	66 2/3	58	75	66 2/3	73	79
		B-	C∓	B-	C∓	B-	C∓	B-	B-	C∓	C	B-	B-	B-	B-
161	First	81	79	70	70	75	80	82	79	81	84	75	66 2/3	80	79
		B-	B-	B-	B-	B-	B-	C∓	B	B∓	B∓	B-	B-	B-	C∓
	Second	79	79	75	65	79	80	82	79	75	83	75	66 2/3	79	75
		C∓	C∓	B	C∓	B	B-	C∓	B	B	B∓	B-	B-	B	C∓

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TABLE I (continued)

NUMERICAL AND RELATIVE GRADES OF 100 PAPERS

Paper No.	Grad-ing	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
162	First	75	77	60	65	60	74	82	62	66	62	50	50	82	77
		C+	B-	C	C+	C	C+	C+	C+	C+	C+	C-	C	B+	C-
	Second	79	78	60	53	67	77	88	62	50	62	83 1/3	50	62	82
		C+	C+	C	C	C-	B-	B-	C	C-	C+	B	C	C	B-
163	First	86	92	75	75	92	94	95	88	87	84	83 1/3	83 1/3	96	96
		B	B+	B	B	A-	A-	B+	A-	B+	B+	B+	A-	A-	B+
	Second	90	88	75	82	82	90	95	83	75	92	83 1/3	83 1/3	87	92
		B	B	B	B+	B+	B+	B+	B+	B	A-	B	A-	B+	B+
164	First	74	80	70	70	73	74	90	70	74	70	75	66 2/3	65	92
		C+	B-	B-	B-	B-	C+	B	B-	B-	C+	B-	B-	C+	B
	Second	83	82	70	63	75	74	88	71	66 2/3	66 2/3	83 1/3	66 2/3	68	78
		B-	B-	B-	C+	B-	C+	B-	B-	C+	C+	B	B-	C+	B-
165	First	84	88	65	68	75	78	92	69	79	80	66 2/3	66 2/3	86	92
		B	B+	C+	C+	B-	B-	B	C+	B	B	C+	B-	B	B
	Second	77	88	75	63	75	82	92	75	75	75	75	66 2/3	80	85
		C+	B	B	C+	B-	B-	B	B-	B	B-	B-	B-	B	B
166	First	88	92	80	75	92	92	94	91	91	88	91 2/3	75	92	98
		B	B+	B+	B	A-	B+	B+	A-	A-	A-	A-	B	B+	B+
	Second	96	92	85	82	85	90	95	83	92	83	100	83 1/3	78	92
		B+	B+	B+	B+	B+	B+	B+	B+	A-	B+	A	A-	B-	B+
167	First	86	92	85	88	92	93	95	87	87	88	91 2/3	75	93	97
		B	B+	A-	A-	A-	B+	B+	A-	B+	A-	A-	B	B+	B+
	Second	93	92	85	85	92	90	95	87	83	88	81 2/3	75	92	90
		B+	B+	B+	A-	A-	B+	B+	A-	B+	A-	A-	B	A-	B+

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TABLE I (continued)

NUMERICAL AND RELATIVE GRADES OF 100 PAPERS

Paper No.	Grading	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
168	First	68 C	63 C	50 C-	53 C-	54 C	68 C	76 C	50 C-	50 C-	33 1/3 D	58 2/3 C	50 C	48 D‡	79 C‡
	Second	66 C	80 C‡	55 C	25 D-	50 C-	70 C‡	80 C‡	58 C-	50 C-	33 1/3 D	66 2/3 C‡	41 2/3 C-	53 C-	72 C‡
169	First	91 B‡	96 A-	80 B‡	80 B	85 B‡	85 B	95 B‡	87 A-	87 B‡	88 A-	83 1/3 B‡	75 B	80 B-	96 B‡
	Second	97 A-	92 B‡	75 B	83 A-	86 B‡	88 B‡	94 B‡	87 A-	92 A-	92 A-	91 2/3 A-	75 B	95 A-	88 B‡
170	First	79 B-	88 B‡	75 B	73 B-	75 B-	89 B‡	92 B	70 B-	70 C‡	75 B-	91 2/3 A-	75 B	80 B-	95 B‡
	Second	89 B	80 C‡	75 B	73 B	75 B-	88 B‡	90 B	75 B-	66 C‡	66 2/3 C‡	83 1/3 B‡	75 B	60 C	70 C
171	First	89 B‡	92 B‡	80 B‡	85 B‡	92 A-	95 A-	95 B‡	87 A-	75 B-	96 A	91 2/3 A-	83 1/3 A-	94 B‡	97 B‡
	Second	86 B	96 A-	75 B	95 A	82 B‡	93 B‡	95 B‡	92 A-	92 A-	92 A-	91 2/3 A-	83 1/3 A-	95 A-	92 B‡

TABLE II

SUMMARY OF GRADING

	Grad-ing	Grader						
		M	N	O	P	Q	R	S
Mean	First	70.25	68.3	59.65	60.35	61.05	67.65	76.20
	Second	72.05	71.7	60.65	57.8	60.25	66.85	76.05
Sigma	First	20.25	21.4	21.15	21.95	24.20	21.80	18.20
	Second	21.10	19.3	21.65	21.45	23.5	22.80	19.20
Correlation (r)		.98	.84	.92	.87	.83	.91	.97
Correlation between ave. and each grader		.95	.95	.97	.96	.89	.90	.94
Years taught in arithmetic		12	10	4		8	6	10
Years taught in other mathematics		6	1			3		

TABLE II (continued)

	Grad-ing	Grader							
		T	U	V	W	X	Y	Z	
Mean	First	59.45	61.85	60.40	58.7	55.55	70.45	73.75	
	Second	60.10	56.7	58.70	65.40	54.85	63.45	68.80	
Sigma	First	23.50	22.15	23.65	21.35	22.70	22.25	20.85	
	Second	22.85	24.05	24.75	23.30	23.45	23.40	19.90	
Correlation (r)		.97	.95	.93	.88	.91	.88	.69	Ave .90
Correlation between ave. and each grader		.97	.96	.94	.96	.95	.95	.84	Ave .95
Years taught in arithmetic		1	½		3		3	6	
Years taught in other mathematics				2				10	

TABLE III

THE DISPLACEMENT OF RELATIVE GRADES BY TEACHERS

Grade Assigned	Grading	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
A	First	8	9	12	9	15	8	2	15	9	14	11	14	6	3
	Second	6	10	9	14	9	9	2	13	12	16	18	15	13	11
B	First	33	35	28	29	22	32	37	24	29	28	27	30	32	34
	Second	36	24	35	18	31	29	36	25	18	21	29	28	28	29
C	First	37	31	26	30	38	32	39	35	38	31	27	32	34	39
	Second	38	39	25	41	32	39	38	25	45	37	32	30	34	34
D	First	14	19	27	26	16	21	15	21	15	20	29	18	17	15
	Second	10	20	21	23	23	15	15	32	18	21	12	22	18	20
F	First	8	6	7	6	9	7	7	5	9	7	6	6	11	9
	Second	10	7	10	4	5	8	9	5	7	5	9	5	7	6
Displacement for 1 Sigma	Zero Order	84	73	70	66	80	68	82	79	85	73	58	89	62	58
	First Order	16	26	29	34	19	32	17	21	15	24	39	11	38	39
	Second Order	0	1	1	0	1	0	1	0	0	3	3	0	0	2
	Third Order	0	0	0	0	0	0	0	0	0	0	0	0	0	1

TABLE III (continued)

THE DISPLACEMENT OF RELATIVE GRADES BY TEACHERS

Dis-Place-Ment- For One-Third Sigma																	
Zero Order	52	39	48	36	56	43	60	50	49	48	23		73	41	37		
First Order	44	47	45	45	36	43	28	42	36	35	42		21	37	36		
Second Order	4	9	4	15	6	7	10	6	13	12	23		6	16	19		
Third Order		3	2		1	5	1	1		2	5				5		
		4th 2	4th 1	4	6th 1	4th 2	6th 1	4th 1	2	4th 2	4th 5				5th 1		
										6th 1	5th 1				6th 1		
											6th 1				6	7th 1	
Amount of Deviation for one-Third Sigma	.5	.8	.6	.9	.6	.8	.6	.6	.7	.8	1.1		.3	.9	1.1		

TABLE IV

ABSOLUTE MARKING

Grade Assigned	Grad-ing	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
							Grader								
A	First	8	9	2	4	3	8	19	4	4	6	4	2	11	17
	Second	14	10	2	5	5	9	22	5	2	3	8	3	9	10
B	First	12	17	7	5	12	12	14	6	5	9	8	5	7	16
	Second	10	17	7	4	4	10	11	6	10	12	10	4	4	10
C	First	18	5	3	5	6	12	23	11	15	7	13	7	14	12
	Second	15	7	8	13	14	11	20	10	7	9	19	8	7	13
D	First	13	15	18	16	15	13	7	13	13	16	15	12	11	12
	Second	16	18	17	8	15	15	9	12	12	12	10	11	17	19
F	First	49	54	70	70	64	55	37	66	63	62	60	74	57	43
	Second	45	48	66	80	62	55	38	67	69	64	53	74	63	48

TABLE V

DISPLACEMENT OF RELATIVE GRADES BY PAPERS

Paper	Sigma Displacement				One-third Sigma Displacement					Ave. Deviation for 1/3 Sigma
No.	Zero Order	1st Order	2d Order	3d Order	Zero Order	1st Order	2d Order	3d Order	4th Order	
43	11	2	1		7	4	1	1	1	1
44	12	2			5	7	2			.8
45	13	1			7	7				.5
46	14				8	6				.5
47	11	3			6	7	1			.7
48	10	4			6	5	2	1		.9
49	10	4			7	7				.5
50	8	6			7	6	1			.6
51	8	6			6	4	4			.9
52	11	3			6	8				.6
53	12	2			5	4	3	2		.9
54	12	2			8	4	2			.6
55	9	5			6	3	4	1		1.2
56	10	4			6	8				.6
57	11	3			8	4	2			.5
58	13	1			8	5	1			.5
59	11	3			6	5	3			.8
60	8	6			8	6				.5
61	8	6			5	4	5			1.1
62	11	3			7	7				.5
63	7	6	1		5	4	3	1	1	1.3
64	10	4			8	4	2			.6
65	13	1			8	5	1			.5
66	7	7			5	5	3		1	1.1
67	7	7			6	7	1			.7
77	10	4			6	4	4			.9
78	9	5			7	7				.5
79	10	4			6	7	1			.7
80	14				14					0.0
81	12	2			6	7	1			.7
82	14				14					0
83	7	7			7	6		1		.7
84	12	1		1	10	2	1		6th 1	.8
85	13	1			9	3	2			.5
86	10	4			6	4	4			.9
87	12	2			5	5	4			1

TABLE V

DISPLACEMENT OF RELATIVE GRADES BY PAPERS

Paper No.	Sigma Displacement				One-third Sigma Displacement					Ave Deviation for 1/3 Sigma
	Zero Order	1st Order	2d Order	3d Order	Zero Order	1st Order	2d Order	3d Order	4th Order	
88	12	2			7	5	2			.7
89	12	2			7	5	1	1		.8
91	9	5			4	4	3	3		1.4
92	11	3			7	4	3			.8
93	14				5	9				.7
94	14				8	6				.5
95	10	4			5	6	3			.9
96	12	2			12	2				.2
97	11	3			6	5	2	1		.9
98	11	3			7	4	3			.8
99	10	4			6	4	3	1		1
100	11	3			6	1	4	1	2	1.4
101	12	2			7	6	1			.6
102	9	5			7	7				.5
112	12	2			6	7	1			.7
113	10	4			9	4	1			.5
114	13	1			7	6	1			.6
115	7	5	2		7	3	1	1	2	1.2
117	8	6			6	6	2			.6
118	7	6	1		5	6	2		1	1
119	9	5			7	4	2	1		.6
120	10	4			7	3	2	2		1
121	9	5			7	7				.5
122	11	3			7	4	3			.8
123	13	1			13	1				.1
124	9	5			9	3	2			.5
125	12	2			7	5	2			.7
126	9	5			7	2	4	1		1
127	8	6			5	6	2	1		1.2
128	9	5			5	4	4		1	.9
129	10	4			6	4	4			.9
130	10	4			5	5	3	1		1.1
131	10	3	1		6	4	2	1	5th1	.8
132	11	3			4	7	3			1
133	11	3			7	6	1			.6

TABLE V (continued)

DISPLACEMENT OF RELATIVE GRADES BY PAPERS

Paper No.	Sigma Displacement				One-third Sigma Displacement					Ave Deviation for 1/3 Sigma
	Zero Order	1st Order	2d Order	3d Order	Zero Order	1st Order	2d Order	3d Order	4th Order	
134	14				7	7				.5
135	11	3			6	5	1	2		1
136	13	1			8	5	1			.5
137	10	4			8	6				.5
147	14				13	1				.1
148	14				7	6	1			.6
149	13	1			7	6	1			.6
150	12	2			6	6	2			.8
151	13	1			6	7	1			.7
152	11	3			6	5	1	2		1
153	12	2			8	5	1			.5
154	9	5			6	6	2			.8
155	14				14					0
156	10	4			4	6	3	1		1.2
157	14				9	5				.4
158	13	1			9	4		1		.5
159	9	5			8	5	1			.5
160	9	5			8	6				.5
161	12	2			9	3	2			.5
162	12	2			8	5	1			.5
163	9	5			6	8				.6
164	10	4			8	6				.5
165	10	4			6	4	4			.9
166	9	5			6	8				.6
167	8	6			6	8				.6
168	12	2			7	5	1	1		.8
169	11	3			7	6	1			.6
170	12	2			6	4	3	1		1
171	8	6			7	5	2			.7

CHAPTER III

ANALYSIS OF DATA

The per cent mark has been the general measure of
school work for several generations. It has gained a
position of great importance, since failure, promotion
and honors are dependent upon it. Parents often show
great concern regarding the marks given their children.
In recent years the mark may be said to be on trial. Many
criticisms, especially, have been lodged against the sub-
jective mark. By the subjective mark is meant the mark
given on the traditional or essay examination into which
the teacher's personal judgment or equation has entered.
Although some investigators have concluded that teachers
siffer as much in the marking of one subject as in another,
it is generally conceded that spelling and arithmetic are
highly objective and hence, can be marked with greater
precision. However, Starch and Elliott found quite as
much variation in a geometry paper as in an English paper
and geometry is rather objective. The writer chose arith-
metic for this experiment since this is her particular
teaching field.

One criticism of the subjective mark emphasized was
the range of marks given the same paper by different
teachers when no comparison could be made to other papers
in the group. Starch and Elliott used this plan in
several of their investigations and considered the marks

obtained as absolute marks while Bolton used a number of papers, but graded them in absolute terms by per cents.

The choice of statistical method for this experiment is the one generally used in scientific grading. Instead of considering the marks as absolute, they were consider-ed in raw scores even though expressed in per cent and implied final grades were transmitted into relative marks by use of the frequency-distribution curve. By a relative mark is meant the relation of a particular mark to every other mark in the test; that is, each student is graded in terms of his position in the group.

In order to make the discussion more concrete, a few papers will be analyzed.

Paper number 47 of group 7 has a range of 30 and by absolute scoring, there would be 10 failures, 2 D's, 1 C, and 1 B. This is quite a range and involves 4 standard deviations. When the marks are converted into relative marks, there are 3 B-'s, 6 C+'s and 5 Cs or the range narrows to within a standard deviation. In the re-grading, eight teachers had perfect agreement with them-selves, four others varied only one-third sigma, one teacher varied two-thirds sigma, and one teacher varied two sigmas. Twelve teachers varied only one-third sigma; that is one-third of a grade while the graders varied two-thirds sigma. However, when all teachers are con-sidered, there seems to be greater accuracy or reliability

of marks among the different graders than the regrading
shows for each individual teacher. This paper is de-
cidedly a high C paper in terms of relative grading
and may be classed as a border line paper between high C
and low B. Either grade would not be unjust.

Paper number 81 of group 4 has a range of 27. Ac-
cording to absolute scores this pupil would fail for all
the graders if 75 per cent is taken as the passing grade.
In practice, most teachers would disregard this absolute
grade and pass the student, particularly if he were one
of those who least deserved to fail. However, the re-
lative marks are 2 C-'s, 6 D∓'s, 5 D's and 1 D-, or, when
this student is graded in terms of his position in the
group, he would make a passing grade under each teacher.
In terms of relative marks, the range is still 1 sigma
although the teachers tend to agree upon a grade of D.
In the regrading no teacher disagrees with himself by
more than two-thirds sigma or not more than two-thirds
of a grade, while the graders vary one sigma. This points
toward a tendency of greater accuracy in regrading than
between the marks of the different graders.

Paper number 43 has a range of 46 which in absolute
marking would include 4 F's, 5 D's, and 5 B's, a range of
four grades. However, the relative grades limit the
range to a given extent; the relative grades are 1 B∓,
3 B's, 7 B-'s, 1 C∓, 1 C-, and 1 D∓. The range has

Narrowed now to 2 sigma or within 2 grades. The teacher
who first gave the C₹ gave a B on regrading the paper.
The teacher who assigned D₹ has never taught seventh grade
mathematics, but his field is in senior high school mathe-
matics. No doubt he was inclined to be a little severe
at first. On his second marking, this paper received B₹
with the odds now in favor of a B paper. In the regrad-
ing, teachers tended to disagree with themselves to a
greater extent than heretofore. Only four teachers gave
the same relative mark both times; five teachers deviated
from their original mark by one-third sigma or one-third
of a grade; three teachers deviated by two-thirds sigma;
one teacher by one sigma and one by two sigma. Yet a
teacher may be said to have a greater agreement with him-
self than with the other graders for only one teacher
varied as much as two sigma, the average range for all the
graders.

Paper number 49, the third paper in group 8, has a
range from 69 to 92 with absolute grades of 2 F's, 7 D's,
3 C's, 2 B's. These grades almost conform to the fre-
quency distribution curve. There are four distinct grade
levels. However, when this pupil is graded in terms of
his position in the group, or graded relatively, the
grades are 2 B₹'s, 7 B's, 4 B-'s and 1 c. The range is
considerably narrower. The teacher who first gave the
C, upon regrading the paper, gave a B- with the result

that all marks were of B rank and consequently would not
conform to the frequency distribution curve. In the re-
grading no teacher disagreed with himself by more than
two-thirds sigma, while the graders disagreed by four-
thirds sigma. This verifies previous findings that a
teacher agrees to a greater extent with himself than with
the other graders.

The examination of Table II will show the same gen-
eral result. One teacher grades the hundred papers with
an average of 76 per cent while another teacher with
more severe standards grades the same papers with an
average of 55 per cent. In both cases a larger number
of pupils would fail if these teachers had the courage
to fail all whose scores are below 75. Some teachers
maintain absolute grades in theory but not in practice, -
that is, they lower their standards of grading,-by use
of relative grades, and when they do so, graders gener-
ally agree.

Table III summarizes the results of the papers ac-
cording to the re-check each teacher has made upon him-
self. Upon regrading the papers, the writer (M) had a
displacement of 2 A's, 3 B's, 1 C, 4 D's, and 2 F's.
Between the first and second markings there was perfect
agreement on 84 papers with 16 more lying within a sigma
or standard deviation, or a total of the 100 papers lying
within a sigma. Upon the sub-division of the sigma into

thirds, there was perfect agrement on 52 papers with 44 other papers lying within one-third sigma, making a total of 96 papers varying only one-third sigma or less; that is less than one-third of a grade.

Teacher N, who has taught seventh grade mathematics and who is now employed in teaching eighth grade mathematics, had perfect agreement on 73 papers with another 26 coming within a sigma range; this totals 99 papers lying within a sigma range. After dividing the sigma into thirds, he had perfect agreement on 39 papers with another 47 coming within the one-third sigma range; this totals 86 papers lying within one-third sigma range or within one-third of a grade.

Teacher Q, who has had experience in junior high school mathematics, had perfect agreement for 80 papers with another 19 coming within a sigma range; this totals 99 papers lying within a sigma range. After the relative grades were sub-divided into one-third sigma, he than had perfect agreement on 56 papers with another 36 papers coming within the one-third sigma range; this totals 92 papers lying within one-third sigma or one-third of a grade. This grader has not taught mathematics for three years.

Teacher S is the only other teacher, besides the writer, who is teaching seventh grade mathematics at the

present time. She had perfect agreement on 82 papers with another 17 lying within a sigma range; for the one-third sigma she had perfect agreement on 60 papers with 28 other papers lying within the one-third sigma; these total 88 papers lying within the one-third sigma.

Teacher Z, who has taught mathematics for the longest period of time, seems to have taught a wider range of subject matter than any other marker. He has given instruction in the 5th, 6th, 7th, 8th, 9th, 10th, 11th, and 12th grades. In his grading he has the greatest divergence of any grader except one (3), who has taught only in the 4th and 5th grades. The writer ranks second in years of teaching service,with teachers N and Q having only one year less experience in teaching mathematics.

Teacher S ranks fifth in teaching service in mathematics.

Teacher R has taught four years in grades 1 to 8, while y has taught one year in grades 5, 6, and 7.

Teachers T, U, V, and 0 have had some experience in teaching mathematics, but they have never taught seventh grade mathematics.

Although teachers P and X have never taught any kind of mathematics, teacher X was one of the best graders. However, teacher X is a man of high intelligence and a very accurate scholar.

One of the chief objections that has been made to subjective grading is that the graders, because of different standards, points of view with reference to subject matter, and institutional requirements, show great variation in marks. We should not expect much variation in a paper that is graded a second time by the same teacher, but we should find considerable variation in marks given by different teachers in this experiment; some of these teachers have never taught the subject; others, with a few years of teaching in the subject, are mostly interested in administrative work; while still others have been teaching the subject for a number of years. Then again, some teachers are naturally more severe in grading than others; this is clearly indicated in this experiment. The severity and leniency of grading are indicated in the passing grades. One grader would give 2 per cent A's and another would give 19 per cent A's. (See Table IV, page 32.) This is a difference of 17 per cent in the number of A's given. Likewise, the differences in the number of B's, C's and D's given are 12 per cent, 20 per cent and 11 per cent, respectively. (Table IV, page 32). We should not expect many failures in any system of grading. Yet in the absolute marking one teacher would fail 43 per cent, while another would fail 74 per cent. (Table IV, page 32). Can this in any way be justified? Yet, when these per cents are converted into relative grades, much of this disparity disappears,

and the difference in variability between regrading by the same person and variability among graders is not so great. Some investigators have found slightly greater sifferences even in terms of relative grading between regrading by one teacher and the marks of a number of teachers, but in this study the two sets of marks are almost the same. This is all the more surprising because the graders were a very heterogeneous group.

However, this group was purposely so chosen because it would represent a condition that would be as bad or worse than a school situation. To make this experimental marking still more subjective and variable, no directions whatsoever were given as to how papers were to be graded, what constituted a passing grade, what relative weight was to be given for reasoning and accuracy, and yet the accuracy between the graders was almost as great as the accuracy in regrading. In the grading by different individuals and in the regrading by the same person, there was seldom more than one standard deviation difference; in the regrading there was an average of 99 per cent of agreement within a sigma (Table III, page 30) and in the grading by the group there was 99.5 per cent of agreement within the sigma (Table V, page 33).

The correlation or r between the two markings of the same paper are also high enough to be significant. Nine of the fourteen graders (M, S, T, U, V, V, O, R, X) had

correlation coefficients greater than 0.90. Two of the
remaining teachers have not taught in the seventh grade.
Although four (Y, W, P, Q) of the five teachers have
correlation coefficients above 0.80, this leaves only
one teacher (Z) with a correlation coefficient below
0.80. The average coefficient of correlation for all the
graders is 0.90 with a probable error of $\pm$.01, while the
average agreement within one sigma or one grade is 99
percent or an average agreement of 85 per cent within
one-third sigma or one-third of a grade. The coefficient
of correlation by the rank difference method of the
reliability of grading versus teaching experience was so
small as to be insignificant.

When each grader is correlated with the average
grade, the average is .95 $\pm$.006; the highest being .97
and the lowest being .84. This indicates a high degree
of reliability and shows that the correlation made in
sigmas and one-third sigmas is substantially correct.
Since this correlation is in relative terms and shows
consistency in grading rather than the degree of severity
in grading, it is comparable to the analysis already
made in sigma displacements which of course, is the
method of relative grading.

The analysis of this study reveals the fact that,
in spite of the supposed objectivity of arithmetic, we
have the general characteristics of the traditional or

essay examination; most papers indicate a wide range of per cents in absolute terms; all examples show a narrower range in relative terms; there is little apparent difference in the accuracy or reliability of grading by the experienced and inexperienced teacher in arithmetic; that the average deviations of .664 and .692 for the regrading and the graders, respectively, show only slightly greater accuracy for the regrading by the same teachers than for the graders; that the average coefficient of correlation of 0.90 (Table II, page 29) is proof of the reliability of the regrading; and that 99.5 per cent (Table V, page 33) of the papers lying within one sigma or less for the graders is proof of the agreement among the graders.

CHAPTER IV

CONCLUSIONS

Any analysis is justified only by its results. Although the analysis of this experiment has been by no means exhaustive, yet from the analysis made the writer is warranted in making the following conclusions:

1. There is a great variation of marks in per cents given by different teachers when these marks are left in their absolute values. This is in harmony with the findings of Starch and Elliott and others.

2. When the marks in terms of per cents are converted into relative grades, that is, when a student's grade depends upon his position with reference to the group, this wide variation narrows down to a given extent and the marks of the different graders tend to agree. This is shown by the fact that the average correlation for regrading was 0.90 (Table II, page 29); that the average agreement within one-third sigma or one-third of a grade was 85 per cent (Table III, page 30); and that there was 99 per cent (Table III, page 30) of average agreement within a sigma or a grade.

3. Teaching experience in arithmetic did not seem to increase the reliability of grading to a great extent as shown by the regrading scores in comparison with the scores of the different graders.

4. There is very little difference in variation between the marks of different teachers and the marks by the same teacher as has been shown by the deviations of .664 and .692 for the regrading and the graders, respectively.

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