

APRIL 1936

MINNESOTA UNIVERSITY

THE UNIVERSITY OF MINNESOTA

IN

EDUCATION

FOR THE DEGREE OF MASTER OF

EDUCATION IN THE DEPARTMENT OF

EDUCATION IN THE UNIVERSITY OF

MINNESOTA

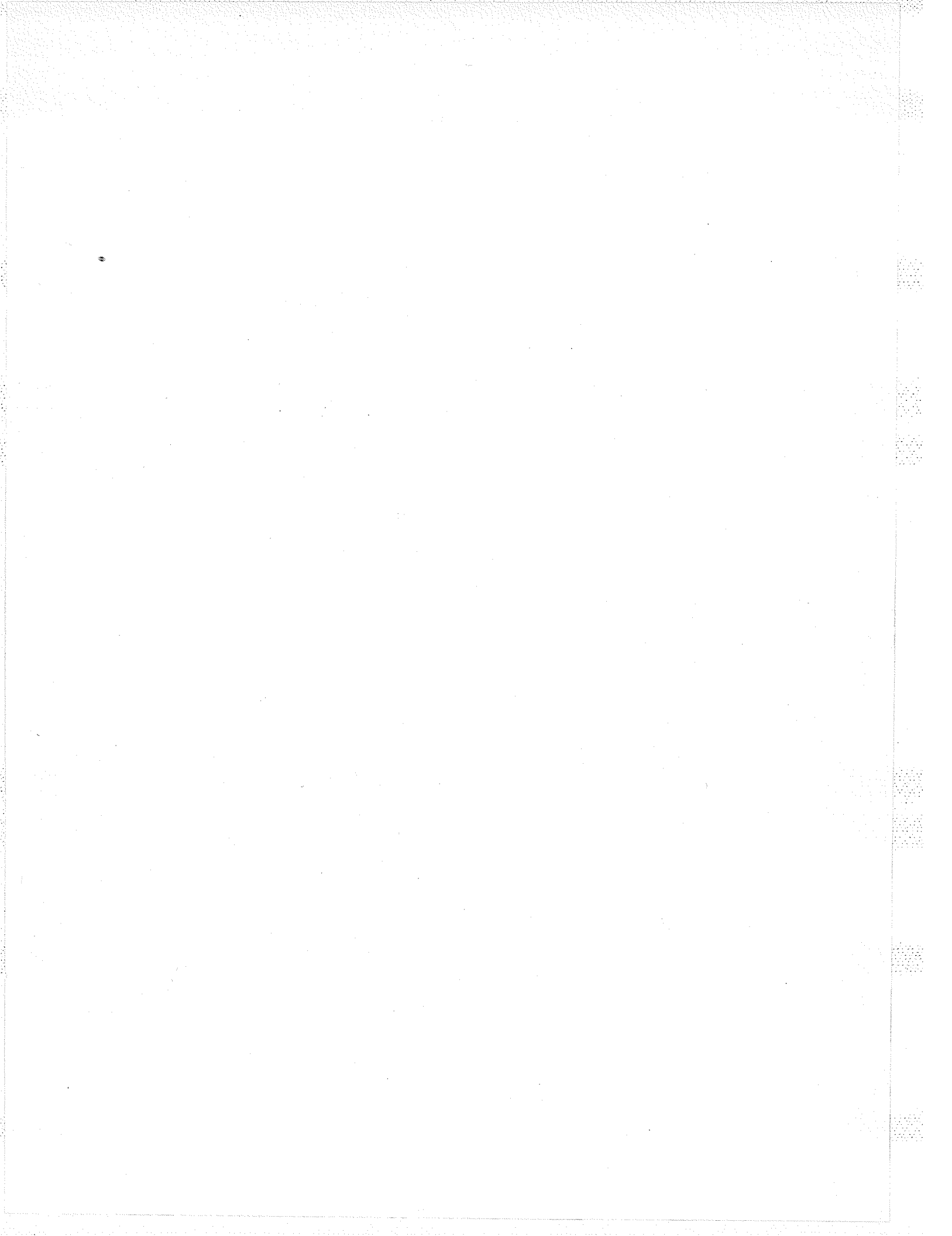
THE UNIVERSITY OF MINNESOTA

STATEMENTS AND IN CONNECTION WITH THE

OF THE DEPARTMENT OF EDUCATION IN THE

IN CONNECTION WITH THE UNIVERSITY OF

THE UNIVERSITY OF MINNESOTA



## ACKNOWLEDGMENTS

The writer wishes to express his heartfelt appreciation to Dr. D. S. Woods for his kind co-operation and assistance in the investigation and for his encouraging influence during the three summer sessions taken on the course, to Professor H. R. Low for his personal guidance during the investigation, to Mr. C. Cornish for his help and for the free use of his school during the preliminary work, and to all the principals and teachers who gave assistance in the administration of the series of tests used in the investigation.

Special acknowledgment is made to my wife without whose co-operation and encouragement during the past three years this work could not have been done.

## TABLE OF CONTENTS

	Page
LIST OF TABLES .....	iv
LIST OF CHARTS .....	xiii
Chapter	
I. INTRODUCTION .....	1
Purposes of the Investigation	
The Nature of the Investigation	
Justification of the Study	
The Importance of the Function Concept in Mathematics	
The Poor Progress That is Being Made in Building Textbooks with the Function Concept as the Unifying Force	
The Importance of the Formula	
The Lack of Extensive Investigation with the Function Concept	
The Abilities That Can be Developed by the Use of the Formula	
Assumptions of the Investigation	
Definitions of Certain Terms Used in the Investigation	
Sources of Material for the Investigation	
II. THE CONSTRUCTION, THE ADMINISTRATION, AND THE SCORING OF THE TESTS .....	23
The Construction of the Tests	
The Administration of the Tests	
The Marking of the Tests	
III. THE EXTENT TO WHICH THE PUPILS ARE ABLE TO PUT TO USE THE ENTIRE GROUP OF FUNCTION CONCEPTS THAT ARE INCLUDED IN THE SET OF TESTS .....	32
IV. THE EXTENT TO WHICH THE PUPILS ARE ABLE TO PUT TO USE THE DIFFERENT FUNCTION CONCEPTS THAT ARE CONTAINED IN THE INDIVIDUAL TESTS .....	47
V. A DETAILED STUDY OF THE ERRORS MADE IN THE WORKING OF EACH QUESTION BY THE PUPILS OF THE JUNIOR HIGH SCHOOL GRADES .....	90

Chapter	Page
VI. SUMMARY AND CONCLUSIONS .....	157
A Summary of the Findings of the Investigation Suggested Conclusions That Might be Drawn From the Findings of the Investigation Lines Along Which Other Investigations Might Be Made	
BIBLIOGRAPHY .....	166
Appendix	
I. THE DIRECTIONS GIVEN TO THE TEACHERS AND TO THE PUPILS .....	169
II. INSTRUCTIONS FOR MARKING TESTS .....	171
III. THE SIX TESTS GIVEN IN THE INVESTIGATION .....	173
IV. THE STATISTICAL FORMULAS USED IN THE INVESTIGATION .....	180

46	11. The Range of Scores for Each Grade, the Standard Deviation and the Range Between the Central Tendencies of Successive Grades .....
43	10. Distribution of the Scores for the Seventh, Eighth, Ninth, and Tenth Grades and for the Combined Junior High School Grades .....
41	9. Summary of the Data Relative to the Distribution of Tenth Grade Scores on the Complete Set of Tests
40	8. Summary of the Data Relative to the Distribution of the Scores of Grades Seven, Eight and Nine for the Complete Set of Tests .....
40	7. Summary of the Data Relative to the Distribution of Ninth Grade Scores of the Complete Set of Tests
39	6. Summary of the Data Relative to the Distribution of Eighth Grade Scores on the Complete Set of Tests .....
39	5. Summary of the Data Relative to the Distribution of Seventh Grade Scores on the Complete Set of Tests .....
36	4. Comparative Tables of Gains Computed for the Medians and from the Means of the Distribution ...
33	3. Showing the Means for Boys and Girls and for Both for Each of Junior High School Grades .....
33	2. Showing the Medians for Boys and Girls and for Both for Each of the Junior High School Grades ...
27	1.a Showing the Number of Pupils in Each of the Junior High School Grades and How Many of These were Girls and How Many were Boys .....
26	1. Showing the Schools, the Number of Groups from Each School, and the Number of Pupils, Girls and Boys, in Each Group .....

Table

Page

LIST OF TABLES

Table	Page
12. Grade Mastery Coefficients, Grade-to-Grade Gains and Ranks for the Five Tests .....	49
13. The Grade Medians for Each of the Five Tests ...	50
14. The Distribution of the Scores for Test I .....	53
15. The Mastery Coefficients for the Questions of Test I for Each Grade and for the Junior High School Group Together with the Ranking of These Mastery Coefficients .....	55
16. The Distribution of Scores for Test II .....	59
17. The Mastery Coefficients for the Questions of Test II for Each Grade and for the Junior High School Group Together with the Ranking of These Mastery Coefficients .....	61
18. The Distribution of the Scores for Test III ....	65
19. The Mastery Coefficients for the Questions of Test III for the Grade Groups and for the Junior High School Group Together with the Ranking of These Mastery Coefficients for These Groups ....	67
20. The Distribution of Scores for Test IV .....	72
21. The Mastery Coefficients for the Questions of Test IV for Grade Groups and for the Junior High School Group Together with Ranking of These Mastery Coefficients for These Groups ....	73
22. The Distribution of Scores for Test V .....	78
23. The Mastery Coefficients for the Questions of Test V for the Grade Groups and for the Junior High School Group Together with the Ranking of These Mastery Coefficients for These Groups ....	81
24. The Grade-Groups to Which both Test V and Test VI were Given with the Number of Pupils in Each Group .....	84
25. The Median Score for Tests V and VI for the Groups That Took Both Tests .....	85

Table	Page
26. The Distribution of Scores for the Special Groups for Test V and Test VI .....	85
27. Showing a Comparison of the Mastery Coefficients for Tests V and VI for the Different Grade Groups Taking Both Tests .....	86
28. Showing the Mastery Coefficients and the Error Coefficients for I(a) of Test I .....	94
28a. Showing the Total Number of Errors for Each Grade and the Per Cent of This Number Due to Each Type of Error, Test I, (a) .....	94
29. Showing the Mastery Coefficients and the Error Coefficients for I (b) of Test I .....	95
29a. Showing the Total Number of Errors for Each Grade and the Per Cent of This Number Due to Each Type of Error, Test I, 1(b) .....	95
30. Showing What Per Cent of the Total Questions for Test I (1) Had Both Parts Correct, (a) Part Alone Correct, (b) Part Alone Correct, and Neither Part Correct .....	96
31. Showing the Mastery Coefficients and the Error Coefficients for Test I, 2 (a) .....	97
31a. Showing the Total Number of Errors for Each Grade and the Per Cent of This Number Due to Each Type of Error, Test I, 2 (a) .....	98
32. Showing the Mastery Coefficients and the Error Coefficients for Test I, 2 (b) .....	98
32a. Showing the Total Number of Errors for Each Grade and the Per Cent of This Number Due to Each Type of Error, Test I 2 (b) .....	99
33. Showing What Per Cent of the Total Questions for Test I (2) Had Both Parts Correct, (a) Part Alone Correct, (b) Part Alone Correct, and Neither Part Correct .....	99



Table	Page
34. Showing the Mastery Coefficients and the Error Coefficients for Test I, 3 (a) .....	101
34a. Showing the Total Number of Errors for Each Grade and the Per Cent of This Number Due to Each Type of Error, Test I, 3 (a) .....	101
35. Showing the Mastery Coefficients and the Error Coefficients for Test I, 3 (b) .....	102
35a. Showing the Total Number of Errors for Each Grade and the Per Cent of This Number Due to Each Type of Error, Test I, 3 (b) .....	102
36. Showing the Per Cent of the Total Questions for Test I (3) Had Both Parts Correct, (a) Part Alone Correct, (b) Part Alone Correct, and Neither Part Correct .....	103
37. Showing the Mastery Coefficients and the Error Coefficients for Test I, 4 (a) .....	104
37a. Showing the Total Number of Errors for Each Grade and the Per Cent of This Number Due to Each Type of Error, Test I, 4 (a) .....	104
38. Showing the Mastery Coefficients and the Error Coefficients for Test I, 4 (b) .....	105
38a. Showing the Total Number of Errors for Each Grade and the Per Cent of This Number Due to Each Type of Error, Test I, 4 (b) .....	105
39. Showing What Per Cent of the Total Questions for Test I, (4) Had Both Parts Correct, (a) Part Alone Correct, (b) Part Alone Correct, and Neither Part Correct .....	106
40. Showing the Mastery Coefficients and the Error Coefficients for Test I, 5 (a) .....	108
40a. Showing the Total Number of Errors for Each Grade and the Per Cent of This Number Due to Each Type of Error, Test I, 5 (a) .....	108
41. Showing the Mastery Coefficients and the Error Coefficients for Test I, 5 (b).....	109