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ABSTRACT

The final report describes the accomplishments of an 18-month study designed to adapt and standardize the 7th Edition of the Stanford Achievement Test with a national, randomly drawn sample of hearing-impaired students. The following objectives were accomplished: (1) test material and special procedures were developed and disseminated; (2) the test (Form E) was administered to 8,332 students with the use of special procedures developed as part of the project; (3) age-based percentile rank norms for hearing-impaired students were computed; (4) computerized test score programs were developed which prepared individual student reports, including the hearing-impaired norms; (5) computerized data files, including achievement, demographic, handicapping, and curriculum information, were statistically analyzed; (6) forms E and F of the Stanford were administered to a second randomly drawn sample of about 900 hearing-impaired students to establish parallel forms reliability; (7) the technical manual was outlined and about 60% of the planned statistical analyses were completed; and (8) eight national workshops were carried out instructing teachers on the administration and interpretation of the new test. Two papers are also presented, on screening procedures for assigning students to the appropriate levels of the Stanford Achievement Test and on achievement patterns of hearing impaired students. (Author/CL)

FINAL REPORT

ADAPTATION AND STANDARDIZATION STANFORD ACHIEVEMENT TEST (SEVENTH EDITION) FOR USE WITH HEARING IMPAIRED STUDENTS

GRANT NUMBER G008300004

by

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October 26, 1984

ABSTRACT

This Final Report describes the accomplishments of an eighteen-month study designed to adapt and standardize the 7th Edition of the Stanford Achievement Test with a national, randomly drawn sample of hearing-impaired students. This project was carried out by the Gallaudet Research Institute's Center for Assessment and Demographic Studies.

The following objectives, described in our original proposal (Oct. 1982) and in our continuation proposal (Nov., 1983) have been accomplished:

1. Test materials and special procedures have been developed and are being disseminated by our Center.

2. The test (Form E) was administered to 8,332 students with the use of the special procedures developed as part of the project.

3. Age-based percentile rank norms for hearing-impaired students have been computed.

4. Computerized test score programs have been developed which prepare individual student reports, including the hearing-impaired norms.

5. Computerized data files, including achievement, demographic, handicapping, and curriculum information, have been statistically analyzed. This analysis is continuing.

6. Forms E and F of the Stanford have been administered to a second randomly drawn sample of about 900 hearing-impaired students for the purpose of establishing parallel forms reliability.

7. The technical manual has been outlined and about 60% of the planned statistical analyses have been completed.

8. Extensive item response data combined with curriculum information collected on individual students at the time the tests were normed are being analyzed.

9. Eight national workshops were carried out instructing teachers on the administration and interpretation of the new test.

TABLE OF CONTENTS

LIST OF APPENDICES

Overview

The goal of the current project was to adapt and standardize the 1982 Seventh Edition of the Stanford Achievement Test for use with hearing-impaired students and to provide educators with a tool that will:

1) accommodate the special needs of hearing-impaired students; and,

2) maintain critical components of the 1982 Stanford so that performance of hearing and hearing-impaired students can be compared.

Five specific objectives were defined to aid in the accomplishment of our goal:

1) to conduct a field test, on a large national sample, of the Stanford Achievement Test as modified for hearing-impaired students;

2) to analyze the field test data in order to construct norms for hearing-impaired students;

3) to establish the extent to which the Stanford Achievement Test is valid for assessing achievement of hearing-impaired students;

4) to develop a sophisticated score reporting system for each test level which is meaningful for instruction; and,

5) to conduct workshops for test users on (a) interpretation of test results and (b) ways to utilize test results in instruction.

Phase 2: Administration of the new test to a nationwide sample of hearing-impaired students

A. Complete sample design; develop data base from the Annual Survey of Hearing-Impaired Children and Youth 1981-82 data base. Contact programs. Do replacement sampling as necessary. Complete project management system.

B. Administer screening tests to national sample. Score and prepare testing material packages for individual programs.

C. As completed, send answer documents to Iowa City for computerized scoring. As "no-frills" tapes are returned from Iowa City, produce preliminary score reports containing all norms except hearing-impaired percentile ranks for norming project programs.

D. Contact programs selected for parallel forms study.

E. Administer screening test to parallel forms sample.

F. Administer selected subtests from both Forms E and F to parallel forms sample.

Phase 3: Norms development and item analysis

A. Data file preparation. "Cleaning" data files. Entering data for supplemental questionnaire validity study. Merging Math Separate and Full battery answer documents to one record per student.

B. Computing norms. Studying the percentile distributions.

C. Producing and printing norms tables for dissemination to the field. Writing and hand-scoring instructions.

To accomplish these objectives, an eighteen-month project consisting of four phases was proposed. These phases are listed below with the major activities associated with each:

Phase 1: Preparation of materials and development of a computerized scoring system

A. Prepare new materials and order needed "shelf" materials from test publisher.

B. Design and print final version of screening test materials, including four forms of test booklets and scoring sheets, and the administration instructions.

C. Write and print special test administration instructions for administering the test to hearing-impaired students.

D. Design supplemental questionnaire for curriculum (validity) study. Design sampling strategy for supplemental study.

E. Design and write computer programs to score screening tests and to generate random subsample for test-to-curriculum match study.

F. Modify existing computer test scoring programs in preparation for preliminary test score reports for participants in norming sample.

G. Design and implement new test-scoring software which takes advantage of the new test.

H. Develop item response analysis programs that are useful to instructors.

I. Order materials needed for small parallel forms equivalency study.

Phase 2: Administration of the new test to a nationwide sample of hearing-impaired students

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B. Computing norms. Studying the percentile distributions.

C. Producing and printing norms tables for dissemination to the field. Writing and hand-scoring instructions.

D. Rerunning individual student reports using new test score reporting programs. Send out to project participants.

E. Write technical manual.

F. Run item analyses. Estimate internal consistency reliability. Identify questionable items.

G. Analyze supplemental questionnaire data to determine curriculum coverage of all item contents contained in the reading comprehension and math computation subtests.

H. Scoring and analysis of parallel forms reliability.

Phase 4: Dissemination and training

A. Identify sites for achievement test workshops.

B. Develop workshop materials.

C. Send out brochures announcing workshops.

D. Schedule and carry out at least four workshops on the proper use of the new Stanford Achievement Test as modified for hearing-impaired students.

The current report reports on the completion of these activities. It is presented in four sections. The first section will describe the accomplishments during the eighteen month grant period. The second section will describe the ongoing statistical analyses that are currently by being performed on the large data base that was created during the project. This section will also describe additional test scoring services that are being developed for use by programs that serve hearing-impaired students. The third section consists of a paper that was presented at the 1984 annual meting of the American Educational Research Association. This paper describes a technical analysis of the screening tests that were developed as a major component of the adapted procedures. The final section presents an analysis of the achievement patterns of hearing-impaired students throughout the U.S. using the norming data that was collected as part of the project. This paper compares the achievement patterns of hearing-impaired students in 1983 with those observed in 1974, when the sixth edition was normed with hearing-impaired students.

SAT Final Report Section 1:

DESCRIPTION OF PROJECT ACCOMPLISHMENTS

Section 1: Description of Project Accomplishments

All of the objectives described in our proposal have been met, and all activities described above are either complete or nearly complete. The new materials are available, and order forms have been prepared and sent to the more than 1,500 programs that participate in the Annual Survey of Hearing-Impaired Children and Youth (Appendix A). The norms have been computed. All data files are complete, and much of the statistical has been completed. Eight national workshops have been presented. A parallel forms reliability study has been carried out; a technical manual is nearing completio"

Each activity ·iertaken during the project is described below.

Phase 1: Preparation of materials and development of a computerized scoring system

A. All test booklets and answer sheets used in the project were ordered directly from the test publisher during the first month of the project. The original plan to print special booklets had to be modified for several reasons:

1) Printing costs and licensing fees were grossly underestimated in the original proposal. When estimates were received from the publisher, it was determined that testing with specially printed tests would average roughly $7.00 per student for test booklets and answer documents alone.

2) Feedback from educators around the country indicated general disapproval for our plan to publish only reading and math basic skills subtests in our special booklets. While some of the other subtests have limited use with the hearing-impaired population, we agreed that programs should have the option of administering these subtests. (Cautions regarding the use of certain subtests -- especially those dependent upon auditory experience -- with hearing-impaired students are printed in our special instructions manual.)

3) By the time the Psychological Corporation provided us with estimates of printing and licensing costs for special materials, there was insufficient time to print all materials and complete the norming by the end of the school year.

While the lack of specially printed materials seems at first to be a failure of the project, we strongly feel that the project was, in fact, strengthened by this eventuality. We can now offer norms for more subtests than we had originally planned. Also, we were able to keep the cost of testing relatively low, were able to devote more resources to the refinement of the screening procedures, and were able to proceed more readily with plans for completing the parallel forms study.

A second modification of the original proposal resulted from the lack of specially printed tests. We were not able to print the teacher-dictated test items in the booklets for hearing-impaired students, as the original proposal called for. After much discussion we concluded that a small scale study in the future which would examine the different methods used in communicating test item strings to students would be of great value. No study has ever shown that students who have item strings printed in test booklets perform better than students who do not. Our feeling now is that empirically demonstrating an advantage for printing dictated items in test booklets should be undertaken before a great deal of resources is committed to reprinting the test booklets.

B. The final versions of the screening tests were prepared and printed on schedule. Scoring sheets which use an item response analysis for assigning test level were developed and printed as well. A sample screening test and its corresponding scoring sheet appear as Appendix B.

C. Since the decision was made to order the test materials directly from the publisher, a special set of administration instructions was prepared. These instructions outline, step by step, the testing procedures to be used when administering the Stanford to hearing-impaired students. The preparation and printing of these special instructions was completed during the first four months of the project. A copy of this booklet, "Administering the 1982 Stanford Achievement Test (Seventh Edition) to Hearing-Impaired Students" appears as Appendix C.

D. Designing a set of supplemental questionnaires to aid in our study of the Stanford's validity was added to the design of the project after our original proposal was accepted and after our first meeting with the project consultant. The supplemental questionnaires were assigned to individual students after their screening tests were computer scored. Twelve different questionnaires were designed which asked teachers to evaluate the reading comprehension and mathematics computation items contained in each of the six levels of the battery. A sampling strategy was developed to ensure that students taking each level of the test were adequately represented. In the questionnaires, teachers were asked to evaluate each item (either reading or math) to which the individual student would be asked to respond on the test. Two questions were asked about each item. First, teachers were asked to indicate the degree to which the student had been exposed to the content of the item. Second, the teacher was asked to judge whether the student would get the item correct. Examining the relationships of teacher expectation, curriculum coverage, and actual student performance on test items will help us evaluate the validity of the individual test items for use with hearing-impaired students. A copy of one of the twelve questionnaires appears as Appendix D.

E. Computer programs were written to score the individual screening tests, to automate the preparation of order forms based on the screening test results, and to randomly select the subsample for the supplemental questionnaire study. A sample student report from the screening test scoring program appears as Appendix E. The sample report shows how item response information, as well as raw scores, was used to assign students to the appropriate test level. A technical description of the screening test scoring procedures appears in Section 3 of this Final Report.

F. The computer programs that supplied schools with special reports from the 1974 norming project were rewritten to be run against the tape formats for the new test. The purpose for using this old report format was to facilitate a fast turnaround for individual programs involved with the project. These computer programs were rewritten during the fifth and sixth months of the project. The individual student report that was sent to the norming project participants as a preliminary report appears as Appendix F.

G. New test scoring software has been developed. One new reporting format, the administrator summary, was developed and used to send the final score reports back to the norming project participants. A copy of this administrator summary report appears as Figure 1 on the following page.

Stanford Achievement Test Hearing Impaired Norming Project

Student Name		Age	Score Type	Word Study	Word Read	Read Comp	Read (W+C)	Concpt Number	Math Compu	Math Appl	Math (C+A)	Vocab	Spell	Lang	Envirn	Social Scienc	Scienc
A	M	11	Level	P1	P1	P1	P1	P1	P1*	P1*	P1		P1				
			Raw	11/36	29/33	17/40	46/73	12/34	14/22	7/23	21/45		16/28				
			SS	421	524	446	474	443	504	447	478		483				
			GE	K.8	2.0	1.2	1.5	K.5			K.8		1.5				
			HI %		58	4	20	2	8	4			7				
D	Q	10	Level	P1	P1	P1	P1	P1	P1*	P1*	P1		P1				
			Raw	14/36	18/33	16/40	34/73	21/34	21/22	[illegible]	31/45		21/28				
			SS	436	456	442	447	484	580	[illegible]	518		481				
			GE	K.9	1.2	1.1	1.2	1.1			1.6		1.8				
			HI %		10	6	10	23	[illegible]	[illegible]			18				
L	K	8	Level	P1	P1	P1	P1	P2	P2	P2			P1				
			Raw	24/36	30/33	27/40	57/73	[illegible]	[illegible]	[illegible]			25/28				
			SS	484	536	487	502	534	[illegible]	[illegible]			513				
			GE	1.5	2.1	1.8	[illegible]	[illegible]	[illegible]	1.6			2.2				
			HI %		80	44	8	[illegible]	[illegible]	[illegible]			52				
L	I	11	Level	P1	P1	P1	P1	P1	[illegible]	P1*	P1		P1				
			Raw	11/36	12/33	[illegible]	[illegible]	[illegible]	20/22	9/23	29/45		17/28				
			SS	421	428	[illegible]	[illegible]	460	568	484	510		457				
			GE	K.8	K.8	[illegible]	[illegible]	[illegible]			1.4		1.5				
			HI %		1	3	[illegible]	8	31	11			8				
M	T	11	Level	P1	P1	[illegible]	P1	P2	P2	P2			P1				
			Raw	20/36	28/33	28/40	56/73	18/34	28/38	10/38			29/28				
			SS	465	514	491	499	514	562	483			578				
			GE	1.3	1.8	1.6	1.7	1.6	3.0	K.8			3.1				
			HI %		48	26	43	26	28	20			45				
N	A	9	Level	P1	P1	P1	P1	P2	P2	P2			P1				
			Raw	15/36	29/33	26/40	55/73	18/34	29/38	15/38			22/28				
			SS	441	524	482	488	529	568	510			488				
			GE	1.0	2.0	1.5	1.7	2.0	3.2	1.4			1.8				
			HI %		[illegible]	36	53	57	52	56			30				
Q	A	11	Level	P1	P1	P1	P1	P1	P1*	P1*	P1		P1				
			Raw	19/36	19/33	17/40	36/73	22/34	15/22	14/23	29/45		18/28				
			SS	460	460	446	452	498	512	503	510		469				
			GE	1.2	1.3	1.2	1.2	1.3			1.4		1.7				
			HI %		9	4	8	20	10	32			9				

* The score information for Primary 1 Mathematics Computation and Mathematics Application is based on performace on the appropriate subset of items contained in the combined Primary 1 Computation/Application subtest.

FIGURE 1
ADMINISTRATOR'S SUMMARY SCORE REPORT

H. An item response pattern analysis program has been acquired from the University of Illinois. This program allows educators to assess the appropriateness of certain items and clusters of items within a test. Modification of this program to make it link automatically to the Stanford tapes and provide useful diagnostic information has been accomplished and is available. The most important component to this report is the Student-Problem (SP) chart which show student performance on individual items arranged by difficulty within content cluster. An example of an SP chart appears in Appendix J.

I. The parallel forms equivalency study is complete. A random sample of over 800 students was administered both from E and F of the Stanford. Data from these administration have been merged and the reliabilities for the various subtests are being currently assessed.

Phase 2: Administration of the new test to a nationwide sample of hearing-impaired students

A. The sampling design was completed during the first month of the project. Tables 1 and 2 show the stratification variables that were used. Table 3 shows the population estimates for each of the stratification groups and specifies the required counts in each cell for the norming sample. Charts 1 and 2 (Appendix G) are flow charts which show the mannner in which the Annual Survey data base and the address list maintained by our Center were used to create the data management system utilized to manage the project. In all, 225 programs were contacted. One hundred and seventy-one agreed to participate in the project and administered the screening tests to their students. Of those, 163 actually sent back Stanford answer documents for scoring. The total number of students in these 163 programs was 8,332. The degree to which the resulting sample matched the Annual Survey on important characteristics is thoroughly discussed in Section 4 of this report.

B. Screening tests were sent out to participating programs during the third month of the project. Since the scoring of the screening tests involved a four-step process, it was determined that our Center should score the screeners. The sampling design for the supplemental questionnaire validity study also mandated that we maintain strict control over the test level assignment process. Computer programs were written to score the screening tests, create order forms, control inventory of materials, and randomly select the twelve supplemental questionnaire subsamples.

C. Answer sheets were edited for stray marks, and header sheets which defined building groups within reporting sources were prepared as they came in from the project participants. Weekly batches were sent to the Westinghouse scoring service during the sixth, seventh, and eighth months of the project. Westinghouse prepared the Psychological Corporation's standard "no frills" tape. (This includes all raw score and itrem response information, but does not contain any normative information.) Grade equivalents and scaled scores using norm tables for hearing students, supplied by the publisher, were entered into the Gallaudet College computer. As tapes came in to the Center, preliminary individual student reports were prepared with all score information except the percentile ranks for hearing-impaired students. In general, these reports were returned to the norming project participating programs about six weeks after reception of the answer sheets from the programs. (A copy of the individual score report appears in Appendix F.) At the same time the preliminary reports were prepared, the data files were set up for the norm computational analyses which took place after all fifteen batch tapes had been returned from the scoring service.

D. Screening procedures for the parallel forms study were identical to the procedures used for the first norming study. Once again, the Center controled the scoring of the screening test scoring sheets. When the order form/inventory reports are produced by the computer, Form E and Form F booklets were assembled and sent out.

E. The Reading Comprehension, Spelling, Language, Mathematics Computation, Mathematics Applications, and Concepts of Number subtests from both Forms E and F were administered to all students in the parallel forms sample in months 16 and 17 of the project. Administration procedures were nearly identical to those used for the norming study. All Form E and F test booklets have been scored; individual student reports from both tests have been sent to project participants.

TABLE 1

Regions of the United States

Region	States/Territories
Northeast	Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Puerto Rico, Virgin Islands
North Central	Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin
South	Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, West Virginia
West	Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming, Guam

TABLE 2

Types of Reporting Sources in the Annual Survey

Code	Type
10	Residential School for the Deaf
20	Day School for the Deaf
30	General Public School Program
31	Full-time Public School Program
32	Part-time Public School Program
33	Mixed-type Public School Program
40	Multi-handicapped Program
50	Rehabilitation Program
60	Pre-School Program
70	Speech and Hearing Program
80	Other Education
90	Other Non-Education
99	Program not in existence

TABLE 3

PROCEDURE FOR DETERMINING SAMPLE PROPORTIONS
STRATIFIED ON REGION AND REPORTING SOURCE TYPE

REGION	NUMBER OF REPORTING SOURCES	NUMBER OF STUDENTS[1]	TOTAL NUMBER OF STUDENTS NEEDED[2]	TOTAL PROPORTION[3]	TOTAL NUMBER OF REPORTING SOURCES[4]
Northeast					
Residential	16	2,491	985	.39	7
Day	15	758	533	.70	9
Public*	116	4,886	1,173	.24	36
North Central					
Residential	15	2,262	920	.41	6
Day	4	394	267	.68	4
Public*	178	6,867	1,200	.17	42
South					
Residential	26	4,915	1,172	.24	8
Day	10	382	267	.70	7
Public*	299	9,105	1,266	.14	58
West					
Residential	12	1,907	928	.48	6
Day	7	411	267	.65	4
Public*	157	6,049	1,200	.20	38
	855	40,427	10,178	.25	225

*Full-time and Part-time Special Education

Notes for TABLE 3

1. The total number of students in the population is based on figures from the 1980-81 Annual Survey of Hearing-Impaired Children and Youth. Students below the age of 8, above the age of 19, or who received their primary educational services is settings designed for multi-handicapped students were excluded from the Annual Survey population before sampling began. The Stanford is generally not an appropriate test for these students. The numbers also exclude all programs from Nebraska with the exception of the state school for the deaf. The basis for surveying in Nebraska is not through service agencies; rather it is through Local Education Agencies. These were determined not to be appropriate contacts for the norming project.

2. The number of students needed for the sample was calculated for a 95% confidence level using a .3% interval for a proportional variable, where the population proportion was assumed to be 50%. The target number was divided by .75 to allow for a 75% response rate.

3. The number of students needed from Step 2 above was divided by the total number in the population (from Step 1) to determine the proportion of each stratification group needed in the sample.

4. The population number of reporting sources was divided by the sample proportion (from Step 3) to indicate the number of reporting sources that should be in the sample. The sampling procedure used assumes that programs of different sizes are, for the most part, evenly distributed within stratification group. Thus, for example, to obtain 39% of the students from the Northeast Region/Residential stratification group, 39% of the 16 reporting sources were sampled.

Phase 3: Norms devolopment and item analysis

A. Data files were created and edited during the ninth and tenth months of the project.

B. By using the scaled score conversion tables provided by the test publisher, frequency distributions, broken down by the age of the students at time of testing, were computed. The cumulative, relative distributions were converted to percentile ranks, and the norm tables were devaloped and prin.ed.

C. The norm tables were completed in the tenth month of the project The complete set of norms appears as Appendix H. Graphs which show the interquartile ranges of the distributions of six of the subtest areas appear in Figures 2, 3, and 4.

D. The new norms were applied to the student data base and new individual student reports were generated during the eleventh month of the project. A new administrator summary report format was used. (A sample copy of this report appears above in Figure 1.) These reports were then sent to the norming project participants.

E. After test data was merged with individual demographic data from the Annual Survey of Hearing-Impaired Children and Youth, a study of the norm distributions of various subgroups of the hearing-impaired student population was undertaken; for example, students with profound hearing loss, and students with additional handicapping characteristics. Decile tables for students with different characteristics were prepared and are being provided in new editions of the norm tables. A sample decile table for students in the Northeast region appears in Appendix K.

F. The preparation of a technical manual to accompany the tests is well underway. This technical manual will include a detailed discussion of the sampling plan, a study of the demographic and handicapping characteristics of the students in the sample, and results of an intensive study of the reliabilities of the various subtests. This manual will be disseminated upon request to persons who desire to review the technical aspects of the norming project or to study the subtest reliabilities.

G. Item analyses and internal consistency reliability will be performed on the item responses of the students in the norming study. A statistical study of "questionable" items has been started; the study relies heavily on the input and assistance of our project consultant, Dr. Delwyn Harnisch. Dr. Harnisch has been retained as a consultant for our office. He is under contract to assist in the writing of several papers which explore the linkage between test item performance and curriculum.

H. An analysis of the curriculum coverage of the content areas contained in all six levels of the Mathematics Computation and Reading Comprehension subtests has been started. This analysis uses data from the twelve supplemental questionnaires completed by teachers during the norming phase of the study. This analysis will explore the relationship between student test item responses and teacher responses regarding curriculum coverage of these test items.

I. Correlations between the Form E and Form F subtests will be used as the estimates of parallel form reliability. This reliability is currently being assessed.

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FIGURE 2
INTERQUARTILE AVERAGES OF HEARING IMPAIRED STUDENTS IN NORMING SAMPLE: Reading Comprehension and Mathematics Computation

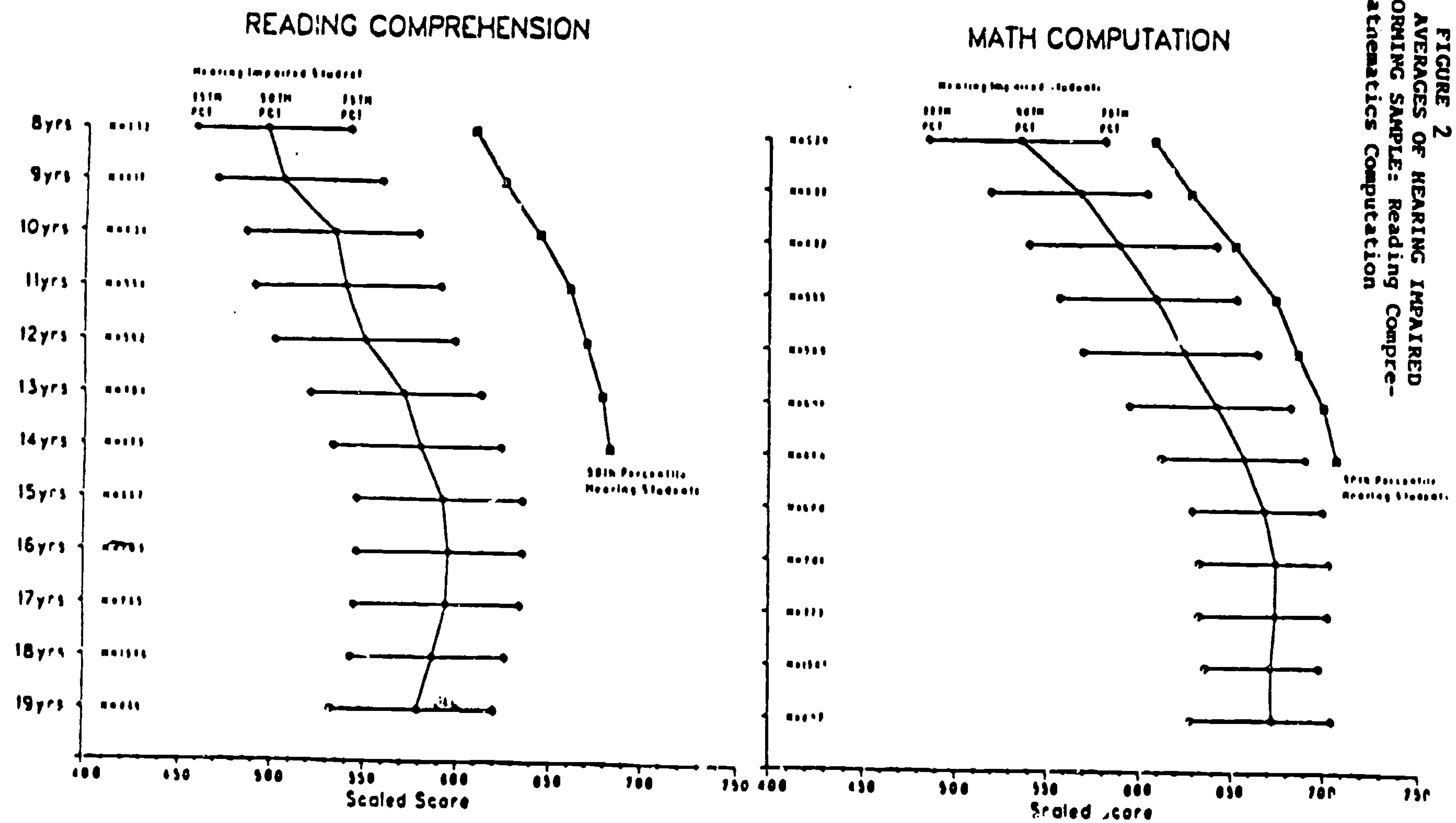

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FIGURE 3
INTERQUARTILE AVERAGES OF HEARING IMPAIRED STUDENTS IN NORMING SAMPLE: Spelling and Language

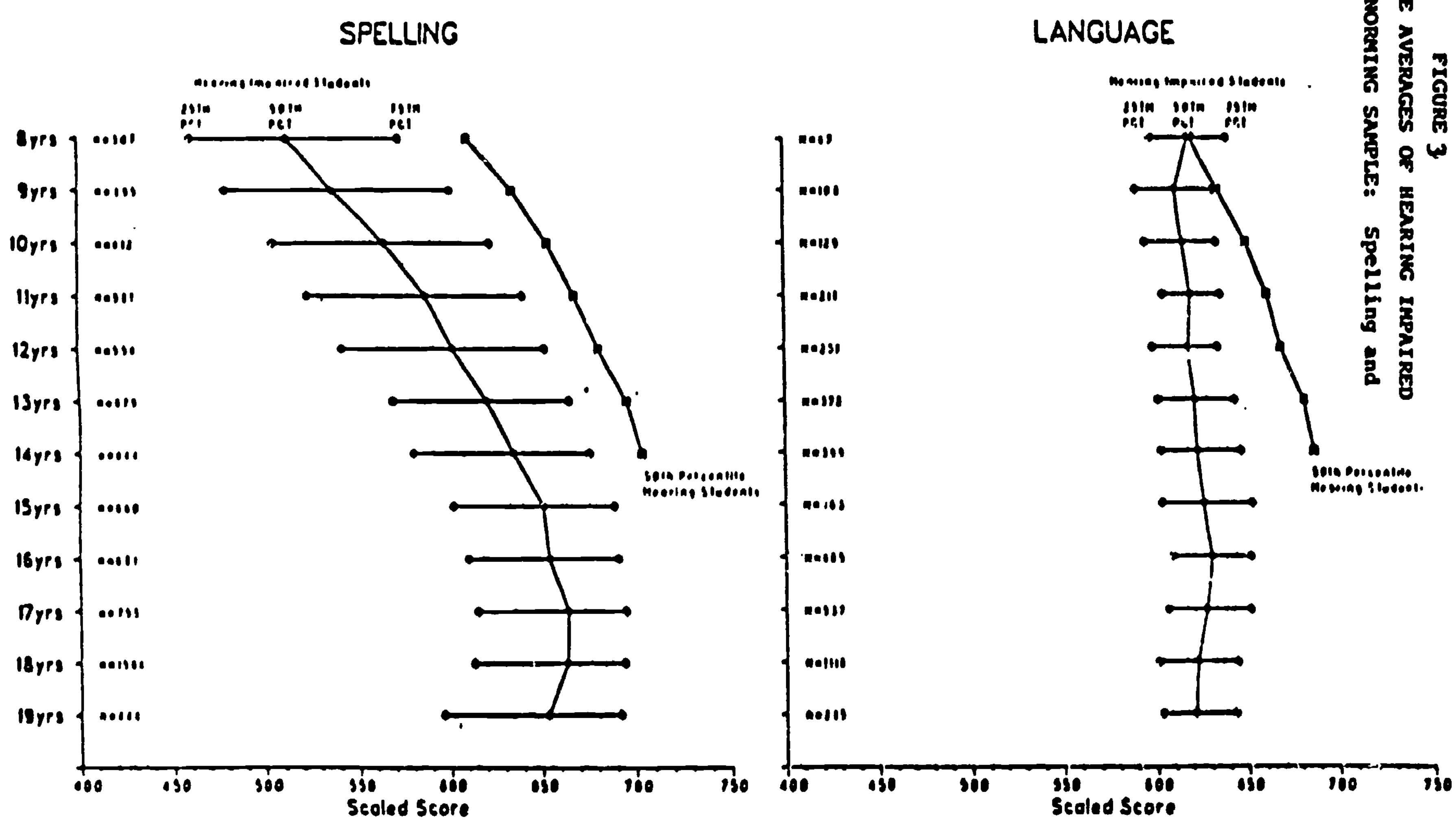

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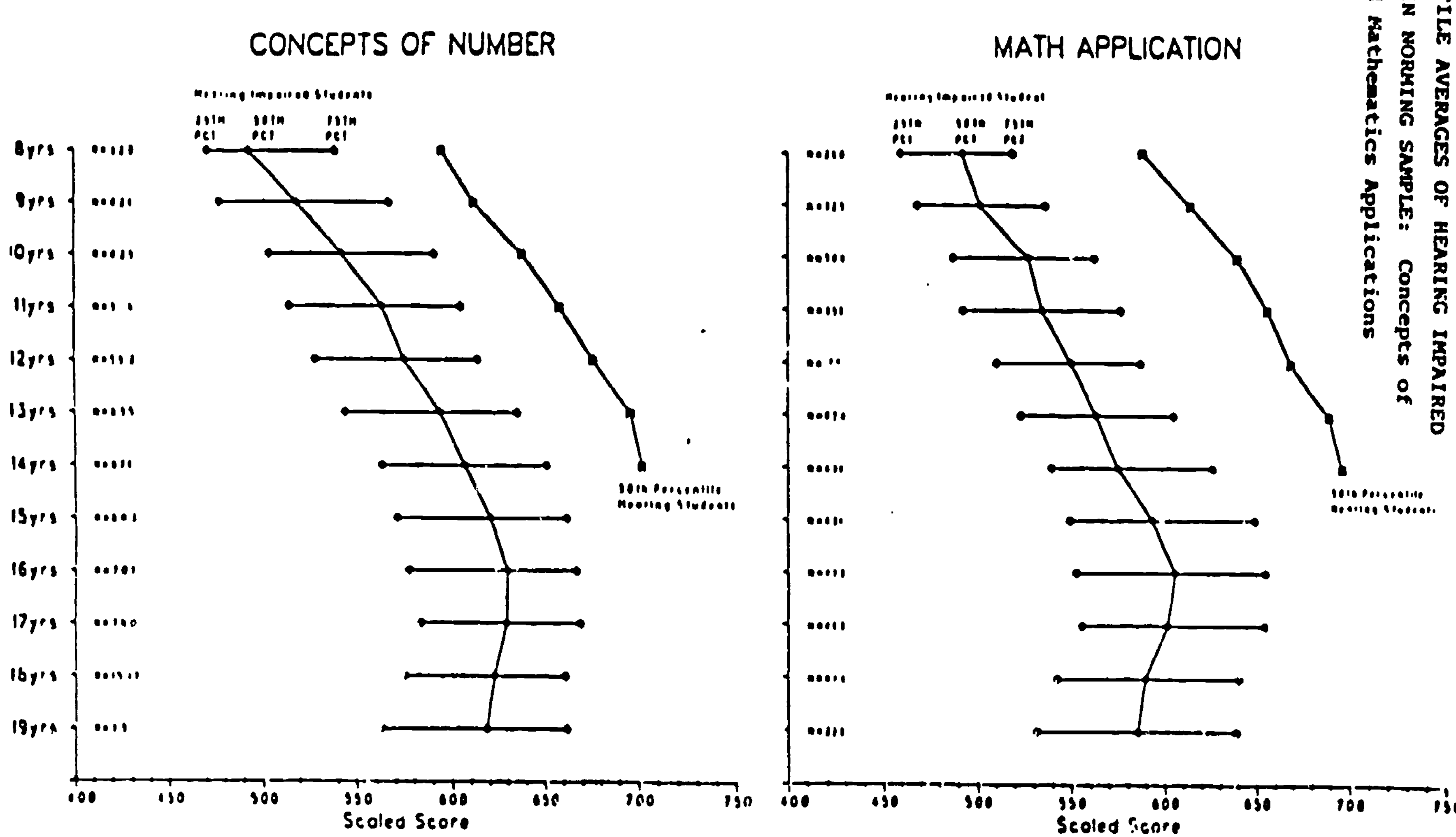
FIGURE 4
INTERQUARTILE AVERAGES OF HEARING IMPAIRED STUDENTS IN NORMING SAMPLE: Concepts of Number and Mathematics Applications



Phase 4: Dissemination and training

Adaptation and standardization of a current, up-to-date achievement test for hearing-impaired students must be accompanied by a national dissemination/ training project informing educators of the availability of the new test materials and procedures, uses of the test, and the interpretation of the test results.

Eight regional workshops were held in the following locations during the winter and spring, 1984:

Portland, ME
Denver, CO
New York, NY
Virginia Beach, VA
Rochester, NY
Rochester, MN
Buffalo, NY
Baton Rouge, LA

Additionally, workshops are scheduled this fall at schools for the deaf in Florida and California.

The workshops have focused on two broad areas - 1) Administration procedures, and 2) Inerpretation of test scores. Since the test materials themselves are identical to those given to hearing students, it is essential that educators become aware of the special procedures necessary for administering the Stanford to hearing-impaired students. A primary objective of these workshops was therefore to describe these procedures very carefully and to allow teachers to ask specific questions.

Since the norming involved the computations of new norms, it was necessary to devote careful attention in our workshops to score interpretation. Relationships among the three norm scales that are used (scaled scores, grade equivalents, and hearing-impaired percentile scales) were carefully described. A graph which demonstrates these interrelationshps for the Reading Comprehension subtest area appears as Appendix L. A more concise description of the hearing-impaired percentile scores was published in the journal, Perscpectives, a publication written for teachers. This article, entitled "Interpreting the New Stanford Achievement Test for Hearing-Impaired Students," appears as Appendix M.

SAT Final Report Section 2:

DESCRIPTION OF ONGOING STATISTICAL ANALYSES OF NORMING DATA

SECTION 2: DESCRIPTION OF ONGOING STATISTICAL ANALYSES OF NORMING DATA

The projected analyses that will be carried out and written up in the coming year cluster around five topic areas. Significant writing in each of these areas comprise the goal of this project plan. These areas are -

1. Summarization of the technical information related to the use of the Stanford with hearing-impaired students.

2. A comparative study of the two major norming projects carried out by CADS in 1974 and 1983, respectively.

3. The development and analysis of achievement productivity models which explore, from a national perspective, the interrelationships among demographic, handicapping, communication, family, and educational variables.

4. A study of curriculum coverage in reading and mathematics in special education programs for hearing-impaired students throughout the United States.

5. A study of the response patterns of hearing-impaired students to the Stanford Achievement Test.

In addition, three activities will be directed toward improving the test scoring and service capabilities of our center.

1. Publication of expanded norms tables.

2. Conversion of computerized screening test scoring program to IBM PC for use with Sentry 3000 scanner.

3. Introduction of SP analysis to educators of hearing-impaired students for use in analyzing test data at the classroom level.

In this section each of these topics will be described separately (and briefly) with comments directed toward rationale, GRI goals, review of literature (where appropriate), impact, past progress, methodology, and utilization. At the end of the proposal a timeline for analysis and writing will be described for all of the topics together. Before each topic is described, an overview of the data base and a description of the variables included for study will be presented.

Description of data bases

CADS possesses a large quantity of achievement data. Data has been collected and stored through major projects carried out in 1974, 1979, 1982, 1983, and 1984. In the analyses to be carried out in this project plan, data from these sources will be brought together. To better understand the topics of concern, we will describe the data sets that will be manipulated, and the categories of variables that will be analyzed.

Data collection year: 1974. In 1974 the Sixth Edition of the Stanford was normed on a national sample of hearing-impaired students. The Stanford data was merged with the 1973-1974 Annual Survey data. To make this data directly comparable with data collected in 1983 and 1984, it has been converted. Scaled scores have been brought up to date through redefining the subtest "strands" in a manner that is consistent with the Seventh Edition. Test levels have been described in terms of actual Stanford battery levels. (That is, separate levels for reading and math in the SAT-HI levels 2 through 5.) Finally, the Annual Survey data has been restructured to match, as best as possible, the structure of the 82-83 Annual Survey file.

Data collection year. 1979. In 1979, the SAT-HI was administered to many of the same programs that participated in the 1974 norming. Annual survey demographic was also collected and merged with score information. These variables will be converted in the same manner as were the variables extracted from the 1974 data base.

Data collection year: 1982. In 1982 the new screening tests developed for the Seventh Edition were pilot tested with approximately 1300 students. As part of that project, the SAT-HI was administered to all project participants. In the design of the norming of the Stanford the following year, all programs who had participated in the screening test pilot project were invited to participate. Of particular interest in the current sets of analyses are the (approximately 600) students who were tested with the Sixth edition in the Spring of 1982 and with the Seventh Edition in the Spring of 1983.

Data collection year: 1983. 1983 represented the largest achievement data collection effort carried out by CADS to date. Three major sources of data have been collected and merged: 1)the Annual Survey; 2)the Seventh Edition of the Stanford Achievement Test; and 3)the Curriculum Coverage survey. Data from the combined files from these three sources will comprise the cornerstones of all the proposed analyses.

Data collection year: 1984. During the current school year, both forms (E and F) of the Seventh edition of the Stanford have been administered to a nationwide sample of approximately 1000 students. (There are no current plans to merge this information with Annual Survey information.)

Categories of Variables studied

Demographic. Variables under this category include-

- Year of birth
- Sex
- Ethnic origin
- Region of country
- Type of educational program attended

Handicapping. Variables under this category include-

- Level of hearing loss
- Additional handicap status
- Cause
- Age at onset of hearing loss

Communication. Variables under this category include-

- Communication modes used by teachers in classroom
- Communication modes used by students in classroom
- Speech intelligibility
- General communication effectiveness

Family. Variables under this category include-

- Languages spoken in the home
- Hearing status of parents
- Nunber of hearing and hearing-impaired siblings

Teacher. Variables under this category include-

Sex
Hearing status
Years of experience with hearing-impaired students
Self-rating of signing ability

Curriculum. Variables under this category include-

Placement level
Coverage estimates in content areas of mathematics computation and reading comprehension (3 levels)--

- Item by Item within all Math Computation subtests
- Content domains within all Math Computation and Reading Comprehension subtests
- Subtest level

Achievement. Variables under this category include-

Stanford Achievement Test scaled scores, raw scores
Stanford Achievement Test cluster scores on content domain areas

Screening Test raw scores

Item responses and Item scores(1 or 0)

Student Caution Indices based on response pattern analysis

Item Caution Inices based on response pattern analyses

Teacher expectation of item performance: mathematics computation

Teacher expectation of content domain performance: reading comprehension

Congruence indicies--

Teacher expectation to student performance at the test item level

Curriculum coverage to student performance at the test item level

Curriculum coverage to teacher expectation at the test item level

TOPIC #1: Summarization of the technical information related to the use of the Stanford with hearing-impaired students

Rationale

The publication of a technical manual for use by researchers and educators of the hearing-impaired is crucial for two primary reasons. First, much care went into the design of the Stanford Norming Project and a summary of the procedures is necessary for persons wishing to understand the rationale for the many decisions that were made throughout the course of the project. The technical manual will document the technical aspects of the project. It will be very useful for persons involved in future normings of standardized tests with hearing-impaired students. Furthermore it will serve as the final report for our grant.

Second, it should be noted that promoting the validity and the reliability of the Stanford when used with hearing-impaired students was the guiding principle behind many of the decisions that were made throughout the project. Through a statistical analysis of the norming data, it is possible to study directly the reliability and validity of the test. In short, the statistical analyses included in the technical manual will tell us how successful we were meeting the goals of our project.

GRI Goals

This topic directly addresses goals 2 and 6. The Stanford is a widely used standardized test. Knowledge about its reliability and validity will assist teachers to use the score information in assessing the reading levels of their students. We expect that the Stanford is widely used by teachers throughout the United States to draw conclusions about the reading levelsof their students. A technical manual will help to ensure that they use the score information appropriately.

Review of Literature

We will use standard techniques for estimating reliability and validity (Lord and Novick, 1968). The sampling procedures that were used and which will be described came from Williams, 1978. The issues which guided the modifications intended to lead to greater reliability and validity are described in Allen, White

& Karchmer, 1983.

Impact

The technical manual will be widely used by researchers and practitioners alike. Researchers will use it whenever they plan to use the Stanford as a measure in their research. It will provide standard error and sample distributional information which will enable them to fully understand the benefits and limitations of selecting the Stanford as a measure. Teachers will want to use the manual for the same reasons. The manual will give teachers some degree of confidence when they select the Stanford. The manual will positively influence future test development activities with hearing impaired persons by describing the methodology that was used in the present norming effort.

METHODS

The following Table of Contents (Projected) will provide information about the projected analyses:

I. Description of screening test development

II. Screening Tests Reliabilities

III. Validity of the screening procedure

IV. Sampling procedures used for the norming

V. A description of the demographic and handicapping characteristics of the norming sample

VI. Reliability estimates of the Stanford subtests (by test level)

a. Using internal consistency estimates

b. Using parallel form reliability estimates

VII. Comments on the linkage of Form E and Form F when used with hearing impaired students (possible topic)

VII. Validity of the Stanford

a. Intercorrelations among the subtests as evidence for concurrent and construct validity

b. Correlations between the screening teset and the Stanford subtests

VIII. Item analysis (Appendix-possibly published as separate technical bulletin)

UTILIZATION

The technical manual will be distributed to users of the Stanford upon request. Many of the tables and narrative sections of the manuscript will be repeatedly used in subsequent writing about the Stanford in the methodology sections. As such the manual will serve as a large methodology section from which portions can be extracted for future writing about the project. A large portion of the norm tables and the sample description section will be summarized in the forthcoming CADS book in the norming study chapter.

* * * * *

TOPIC #2: A comparative study of the two major norming projects carried out by CADS in 1974 and 1983

Rationale.

Having carried out two large scale achievement test normings over a nine year period, CADS is in a good position to analyze the achievement progress of the hearing impaired student population over that time period. A tantalizing and obvious question presents itself immediately: Have hearing-impaired students gained in their achievement over the last ten years? With one year experience distributing the new Stanford, we are keenly aware that the norms computed in the two years are dramatically different; the percentile distributions have shifted upward significantly. This is good news and bad news to educators of hearing-impaired students. It is good news in the sense that hearing-impaired students today appear to have outperformed their counterparts from nine years ago. It is bad news in the sense that the percentile ranks of individual students have dipped dramatically, given the higher distributions.

It is too early to praise educators of hearing-impaired students for their work in improving test scores over the last decade. There are other reasons why the the increase in test scores may have happened. The norming samples may not be comparable on key characteristics. The procedures used in screening students into test levels have changed, and the difference in test level distribution may, itself, account for the difference in scaled score distributions. Finally, the scaled score conversion tables provided to us by the test publisher may have some characteristics of which we are not yet aware. The primary goal of this analysis topic is to explore these alternative explanations and draw some conclusions about the relative achievement levels of hearing-students in 1984, compared to 1974.

GRI Goal

The future of educational materials development for deaf and hearing-impaired students will depend on a study of what has and has not worked in the past. The goal of this analysis will be to articulate what factors in our data base can account for the noted differences in achievement. Inevitably it will be seen that educational materials interact with the characteristics of students in the facilitation of better achievement. A national perspective on the achievement trends of hearing-impaired students over the past ten years will help to articulate factors that contribute to enhanced achievement and to better instruction. Thus this analysis addresses itself to articulating the changes in the learning patterns of hearing-impaired students over the past ten years and will help a more comprehensive understanding of how deaf children develop school skills.

Review of the literature.

Very recent research with hearing children has suggested a possible increase in IQ levels in recent years (Horst, 1983; Wahlberg, 1983). Likewise, the Stanford norms published with the seventh edition show an upward turn of the distributions when the sixth and seventh edition scaled scores are linked. These large scale studies of hearing children are brand new; there is certainly no data published showing similar increases with hearing-impaired children. No doubt, the publishers of the Stanford are hesitant to announce achievement differences based on comparisons of two different normings. A recent study by House (1983) has shown that even Fall to spring comparisons based on two different norming samples can be terribly misleading and lead to large overestimates of growth.

Educators of hearing-impaired students need to know how their students have fared over the last ten years. Yet with two different norming samples and two different versions of the Stanford, comparisons will be tricky. Nonetheless, charting the academic progress of hearing-impaired students over time is as important an endeavor with hearing-impaired students as it is with hearing students.

Impact

This analysis will not only consider the overall means of achievement scores at two points in time but will look for reasons why the 1983 scores are higher. Some of these reasons may by related to differences in the schooling practices for hearing-impaired students from 1974 to 1983. If such relationships can be noted, this analysis will have an impact on defining the appropriateness of certain educational practices employed with hearing-impaired students. If no such relationships can be noted the analysis will still serve an important function in the research literature. It will document two highly important studies in the area of achievement testing with hearing-impaired students. It will also provide explanations for the differences in the derived scales from the two different tests. As such, it will help educate teachers how to interpret norm scores by showing them the cautions of comparing a child's performance with two different norming samples simultaneously.

Past progress

The 1974 data file has been converted to match current data files. The scaled scoreshave been converted using conversion tables provided by the test publisher; the subtest strand definitions have been altered so that the subtest areas are comparable across the two different editions of the tests. The test levels have been matched and renamed so that Primary 1 always means Primary 1, and so on for both editions of the test. The demographic file from 1974 has been restructured to match the format of the 1983 file and variables common to both years have been identified and extracted. The files from both years have been merged and some preliminary analyses have been run.

These preliminary analyses show that there are very few demographic and handicapping differences (in terms of proportions of students with given characteristics) between the two normings. The only large differences relate to proportions among the various categories defined by the stratification variables region of the country and program type). These may eventually prove to be very important. Other large differences exist in the proportions of students at each age level assigned to the various levels of the test. The study of the 1983 screening procedures has led us to be confident in the validity of those assignments. The validity of the 1974 screening procedures has not been carried out.

METHODS

Research questions

The overriding research question which will guide the current analysis is, "Has the achievement of hearing-impaired students an the areas of Math Comnputation and Reading Comprehension changed over the past ten years?" A more detailed question is, "What factors account for the noted differences in achievement between the 1974 and 1983 norming samples?"

Statistical Analysis

Multiple classification analysis, regression analysis and analysis of covariance will be used to study the data set. If time permits, a secondary study of the 1979 achievement data base will be undertaken to see if gains in achievement have been continuous throughout time. If so, then the hypothesis that hearing-impaired students have gained will be supported.

UTILIZATION

The analysis of this topic will be the subject for a chapter in the 10 year perspective book being written by CADS. This is the most appropriate place to publish this piece of research since the whole book is geared toward articulating the characteristics of the hearing-impaired student population over the last ten years. The tentative title for the chapter is, "Achievement Patterns of Hearing-impaired Students, 1974-1983".

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TOPIC #3: The development and analysis of achievement productivity models which explore, from a national perspective, the interrelationships among demographic, handicapping, communication, family, and educational factors

Rationale

Basic demographic information does not go far enough to explain educational productivity. Students are educated in a context of very complicated interactions among a large number of factors. While demographic factors alone have been readily shown to account for significant proportions of variance in achievement, almost all studies show that there is plenty of variance left to be explained. While the Topic #2 analysis described above has as its focus a ten year perspective with demographic information serving as the only available explanatory variables, the current analysis will attempt to place these variables in the context of more alterable educational characteristics. As such, the results of this analysis have more potential for impacting the educational practices of educators throughout the United States.

Many new variables have been added into the picture. These include family characteristics, teacher characteristics, school variables such as time on task and degree of integration during instruction, curriculum information, and communication pattern information. This analysis will lead a much fuller explanation of educational productivity among hearing-impaired students than has been heretofore possible with demographic information alone.

GRI Goal

The GRI goal pursued by this analysis is the same as described under Topic #2.

Review of the literature.

There is a wealth of recent literature describing the development and analysis of educational productivity models (e.g. Allen, 1982; Anderson, 1978; Maruyama and McGarvey, 1980;Maruyama and Miller, 1979). Most of this research is geared toward articulating the role of social and motivational variables in the enhancement of achievement. Among hearing-impaired students, these models have not been tested, due to the lack of adequate social and motivational measures which are appropriate for hearing impaired populations. In their place, researchers of educational productivity among hearing-impaired students have focused on other categories of variables, such as communication, mainstreaming, parental hearing status, etc. Yet the more sophisticated analytical techniques for studying educational productivity models among hearing students have not often been applied to the study of hearing-impaired students.

A couple studies carried out by the principal investigator have attempted to look at more global models of achievement. Allen & Karchmer (1982) studied the role of maternal rubella as a cause within the context of a number of other variables. Allen & Osborn (1984) studied the relationship of integrating hearing-impaired students with hearing students during instruction, controlling for a number of other demographic variables. The major shortcomings of these studies was that information related to educational processes was not included in these designs.

The Curriculum Coverage survey which was distributed with the Stanford during the norming project to a random sample of students within the norming sample solicited information on important educational questions. With these new data, more comprehensive productivity models can be developed and tested, and the interactions among the variables can be assessed.

Impact

This analysis will shed some insight into the effect of a number of important educational variables on achievement, such as time-on-task, communication patterns in the classroom, speech intelligibility, and degree of integration among hearing-impaird and hearing students during instruction. This has potential for improving the educational practices within programs for hearing-impaired students. For example, we may learn the extent to which time-on-task can mediate the influence of speech intelligibility on achievement. Or, we might learn the effectiveness of integrating hearing-impaired students with low versus high speech intelligibility. This knowledge may have an impact on placement and curriculum decisions in the future.

Past progress

All the data for this analysis has been collected and is stored in computer files. Some discussion has taken place about the specific kinds of models that will be tested.

METHODS

Research questions

A large set of questions will be posed that consider the interactions among the variables that have been studied. Where possible, achievement models will be constructed which hypothesize the anticipated interactions and effects.

Subjects

This study will combine data from the Stanford Norming, the Curriculum Coverage Survey, and the Annual Survey. Merged data files have resulted in a data base with 2,845 students with data from each of the three sources of data. For aproximately half of these students teachers were asked specific questions on the Curriculum Coverage survey related to the mathematics instruction of their students; teachers of the other half were asked questions about the reading instruction of their students. Thus, separate models will be developed for reading and math achievement. The data base for the assessment of each model contains about 1400 students.

Statistical analyses

At first, multiple regression will be used to study the effects of each of the independent measures. About one-half of the variables in the data set can be considered to be on interval level scales; the other half will be recoded to dummy variables. Where appropriate, smaller path analytic models will be constructed and assessed using least squares regression. These will be assessed only to the extent that models can be specified prior to testing.

Eventually, if more theoretical constructs can be identified which extract the shared variance of two or more independent variables (e.g., Level of Handicap, which may combine hearing loss and additional handicap information), more appropriate maximum liklihood approaches to the data may be used (Maruyama and McGarvey, 1980).

UTILIZATION

Results of these analyses will be written up and submitted to referreed journals. Possible paper titles include-

A model of educational productivity among hearing-impaired students

Speech intelligibility and achievement within integrated and non-integrated educational settings for hearing-impaired students

Communication patterns and achievement within integrated and non-integrated educational settings for hearing-impaired students

Authorship for these papers will be one of the following combinations: Allen; Allen & Karchmer; Allen & Harnisch; Harnisch & Allen; Allen, Harnisch, & Karchmer.

Possible journals are-

American Educational Research Journal

Journal of Special Education

Exceptional Children

Journal of Speech and Hearing Research

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TOPIC #4: A study of curriculum coverage in reading and mathematics in special education programs for hearing-impaired students throughout the United States

Rationale

The linkage between the Stanford and the various curricula in programs for hearing-impaired students throughout the United States has never been directly studied. It is inevitable that there is variability in what is presented to students among programs of different types in different regions of the country. The purpose of this analysis will be to study, from a national perspective, the extent to which the different content areas measured by the Stanford in reading comprehension and mathematics computation receive curriculum coverage in programs throughout the United States.

A more extensive analysis will study the relationship of curriculum coverage to program and student characteristics. For example, do residential schools offer substantively different coverage in reading and math than do local public schools? Also, do the curricula in reading and math for hearing-impaired students differ in the different regions of the country.

A third level of analysis will identify curriculum areas that have unusual patterns of coverage throughout the United States, in their relationships with other curriculum areas.

A final area of analysis will examine directly the relationship of curriculum coverage to actual performance on the Stanford.

GRI Goal

The primary purposes of this analysis are to describe the national curricula in reading and math (insofar as they are consistent with the content areas measured by the Stanford), and to establish an empirical link between curriculum coverage and test performance. Where differences are noted, we will be able show how differential coverage can lead to differential performance.

Review of the Literature

An entire recent issue of the Journal of Educational Measurement (Vol.20,2,1983) was devoted to research which attempted to articulate the linkage between standardized tests and instruction. The assumption made by most of the articles in this journal was that, although standardized tests are not especially useful in the day-to-day learning that goes on in the classroom, establishing the link between a given standardized test and the curriculum within which it is administered is crucially important. It is noted that standardized tests are used to make many important decisions in schools. They are used by researchers to study school effectiveness. They are, in many cases, used to make program placement decisions for individual students. This is especially true for special populations such as hearing impaired students.

Educators of hearing students have a large number of tests from which to choose. They have the luxury of selecting tests which they feel best match their curriculum. For hearing-impaired students, the Stanford serves as the only major test for which special norms and administration procedures have been developed. Thus an examination of the linkage between the Stanford and educational programs throughout the United States should be a high priority.

Impact

This project will have a significant impact in two major areas: 1) it will provide considerable information to teachers on the appropriateness of the Stanford, and 2) it will describe the "national" curriculum of hearing impaired students in reading and math (within the limits of the content domains measured by the Stanford). This will be of considerable use to curriculum developers who wish to gain knowledge about the national context of education for hearing-impaired persons.

Past progress

Data from the Curriculum Coverage Survey have been collected and merged with Annual Survey and Stanford data. Twelve subfiles have been created which contain data relative to the six levels of reading comprehension and mathematics computation subtests, respectively. Descriptive analyses of item by item coverage on one of these subfiles has been completed. Prototypes for visually displaying the level of coverage and level of performance for subtest scores, content domain scores, and item scores have been designed. Correlations among performance, teacher expectation, and coverage variables have been computed for one of the six mathematics files. A schedule for analysis has been drawn up.

METHODS

Research questions

1. To what extent are the various content domains assessed by the Stanford covered in programs for hearing-impaired students throughout the United States?

2. Do programs in different regions of the country differ in their curriculum coverage of the content areas measured by the Stanford?

3. Do different types educational programs serving hearing-impaired students differ in their curriculum coverage of the content areas measured by the Stanford?

4. Do students with different characteristics (e.g. different amounts of hearing loss) recei› different patterns of coverage in the content areas measured by the Stanford?

5. Do some content areas have unusual patterns of coverage in programs for hearing-impaired students throughout

the United States?

Subjects

The Curriculum Coverage Survey sample was selected concurrently with our scoring of the norming sample's screening tests. The full norming sample (8,331 students) was stratified by test level assignments in reading and math as the screening tests were scored. Within a school, 17% of the students assigned to each of the six levels of the reading (Full Battery) test were randomly selected. Similarly, 17% of the students assigned to each of the six levels of math were randomly selected. A constraint was placed on the sampling process which prohibited a student from being sampled into both the reading and math subsamples. To avoid any bias arising from that constraint, the number 1 or 2 was selected at random; if 1 was selected, the reading subsample was drawn first. If the number 2 was selected, the math subsample was drawn first.

The computer generated labels with the sampled students' names, their test level assignments, and whether they had been selected for the reading or math subsample. These labels were attached to one of the twelve Curriculum Coverage questionnaires that had been prepared, determined by test level and subject area.

Since a standard percentage was used to draw the Coverage sample, the distribution of returned questionnaires parallels the population distribution of norming sample test level assignments. This distribution is by no means rectangular. Thus the twelve curriculum coverage files are not of uniform size. They range in size from 45 to 353. The larger of these files will be used more predominantly in the analyses.

Statistical analysis

The following analysis protocol has been devised:

1. On each of the 6 Math files, create 3 separate files--

    a. Test item responses

    b. Coverage of item content

    c. Expected performance

(For 6 reading files, create only the test item response file.)

2. Run SP analysis on all created files to create new variables for analysis (N correct,% correct,Caution Index, Modified Caution Index for: Item performance array, Coverag. array, and Expectation array)

3. Merge new variables back with student file.

4. Create an Item file for each test level containing SP variables and Content classification

5. Perform analysis on student file, breakdowns of coverage by other variables, etc. to answer research questions.

6. Analyze item files in terms coverage and performance, including a study of item caution indices

Once the Student-Problem analysis has been applied to the performance, expectation, and coverage items and the new indices have been merged back with the original files, the statistical treatment of the data sets will be quite simple and mostly descriptive in nature.

UTILIZATION

We feel very strongly about the importance of this topic, and we will therefore be looking for a number of different ways to communicate the results of this analysis. The following are tentatively planned -

1) A paper presentation at AERA in Chicago next March.

2) A technical bulletin based on a study of the item file, which presents caution and coverage information for all of the math computation and reading comprehension items appearing in the battery.

3) A series of journal articles articulating the level of coverage of the various content domains throughout the United States and the degree to which item performance and curriculum coverage are related on the Stanford

Authorship for these topics will be Allen & Harnisch (for topics that emphasize the analysis of the reading files); Harnisch & Allen or Harnisch, Allen & Miller (for topics that emphasize the analysis of the math files.)

* * * * *

TOPIC #5: A Study of the response patterns of hearing-impaired students to the Stanford Achievement Test

Rationale

The purpose of this analysis is to identify correlates of unusual response patterns shown by students to the Stanford. It is certain that among groups of students with similar raw scores on selected subtests of the Stanford, there will be a wide variety of response patterns that will be in evidence. It is possible, using techniques of response pattern analysis such as the Student-Problem table with the Caution Index and Modified Caution Index (Harnisch, 1983; Harnisch and Linn, 1981; Sato,1975) to identify students with unusual response patterns. These are students whose raw score is comprised of an unusual set of correct and incorrect responses. Unusual, in this context, is determined by the group of test takers as a whole.

The norming data base is highly representative of the nation's hearing-impaired student population. Thus, for each of the subtests, we can establish difficulty values which have meaning in a broad national context. In an ideal world, each student's raw score would contain all the information we would need to be able to predict which items the student got right and which items the student got wrong. More specifically, if we order the items by their difficulty values, as determined by our national assessment, each student should answer correctly all items whose order of difficulty was less than or equal to the student's raw score.

Students often answer correctly items that are more difficult and answer incorrectly items that are less difficult than what we would expect, given their raw scores. To the extent that response patterns deviate from the "expected" pattern, we must exercise caution in interpreting the raw scores and the norms that are based on conversions of these raw scores. The Modified Caution Index (Harnisch & Linn, 1981), used in the current analysis is a measure of the extent of deviation between a students response pattern and the expected response pattern for the student's particular raw score.

We suspect that some subgroups of hearing-impaired students should not be taking the Stanford. Perhaps that is stating matters too strongly. We know that there are some groups for whom extreme caution should be used when interpreting scores derived from the Stanford. By using Student-Problem analysis we can identify students who have responded in an unusual manner to the test. The purpose of the currest analysis is to study the characteristics of such students, and to identify the correlates of unusual responding to the test.

Review of literature

In the last few years, there has been a large amount of research into the study of student response patterns to achievement tests (e.g., Donlon & Rindler,1979; Harnisch, 1983; Harnisch & Linn,1981; Tatsuoka & Tatsuoka, 1982). Much of this research has centered around the use of the S-P table. Three areas of research and analysis can be identified: 1)Psychometric properties of various response pattern indices; 2) Exploration of ways to make S-P analysis useful for instruction; 3) Examining the correlates of response pattern indices in terms of student and program differences. The current analysis will concentrate on this third area with the hearing-impaired student population in the United States.

Impact

If groups of students can be identified that have high caution indices associated with their response patterns, we can make recommendations about the level of caution that should be used when administering the Stanford to students with similar characteristics. In a planned secondary analysis, we will study the the distractors chosen by students with high caution indices. This may lead us to formulate some hypotheses related to the cognitive strategies of these students. Thus one benefit of this kind of analysis is that it may lead directly to future experimental work.

Past progress

The Stanford norming data is on the computer in a readily retrievable format; the S-P Package which does all the response pattern analysis has been acquired from Dr. Harnisch and is now up and running on the DEC. Some response pattern analyses have been run on the smaller Curriculum Coverage survey files, but none have been run on the full norming sample file.

METHODS

Research questions

1. What are the correlates of high caution indices?

2. Should any subgroup of hearing-impaired students not be taking the Stanford?

3. Can a consistent pattern of error responses be determined from a response pattern analysis, especially among those with levels of caution indices and similar demographic characteristics?

Subjects

Students from the full norming file will be used in this analysis (N=8,331).

Statistical analysis

The item responses will be analyzed using the S-P Package. The derived caution indices will be merged back with the master student files and analyzed as dependent measures. Various statistical procedures will be used to study the relationships among the variables on the file.

UTILIZATION

This analysis will result in journal articles. See possible list under Topic # 3 above. Also, some basic S-P tables will be generated and used to illustrate these techniques to educators of the hearing-impaired. These illustrations will be published in more practitioner related publications.

Service Activities

I. Publication of expanded norms tables

At the request of many programs which use the Stanford Achievement Test, we will publish decile information based on various groupings of the norming sample. Under consideration now are:

Region of the Country

Northeast, North Central, South, West

Program Type

Special Schools(residential and day), Local Public School Districts

Hearing Loss

Less than Severe, Severe, Profound

Additional Handicaps

No additional handicaps, Additional physical handicaps, Additional cognitive/behavioral handicaps

Ethnic Origin

Whites,Blacks,Hispanics

II. Conversion of screening test scoring program to IBM PC for use with Sentry 3000 scanner

The scoring of the screening test involves, in some cases a consideration of item response patterns, and, in others, a consideration of the student's performance on a set of best dis criminating. Furthermore, the resulting test level assignments of student groups can lead to complex logostical problems in organizing the testing with the Stanford. Computerized software was developed for the norming which scored screening tests, provided separate listings of students within a program by their reading and math assignments, and created a computer-generated order form which summarized all the needed materials for a given program.

Scoring screening tests would be an ideal service to provide for the field to ensure that the test levels were being assigned appropriately. However, in their current format, the scoring sheets cannot be machine read. We cannot envision a service where our data enterers entered actual item responses key to disk. Therefore we propose to convert the screening test scoring software to the IBM PC and to develop specialized scoring answer sheets that can be scanned with our Sentry 3000 scanner.

III. Introduction of SP analysis to educators of hearing-impaired students for use in analyzing test data at the classroom level

SP analysis is an excellent technique for teachers to use in analyzing the results of their own tests. Through this technique they can identify students with unusual response patterns and use that information to make remedial instruction decisions. They can use the derived caution indices to identify items that perhaps are not measuring what they think they are. They can assess the degree to which their own tests match their own conceptions of the sequencing of skills development as evidenced by the response patterns of their students. Furthermore they can obtain a wealth of "traditional" test and item analysis statistics.

In some manner, we will begin to introduce this useful test interpretation technique. The exact format for that introduction is not yet clear. At the minimum, we will prepare an illustrative paper which includes some examples of SP tabels and caution indicies. Otherwise, we may try to schedule a workshop or two at MSSD and KDES.

SAT Final Report Section 3:

OUT-OF-LEVEL TESTING WITH THE STANFORD ACHIEVEMENT TEST (SEVENTH EDITION): A PROCEDURE FOR ASSIGNING STUDENTS TO THE CORRECT BATTERY LEVEL

SECTION 3: Out-of-level testing with the Stanford Achievement Test (Seventh Edition): a procedure for assigning students to the correct battery level

This paper will report on the development of a set of screening procedures for assigning students to the appropriate levels of the Stanford Achievement Test, Seventh Edition (Gardner, Rudman, Karlsen, & Merwin, 1982). Four screening tests were developed and piloted during the spring of 1982 with a national sample of hearing-impaired students, and the system for scoring the tests was developed after an analysis of the pilot data. The final tests were eventually used to screen over 8,000 students during the spring of 1983 when the Stanford was normed for the hearing-impaired student population. The screening tests form part of a set of special procedures and materials designed to facilitate the use of the Stanford with hearing-impaired students. This paper will describe the manner in which the screening tests were developed and piloted, present the results of the pilot testing, describe the scoring system that was developed, and report on the validity of the screening through a study of its use with the norming sample.

The Stanford Achievement Test is published in six difficulty levels (Primary 1, 2, and 3, Intermediate 1 and 2, and Advanced); each level is administered to hearing students in specific grades in school. The test booklets contain subtests in different content areas designed to test the progress of students with grade-appropriate material. Students are normally assigned to test booklets on the basis of their grade. The score information is then based on comparisons of the students' performance with the performance of students in the norming sample who were in the same grade when the tests were normed.

Relying on a student's grade or age as a basis for assignment to test level is often not appropriate. This is true for students whose progress in school lags significantly behind the progress of students who are similar in age or grade and for students whose growth in different achievement areas is uneven, i.e., they achieve at similar levels in some content areas, but lag behind in others. It is also inappropriate for students receiving instruction in programs with curricula which differ significantly from the curricula which guided the construction of the test.

Assigning a student to a level of the Stanford that is either too easy or too difficult leads to results that are not valid. For example, guessing on the Advanced level Reading Comprehension subtest can lead to a grade-equivalency estimate in the third to fourth grade range. Clearly, the value of this result is questionable. Norms such as these often become a part of students' permanent records, and, in the case of special education students, are used to make important planning decisions.

The need for quick and reliable procedures for determining appropriate test level assignments is great. Wick (1983) reported that in 1974 42% of the students in Chicago taking the Iowa Test of Basic Skills scored at the equivalent of a chance level, i.e. 25% or less in terms of their raw score. In some of the low-performance Chicago schools, the percentage was as high as 82%. This had the effect of elevating district averages when the raw scores were converted to norms. To solve the problem, Chicago switched to "functioning-level" test assignment, in which students were assigned to test level on the basis of "teacher opinion." Although this procedure led to a lower proportion of chance scores and a better test reliability, it is not clear what criteria teachers used in making their test level assignments. The project reported here was undertaken to develop a two-stage testing procedure in which a short screening test would provide the basis for making objective functional test level assignments.

In the current project, hearing-impaired students were used as the test development population. Assigning these students standardized achievement test levels on the basis of their age or grade is especially problematic. Allen, White, and Karchmer (1983) reviewed previous research findings related to the achievement levels of hearing-impaired students. They noted that the relationship between grade placement and skill level is often not the same for hearing-impaired students as it is for hearing students and that hearing-impaired students' academic progress is uneven across content areas. They concluded that special procedures for assigning hearing-impaired students to levels of standardized tests are necessary. They also suggested that separate screenings in reading and math are necessary so that the subtests related to specific content areas are more adequately matched to the students' abilities. This population of students is one which has a need for special screening procedures if the results of standardized achievement testing are to be interpreted correctly.

METHOD

Test construction

Several guidelines were established to aid the construction of the screening tests:

1. tests should be short, about 30 items each;

2. items selected for the screening tests should have a known statistical relationship in terms of their item difficulties to items that appear in the actual Stanford booklets;

3. separate screening tests in reading and math should be constructed;

4. items should be written in formats which are the same as formats used in the Stanford booklets;

5. lower and upper level screening tests should be constructed so that the range of ability levels measured by any one test would not be too wide;

6. the lower and upper levels should overlap in difficulty to allow for flexibility in assigning students to screening test levels who are achieving in the mid-range of ability.

The Psychological Corporation, publishers of the Stanford, made available to the current project, the bank of test items which had been included in the initial item try-out for the Seventh Edition Stanford with a large national sample of hearing students. These items had been statistically analyzed along with the items that were selected for inclusion in the published edition of the test. Statistical information available for these items included biserial and point-biserial correlations p-values for hearing students at different grade levels in the item try-out sample, and scale values of item difficulty, calculated through a Rasch analysis of the item data. Despite the fact that these items had been rejected from the set of items selected for the published test, there was an ample number of items available which had acceptable item statistics, i.e., biserial correlations above .40 and item difficulty indices which adequately represented the range of abilities measured by the different levels of the Stanford.

Means of the Rasch scale values of the items which had been selected by the publisher for publication in the Stanford were computed separately for the Mathematics Computation and Reading Comprehension subtests at each of the six levels. Where possible, items were selected for the screening tests from the remaining items which had scale values that clustered around these mean scores. This assured that the screening test items would adequately represent the entire range of ability measured across all six levels of the Stanford in the subject areas of reading comprehension and mathematics computation.

Each item in the bank was coded by the test authors to represent the Stanford battery level for which it was being considered for inclusion. Using these codes to pick items for the screening instruments, eight items were selected to represent each of the six levels of Reading Comprehension, and eight items were selected to represent each of the six levels of Math Computation. The items were assembled into four booklets, each containing 32 items. Drafts of the booklets were sent to The Psychological Corporation for review and comment. The publisher noted some redundancy in the content of some of the items. As a result, several items were deleted from each of the booklets. An artist was employed to create the needed artwork for the booklets in a style that was consistent with that used by the test publisher in creating the final forms of the test. The final versions of the screening tests were constructed as follows:

Form R1A - Lower Level Screening Test in Reading, containing items from Primary 1, Primary 2, Primary 3, and Intermediate 1 Reading Comprehension subtests (27 items,.

Form R2A - Upper Level Screening Test in Reading, containing items from Primary 3, Intermediate 1, Intermediate 2, and Advanced Reading Comprehension subtests (30 items).

Form M1A - Lower Level Screening Test in Mathematics, containing items from Primary 1, Primary 2, Primary 3, and Intermediate 1 Mathematics Computation subtests (26 items).

Form M2A - Upper Level Screening Test in Mathematics, containing items from Primary 3, Intermediate 1, Intermediate 2, and Advanced Mathematics Computation subtests (26 items).

Samples

Development sample. Students selected for inclusion in the pilot testing project were drawn from the population of students on whom data had been collected by the Annual Survey of Hearing Impaired Children and Youth (AS) during the spring of 1981. This survey collects information yearly on over 55,000 hearing-impaired students who receive special education services in programs throughout the United States. Nearly 1100 programs containing over 5,000 individual schools throughout the country participate in this survey every year.

A random sample of schools was selected from the AS data base to represent the different regions of the country and the different types of educational programs serving hearing-impaired students. A total of 84 schools throughout the country participated in the project. Of these, 76 schools completed all the required testing. The total number of students tested in these schools was 1,450.

Verification sample. The screening procedures developed during the first year of this project were used the following year to assign hearing-impaired students to the six levels of the Stanford when the test was normed on a large national sample of hearing-impaired students. The screening tests were administered to 8,331 hearing-impaired students, chosen through a random sampling of the programs which participate in the Annual Survey.

Design

Criterion measure. During the year in which the pilot testing was being carried out, the 7th Edition of the Stanford was not available in its final form. The 6th Edition of the Stanford was therefore used as the criterion measure for assessing the discriminating power of the new screening tests. This procedure was considered satisfactory since the grade-level to battery-level relationship is approximately the same for both the 6th and 7th editions of the Stanford.

During the 1973-74 school year the 6th Edition of the Stanford Achievement Test was normed on a large national sample of hearing-impaired students (Office of Demographic Studies, 1974). During that project, the problems of functional-level versus grade-level test assignment were also addressed. The result was a modified version of the Stanford called the Special Edition for Hearing-Impaired Students of the Stanford Achievement Test (SAT-HI). It is important to consider two features of this special edition in the present design:

1. The Reading Comprehension subtests from the Form B Primary 2 and Intermediate 1 levels of the Stanford served as upper and lower level screening tests for the Form A batteries. There was no separate screening for math.

2. To get around the uneven growth problem, the test booklets were reconstructed, i.e., subtests from different Stanford battery levels were mixed, and special

booklets were printed to approximate the median growth patterns of hearing-impaired students in the different subtest areas. Six levels of the SAT-HI were constructed. The Reading Comprehension and math computation subtests included in each of these levels are as follows:

SAT-HI Level 1 - P1 Reading	P1 - Mathematics
SAT-HI Level 2 - P2 Reading	P3 - Mathematics
SAT-HI Level 3 - P3 Reading	I1 - Mathematics
SAT-HI Level 4 - I1 Reading	I2 - Mathematics
SAT-HI Level 5 - I2 Reading	Ad - Mathematics
SAT-HI Level 6 - Ad Reading	Ad - Mathematics

The problem posed by using the SAT-HI as the criterion measure was that the Primary 2 Mathematics Computation subtest is never administered. In determining cut-off scores for assignment to the Primary 2 Mathematics Computation level, a pseudo Primary 2 math criterion group was created through interpolation. This procedure is discussed below.

Test assignments and criterion groups. Students in the pilot project were first administered the screening tests designed for use with the 6th edition. These were hand-scored by the teachers participating in the project, and, as a result, students were assigned to one of six levels of the SAT-HI. These level assignments defined six criterion groups for studying the new screening instruments. In the analysis, these groups will be referred to as criterion groups 1 through 6, rather than Primary 1 through Advanced, since the SAT-HI combines subtests from various Stanford levels within each of its own levels.

Soon after the SAT-HI level assignments were made, students were assigned separately to different levels of the new reading and math screening tests. Teachers were asked to make independent judgements as to whether they felt each student was above or below the fifth grade level in reading and math. For hearing students the fifth grade level is roughly the dividing point for assignment to the Primary 3 and Intermediate 1 test booklet levels. Hearing impaired students in the current sample who were judged to be at or above the fifth grade level in either reading or math were administered the appropriate upper level screening test (Form R2A or Form M2A). Students judged to be below the fifth grade level in either reading or math were administered the appropriate lower level screening test (Form M1A or R1A).

Each student took a total of four tests: the screening test used with the 6th edition SAT-HI; one of six levels of the SAT-HI; either Form R1A or R2A (determined by the teacher's opinion of the student's reading ability); and either Form M1A or M2A (determined by the teacher's opinion of the student's mathematics ability).

Validation. When the Stanford was normed on a national sample of hearing-impaired students in the spring of 1983, the screening procedures developed the previous year were used to assign students to test levels. To assure that the screening procedures were rigorously followed, all screening tests were computer scored by the norming project office.

For the Reading Comprehension and Mathematics Computation subtests at each of the six levels, acceptable raw score ranges were determined: 25% of the total number of items as the lower boundary and 90% of the total number of items as the upper boundary. Students scoring within this range were judged as having interpretable or acceptable scores. (Only students whose actual test level matched the assigned level were studied in this part of the analysis. Approximately 5% of the norming sample were either not screened or were administered a level of the test which differed from the level suggested by the screening test results.)

RESULTS

Table 1 shows the means and standard deviations of raw scores on the four screening tests for each of the six criterion groups defined by the SAT-HI test level assignments. It also shows estimates of the test reliabilities, computed using the KR-20 formula. Students who screened into levels 1 and 2 of the SAT-HI using the 1974 screening procedures, but who were rated as being above the fifth grade level by their teachers (and were therefore assigned to the upper level screening tests) were excluded from this analysis. Also excluded were students who screened into levels 5 and 6 of the SAT-HI, but who were judged to be below the fifth grade level by their teachers (and were therefore assigned to the lower level screening tests). These students were excluded since they took levels of the SAT-HI which were not represented by items included in the screening tests to which they were assigned. When these students were excluded, the resulting sample consisted of 1,374 students who took both the SAT-HI Reading Comprehension subtest and a reading screening test, and 1,357 students who took both the SAT-HI mathematics computation subtest and a math screening test.

Insert Table 1 here.

The means in Table 1 give some idea of the discrimi ting power of the new tests. The mean raw scores on Form R1A r criterion groups 1, 2, and 3 are markedly different, with jumps of over 4 points at each successive level. Criterion groups 3 and 4 differed in their mean performance on Form R1A by only 1.4 points. While the students in criterion group 4 were assigned by the old screening procedures to take the Intermediate 1 reading comprehension test, their teachers rated their ability below the fifth grade level. Thus we should not expect their performance on Form R1A to differ dramatically from the performance shown by group 3.

Form R2A does less well discriminating the upper level criterion groups, as can be noted by the mean values for Form R2A in Table 1. The difference between means for groups 4 and 5 is particularly small (2.2 points).

Form M1A shows a pattern for criterion groups 1-4 in math similar to the pattern noted for this same group in reading. Criterion groups 1,2 and 3 were well differentiated, while groups 3 and 4 had almost identical mean scores. Criterion groups 1 and 2 differed in mean raw score performance by a large 6.1 points. (Students who took level 2 of the SAT-HI actually took the Primary 3 Math Computation subtest.) The large difference in screening test performance by criterion groups 1 and 2 shows that hearing-impaired students progress in math at a faster rate than they do in reading. These results confirm the necessity for separate screenings in math and reading.

Form M2A shows the least discriminating power of all the four tests. Criterion groups 4,5, and 6 had mean raw scores that were all very close. Since groups 5 and 6 were both assigned to the Advanced level of the Mathematics Computation subtest, we would not expect these two groups to differ markedly on their screening test performance.

The reliabilities were all over .80. The two lower level tests which had higher variability (and better discriminability among the criterion groups) showed slightly higher reliability than the two upper level tests which were more restricted in range.

Insert Figures 1-4 here

Figures 1 to 4 show the discriminating features of the four screening tests more clearly. In these figures, the cumulative relative distributions are plotted for all criterion groups for each of the four screening tests. For these plots, the criterion groups were restricted to students scoring in the inter-quartile range of the appropriate SAT-HI subtests. These students are the ones who are the most ideally placed in terms of Stanford test level assignment.

Figures 1 to 4 confirm the mean score findings: Forms R1A and M1A were good discriminators of students taking levels 1, 2 and 3 of the SAT-HI. Level 4 performance on Form R1A was not distinguishable from level 3 performance. (The criterion group 4 performance on Form M1A is not plotted since the inter-quartile range for this group only contained 21 students. Also, criterion group 4 took the Intermediate 2 math subtest, which is not represented by the Form M1A screening test items.)

The upper level screening tests had less discriminating power. In reading, the distinction between criterion groups 4 and 5 (Intermediate 1 and Intermediate 2 assignments, respectively) was very slight. In math, the distinction between criterion groups 3 and 4 (also Intermediate 1 and Intermediate 2 assignments) was equally poor.

Scoring

The goal of the scoring system that was developed was to give teachers a way to assign students to levels of the Stanford test battery in reading and math. The results of the reading screening test should help teachers assign their students to the reading and reading-related subtests in the Stanford battery. The results of the math screening test should help teachers assign their students to the appropriate levels of the math subtests.

The analysis above revealed that students taking different levels of the Stanford, especially those taking the lower three levels, performed differently on the screening tests. Nonetheless, the following facts also had to be taken into account:

1) Although the distributions of screening test scores differed for the different criterion groups, there was considerable overlap, especially at the upper levels.

2) Because the Stanford may not be ideally suited for all hearing-impaired students, and because the screening tests were so short, some study of the response patterns of the test takers was necessary to assure teachers of the validity of the assignments. A procedure was needed which allowed teachers to study the individual response patterns.

Score ranges and border regions. The screening test raw score ranges for students who scored in the middle 50% of each criterion group were determined. These ranges are plotted in Figures 5 through 8 for the four screening tests. Border regions were defined as the raw score values which were included in the mid-ranges of two different criterion groups. These border regions are also indicated on Figures 5 through 8.

Insert Figures 5-8 here

In Figures 5 through 8 the actual Stanford test levels are indicated for each criterion group. Figure 7 shows the interpolated Primary 2 criterion group for Form M1A. This interpolation was necessitated by the subtest structure of the SAT-HI, in which the Primary 2 Math Computation subtest is not administered. The Primary 1 and Primary 3 criterion groups overlapped only at the raw score value of 15. A pseudo-Primary 2 criterion group was created which was defined by 15 plus and minus 2. This interpolation resulted in a Primary 1 to Primary 2 border region and a Primary 2 to Primary 3 border region, as shown in Figure 7.

Scoring rules related to border regions. When students do not score in a border region, their test level assignment is determined by the criterion group range in which they fall. Students who score in a border region could be assigned to either of the adjacent test levels. To help teachers decide which of the two adjacent levels is the most appropriate, a table of "Best Discriminating Items" was developed.

Insert Tables 2 - 5 here

The "Best Discriminating Items" are those items which are the best discriminators between two adjacent test levels. To determine which items were the best discriminators, p-values were computed for each item for each criterion group. Then, p-value differences were computed for adjacent levels. These p-value differences are shown in Tables 2 through 5 for the four screening tests. The 7.6 shown as the Primary 1 to Primary 2 p-value difference for Form R1A indicates that 7.6% <u>more</u> of the students in the Primary 2 criterion group answered item 1 correctly than answered it correctly in the Primary 1 criterion group.

For each of the adjacent levels, the four <u>best</u> discriminating items were noted. These were the items that had the largest p-value differences for the adjacent levels.

When students score in a border region, teachers are asked to look more carefully at the best discriminating items. If students have answered at least three of the four best discriminating items correctly, they should be assigned to the higher of the two adjacent levels. If they fail to answer at least three of the four best discriminating items correctly, they should be assigned to the lower of the two adjacent levels.

<u>Response pattern assessment.</u> The items selected for the screening tests have a known statistical relationship to the items published in the Stanford battery. The Rasch scaled difficulty values of these items place them in the context of the reading comprehension and mathematics computation scales that have been developed for the six-level battery. An important component of the screening process is to identify students who respond to these items in a way that violates the assumptions of the scale, i.e., that the items are hierarchically arranged along a unidimensional scale.

For special populations such as hearing-impaired students, a check on how well the scale "fits" the students is crucial. If special education students attend special programs, it is possible that their curricula is not well represented by the test items. Also, they may show special growth patterns in which the hierarchy of skills is acquired in a different sequence. Finally, with short tests, guessing poses a problem unless the pattern of item responses is taken into consideration.

Much of the score information from the Stanford is based on raw score conversions. The legitimacy of these conversions depends on a good fit between the student and the scale. The current scoring procedures sought to provide information to teachers about the response patterns of their students and to make adjustments in test level assignments for students who showed unusual patterns of item responses.

Special scoring sheets were developed to enable teachers to study the response patterns of their students. (See Figure 9.) On these sheets, grids were printed which rearranged the items by the Rasch item-difficulty indices provided by the test publisher. Teachers are instructed on these sheets to transfer the student responses to the grid. This enables them to study each student's pattern of item responses. Ideally, each student should answer correctly all items which have a difficulty ranking equal to and less than their raw score. More care should be given in assigning students who answer a substantial number of items correctly which have difficulty rankings above their raw score. These students may have guessed well, or they may not be well suited for testing by the Stanford.

Criterion for identifying unusual response patterns. Standard errors for each of the four screening tests were within two raw score points. Therefore, the procedures instruct teachers to consider correct item responses unusual only if their difficulty ranking is greater than 4 positions (two standard errors) above the obtained raw score. Teachers then count up the number of unusual responses and divide that number by the raw score. If the total number of items correct (the raw score) is comprised of more than 30% unusual correct responses, then the student should receive special consideration before the test level is assigned.

Scoring rules for students with unusual response patterns. Students whose raw score is comprised of a large number (> 30%) of unusual correct responses are difficult to assign to appropriate levels of the Stanford. There are several reasons why they may have responded in an unusual fashion to the screening test. They may have guessed well; their curriculum may not match the test; their growth patterns may be such that they develop skills in a different sequence. The following rule was devised as a practical solution to the problem of assigning these students: _Reduce their raw scores to the next lowest border region and apply the best discriminating items test to their responses._ While this procedure does not guarantee that students will be correctly assigned, it forces teachers to consider a subset of items which have good discriminating power between different test levels.

Summary of the scoring procedure. To score the new screening tests, the following procedure is used:

1. Transfer item responses to the scoring sheet.
2. Score the items. Calculate the raw score.
3. Determine if raw score is comprised of more than 30% "unusual" correct responses.
4. Determine if raw score is in a border region.
5. If step 3 is true, reduce raw score to the next lowest border region.
6. If step 4 is true, or if the raw score has been reduced because of an unusual response pattern, apply the appropriate discriminating item test to assign test level.
7. If neither step 3 nor 4 is true, use the obtained raw score to assign test level.

The scoring sheets which contain the rearranged item grids also contain instructions for completing all of the steps listed above. The sheet developed for Form R1A appears in Figure 9.

Insert Figure 9 here

Administering a single screening test to each student will result in each student being placed into one of nine categories with a separate assignment or special instruction for each, as follows:

1. Scored too low on the lower level screening test.

   Achievement level is perhaps too low for entry level into the battery.
2. Assign to Primary 1.
3. Assign to Primary 2.

4. Assign to Primary 3.
5. Scored too high on the lower level screening test. Administer upper level test before making assignment.
6. Scored too low on upper level screening test. Administer lower level test before making assignment.
7. Assign to Intermediate 1.
8. Assign to Intermediate 2.
9. Assign to Advanced.

Validation of screening procedures

Insert Table 6 here

Table 6 shows the proportions of students from the norming sample who scored in each of three different raw score ranges at each level of the Stanford. These ranges are 1) <26% of the items correct (chance level); 2) 26% to 90% of the items correct (acceptable level); and 3) >90% of the items correct (top-out level).

All of these students were assigned to their test levels using the procedures described above. The total number of students in this table does not equal the 8,331 tested in the norming because only the students who were classified into categories 2,3, 7,8, and 9 are reported. Due to time constraints, students in the norming sample who scored too high on the lower level screeners or too low on the upper level screeners could not be re-screened. They were assigned to the next highest or lowest levels, respectively, but are not reported in Table 6. Students who scored too low on the lower level screeners (category 1) were assigned to Primary 1. These students are also not included in Table 6.

For Reading Comprehension 96% of the sample scored in an acceptable range. This percentage is fairly consistent across all levels of the test. There is a slightly higher liklihood for students assigned to Primary 1 to score in the top-out category (3.1% compared with 1.0% overall), and for students at the Intermediate 2 and Advanced levels to score at chance level (4.5% and 5.0% compared with 2.1% overall). However, these percentages are quite small. The screening tests placed an overwhelming majority of students into a correct reading level.

For Math Computation, 83.6% of the sample scored in an acceptable range. Only 1.0% of the students scored at chance level, and 15.4% score in the top-out category. These results imply that the computational abilities of 15% of the students in the norming sample were underestimated by the screening tests.

In the math area, it is useful to consider other subtests which are assigned on the basis of the math screening test. The special procedures developed for using the Stanford with hearing-impaired students recommend assigning the Math Applications subtest on the basis of the reading screening since the test requires considerable verbal ability, and hearing-impaired students tend to perform at a lower verbal level than math level. The Concepts of Number subtest, on the other hand, is assigned on the basis of the math screening test. It is useful to consider the Concepts of Number raw scores obtained by the norming sample at each level of the battery.

Insert Table 7 here

Table 7 shows the proportions of students who scored in each of the three performance categories for Concepts of Number. These data show that, for Concepts of Number, 94.2% of the sample scored in a acceptable range. Approximately 3% scored at chance level and 2.5% scored in the top-out level. Thus, while a fairly high proportion of students top out of the Math Computation subtest, the proportion is much lower for Concepts of Number. Since students take both subtests in the level determined by the math screening test, these results are encouraging.

CONCLUSION

The screening tests developed in this project have elaborate scoring procedures. Nonetheless, when followed carefully, they result in excellent placements of students into appropriate levels of the 7th Edition of the Stanford Achievement Test.

A side-effect of the scoring procedure is that it leads teachers to consider test results in a more in-depth manner than simply converting a raw score to a test level assignment. They are encouraged to consider the response patterns of individual students as valuable sources of information. They are led to consider situations where students score in border regions. They are forced to look at performance on individual items as input to important decisions.

Inevitably, it is hoped that the procedures will develop sophistication on the part of the teachers who use them, and that they will approach any test results with a more critical eye. Response pattern analysis and consideration of individual item performance are not activities that are reserved for screening tests alone.

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Table 1

SCREENING TEST MEANS AND STANDARD DEVIATIONS
BROKEN DOWN BY SAT-HI TEST LEVEL POPULATIONS

SAT-HI LEVEL		FORM R1A	FORM R2A	FORM M1A	FORM M2A
1	X	10.2	----	11.8	----
	SD	3.79		5.54	
	N	274		272	
2	X	14.9	----	17.9	----
	SD	4.66		5.14	
	N	335		294	
3	X	19.5	16.5	20.9	16.9
	SD	4.12	4.56	4.13	3.77
	N	266	53	162	169
4	X	20.9	19.7	21.0	19.4
	SD	4.54	4.08	3.85	3.31
	N	90	100	42	148
5	X	----	21.9	----	20.3
	SD		3.79		3.38
	N		121		132
6	X	----	25.7	----	21.3
	SD		2.89		3.08
	N		135		138
TOTAL Ns		965	409	770	587
RELIABILITY: KR 20		.87	.83	.92	.81

Table 2

FORM R1A
P VALUE DIFFERENCES IN ADJACENT
TEST LEVELS

ITEMS	P1 TO P2	P2 TO P3	P3 TO I1
1	7.6	1.5	1.9
2	3.3	1.0	-1.4
3	5.4	4.2	8.6
4	26.4	8.1	-1.3
5	23.6	7.7	3.0
6	37.2*	6.7	-2.6
7	33.2*	26.1	-4.6
8	33.0*	11.5	-0.2
9	21.6	15.9	5.4
10	37.3*	12.4	1.6
11	16.5	26.6	8.9
12	28.7	24.6	4.8
13	28.5	6.5	9.5
14	-5.5	15.8	20.0*
15	28.6	23.8	1.0
16	12.7	11.7	17.7*
17	5.3	18.3	-3.5
18	-1.3	-0.7	19.4*
19	20.8	23.4	6.3
20	18.1	22.9	-8.7
21	14.7	30.6*	7.6
22	18.8	17.0	4.8
23	5.2	30.4*	6.6
24	16.6	29.4*	0.6
25	23.2	30.5*	4.8
26	7.8	24.0	17.8*
27	14.5	16.5	11.5

*Best Discriminating Items

Table 3

FORM R2A
P VALUE DIFFERENCES IN ADJACENT
TEST LEVELS

ITEMS	P3 TO I1	I1 TO I2	I2 TO ADV
1	8.6	-3.1	3.4
2	22.2*	14.6	4.4
3	11.8	7.4	8.6
4	18.8	11.9	14.2
5	13.8	8.4	5.9
6	2.3	6.7	4.6
7	17.1	0.2	1.4
8	6.8	8.8	8.0
9	11.2	3.4	2.2
10	8.2	-0.2	2.8
11	13.4	1.2	-0.7
12	13.8	8.4	4.4
13	24.3*	14.9*	22.2
14	-11.0	10.4	6.3
15	7.8	10.8	18.7
16	-3.7	16.5*	25.6*
17	20.5*	5.5	22.2
18	7.6	6.5	24.0
19	-6.5	17.1*	25.5*
20	6.1	8.1	5.8
21	4.8	3.7	10.4
22	-7.2	15.5*	21.8
23	-6.8	-1.5	18.9
24	1.6	5.7	13.2
25	11.8	10.9	16.8
26	16.1	-8.3	38.6*
27	10.1	9.1	5.9
28	19.0	11.4	12.7
29	19.8*	9.6	10.1
30	18.2	5.5	26.2*

*Best Discriminating Items

Table 4

FORM M1A
P VALUE DIFFERENCES IN ADJACENT TEST LEVELS

ITEMS	P1 TO P3	P3 TO I1	I1 TO I2
1	14.4	0	3.7
2	17.5	1.6	-2.2
3	13.6	2.2	0.8
4	22.1	-0.4	-0.9
5	28.5	3.8	-3.8
6	24.0	3.2	3.2
7	18.0	8.5	6.9
8	21.5	5.4	10.6*
9	12.7	10.2	6.5
10	34.0	6.8	-3.8
11	25.4	15.4	-3.5
12	24.1	9.3	1.2
13	35.5*	13.8	-10.4
14	38.6*	9.2	4.4
15	23.7	6.7	-4.0
16	33.6	14.6	-9.9
17	37.1*	21.1	8.9*
18	27.6	15.3	-7.1
19	30.3	10.9	0.3
20	35.6*	18.7	-1.0
21	23.3	25.0*	-6.0
22	21.0	14.6	-6.1
23	-4.8	20.0	-3.3
24	8.9	24.7*	7.6*
25	15.7	22.7*	2.8
26	21.0	22.1*	9.5*

*Best Discriminating Items

Table 5

FORM M2A
P VALUE DIFFERENCES IN ADJACENT
TEST LEVELS

ITEMS	I1 TO I2	I2 TO ADV
1	3.0	-2.0
2	-0.9	-1.0
3	-2.6	4.1
4	2.8	-1.0
5	10.9	1.8
6	1.8	2.6
7	6.8	1.4
8	14.6	10.2
9	1.6	2.1
10	19.5*	2.6
11	13.4	5.2
12	11.5	-1.0
13	7.2	12.2
14	10.2	-2.1
15	9.7	-0.2
16	5.1	-0.6
17	7.7	-1.3
18	17.7*	10.8
19	12.2	5.7
20	7.7	19.2*
21	9.5	16.9*
22	20.3*	4.6
23	12.3	17.3*
24	27.0*	15.6*
25	11.7	14.1
26	6.4	1.9

*Best Discriminating Items

Table 6

PERCENT SCORING IN EACH OF THREE PERFORMANCE CATEGORIES FOR READING COMPREHENSION AND MATH COMPUTATION AT EACH OF THE SIX STANFORD ACHIEVEMENT TEST BATTERY LEVELS

	N	Chance <26%	Acceptable 26%-90%	Top-out >90%
<u>Reading Comprehension</u>				
Primary 1	1335	0.9%	96.0%	3.1%
Primary 2	1694	2.3%	97.6%	0.1%
Primary 3	1788	1.3%	98.6%	0.1%
Interm. 1	455	1.3%	98.5%	0.1%
Interm. 2	268	4.5%	95.1%	0.4%
Advanced	959	5.0%	93.7%	1.3%
Overall	6499	2.1%	96.9%	1.0%
<u>Mathematics Computation</u>				
Primary 1	958	1.6%	76.1%	22.3%
Primary 2	516	0.0%	88.0%	12.0%
Primary 3	1399	1.1%	77.3%	21.6%
Interm. 1	1648	1.1%	85.9%	13.0%
Interm. 2	1094	0.5%	83.9%	15.6%
Advanced	1178	0.9%	91.7%	7.4%
Overall	6793	1.0%	83.6%	15.4%

Table 7

PERCENT SCORING IN EACH OF THREE PERFORMANCE CATEGORIES FOR CONCEPTS OF NUMBER AT EACH OF THE SIX STANFORD ACHIEVEMENT TEST BATTERY LEVELS

	N	Chance <26%	Acceptable 26%-90%	Top-out >90%
CONCEPTS OF NUMBER				
Primary 1	954	0.8%	95.8%	3.4%
Primary 2	522	1.0%	96.3%	2.7%
Primary 3	1398	2.5%	96.2%	1.3
Interm. 1	1653	8.2%	90.2%	1.6%
Interm. 2	1091	2.0%	96.8%	1.2%
Advanced	1177	1.5%	93.1%	5.4%
Overall	6795	3.3%	94.2%	2.5%

Figure 1

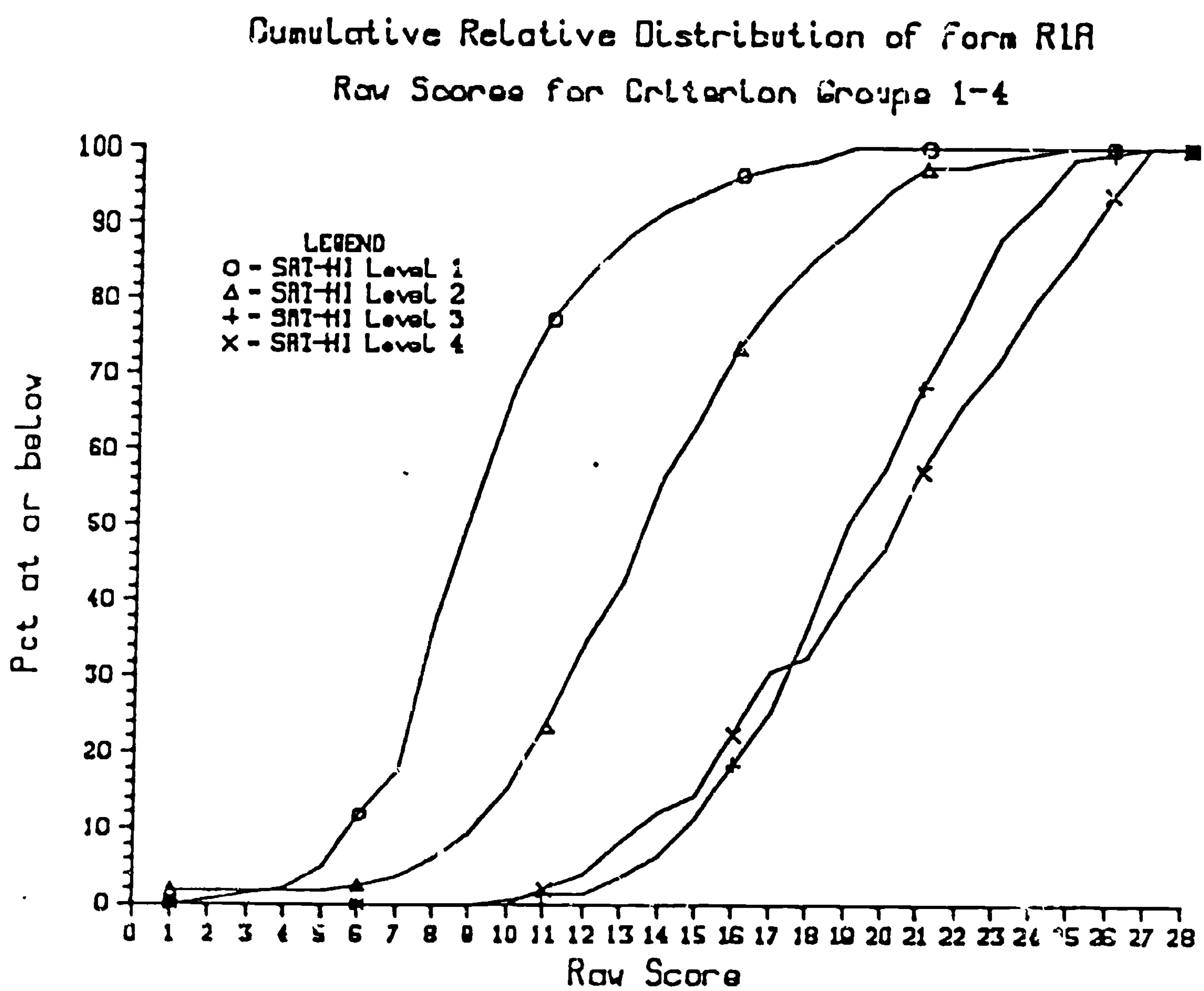

Cumulative Relative Distribution of Form R1A
Raw Scores for Criterion Groups 1-4
LEGEND
O - SAT-HI Level 1
Δ - SAT-HI Level 2
+ - SAT-HI Level 3
X - SAT-HI Level 4
Pct at or below
Raw Score
0
10
20
30
40
50
60
70
80
90
100
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28

Figure 2

Cumulative Relative Distribution of
Form R2A Raw Scores
for Criterion Groups 3-6

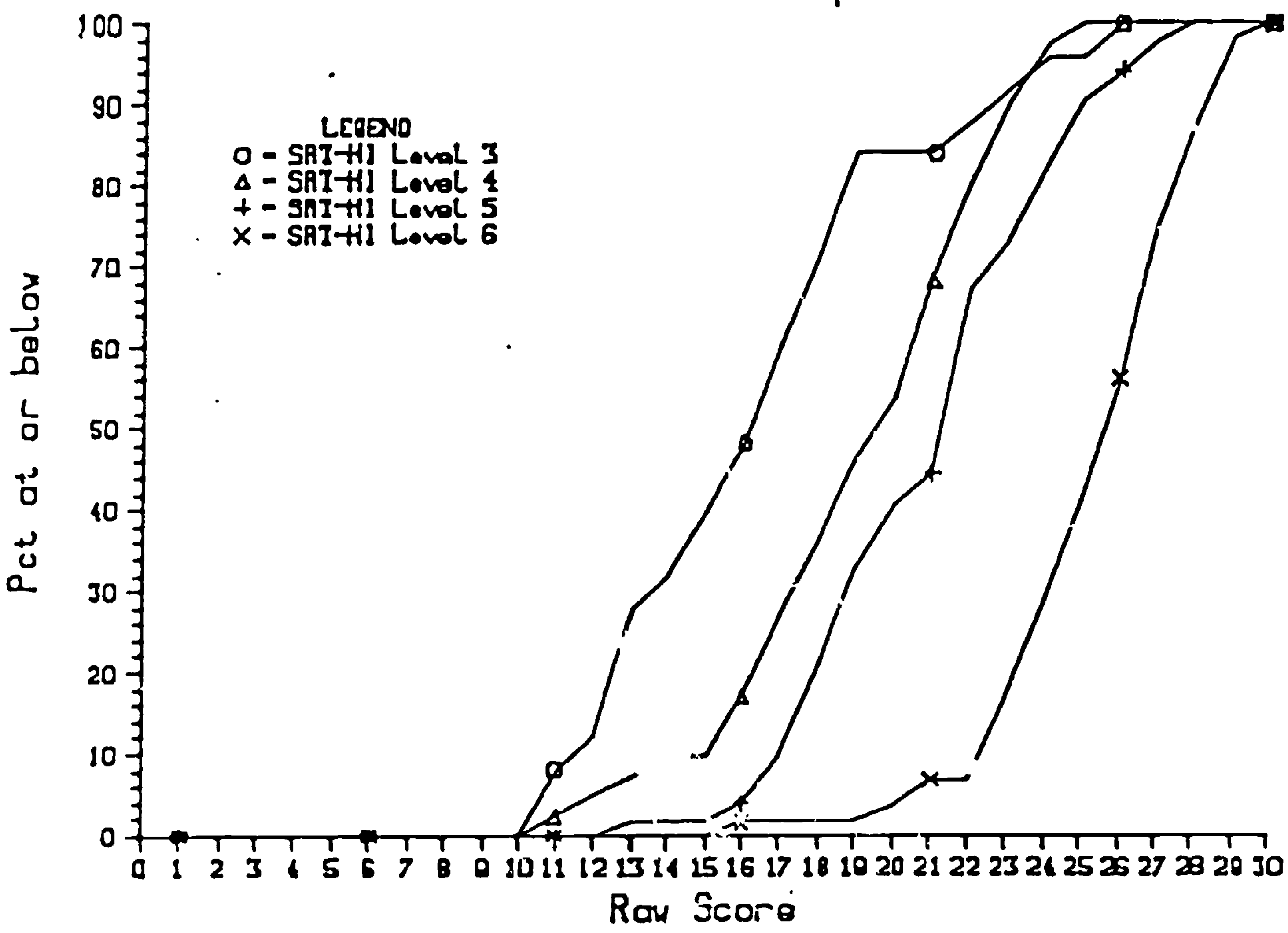


Figure 3

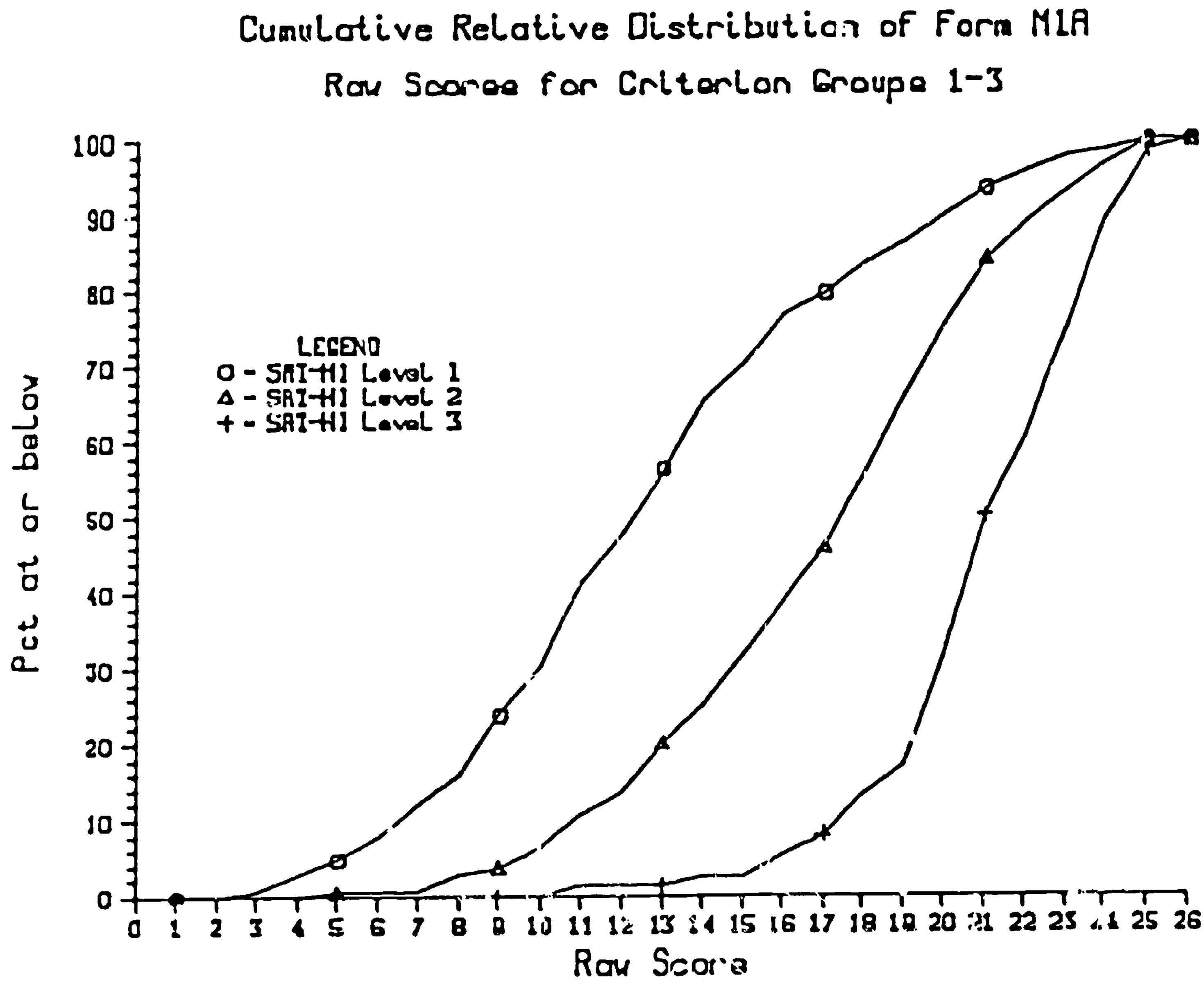

Cumulative Relative Distribution of Form M1A
Raw Scores for Criterion Groups 1-3
Pct at or below
Raw Score
LEGEND
O - SAT-HI Level 1
Δ - SAT-HI Level 2
+ - SAT-HI Level 3
0
10
20
30
40
50
60
70
80
90
100
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

Figure 4

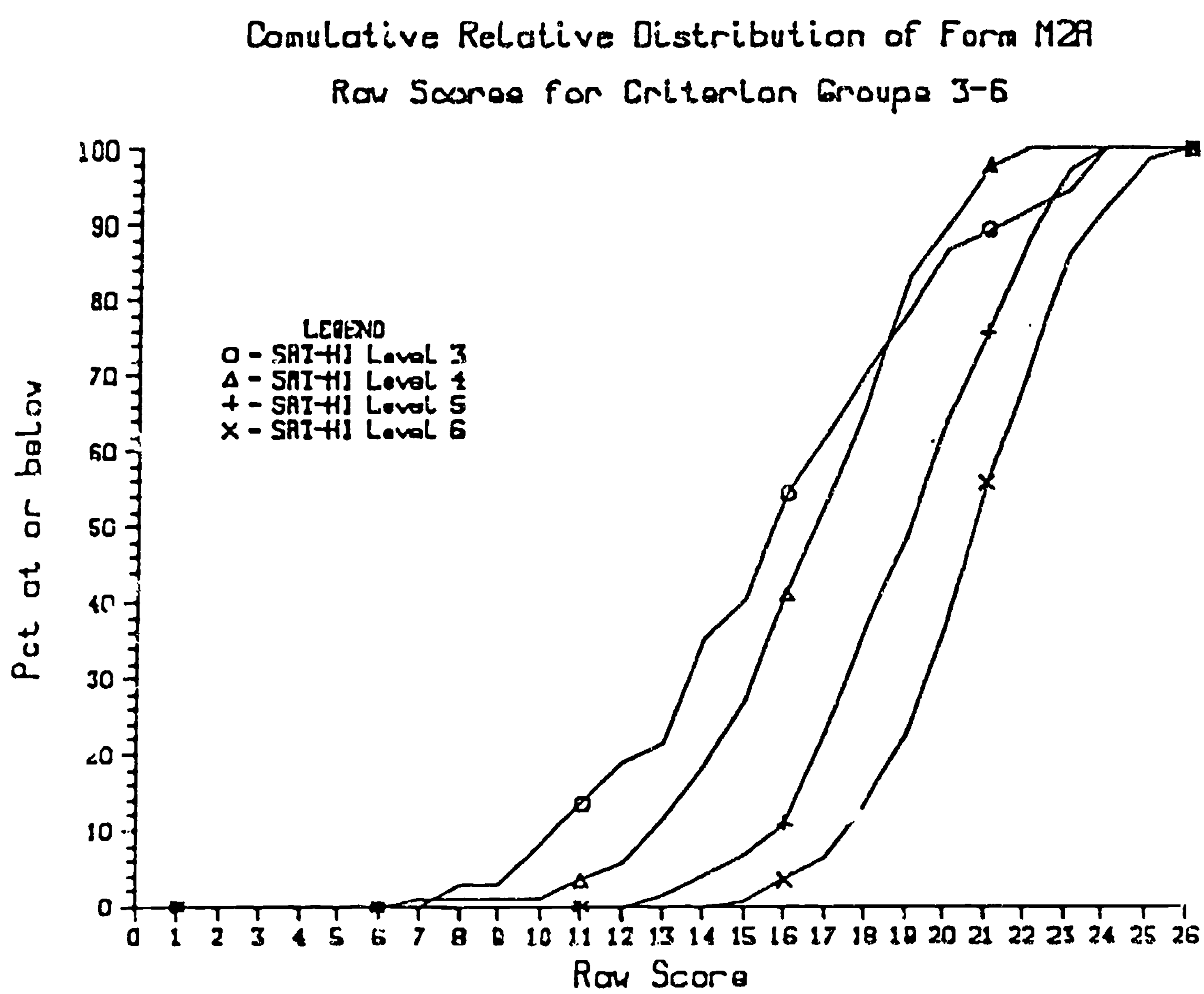

Cumulative Relative Distribution of Form M2A
Raw Scores for Criterion Groups 3-6
LEGEND
O - SAT-HI Level 3
Δ - SAT-HI Level 4
+ - SAT-HI Level 5
X - SAT-HI Level 6
Pct at or below
Raw Score
0 10 20 30 40 50 60 70 80 90 100
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

Figure 5

Interquartile Ranges of Form R1A
Raw Scores for Primary 1, Primary 2, and
Primary 3 Criterion Groups

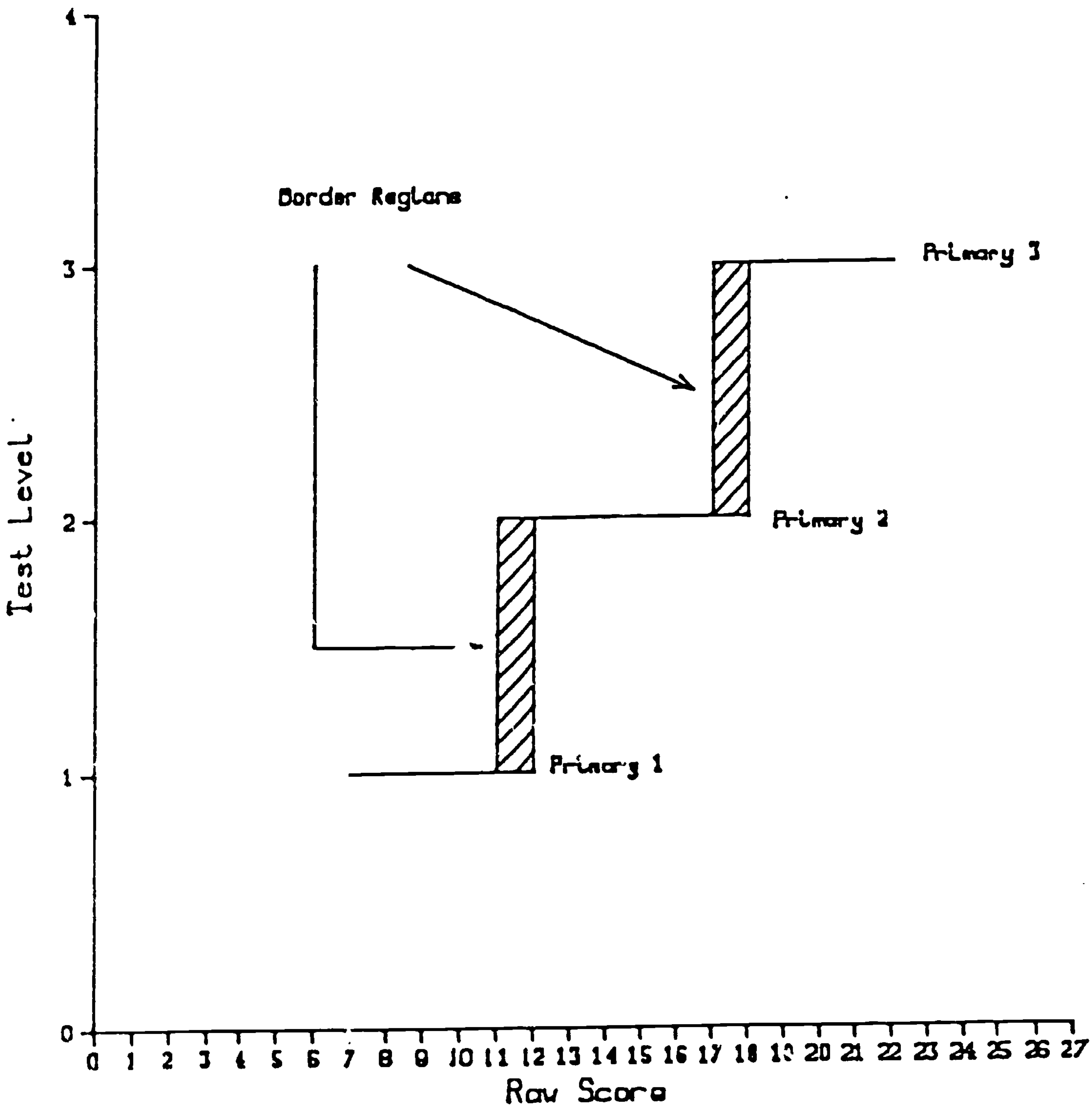


Figure 6

Interquartile Ranges of Form R2A Raw Scores
for Primary 3, Intermediate 1, Intermediate 2,
and Advanced Criterion Groups

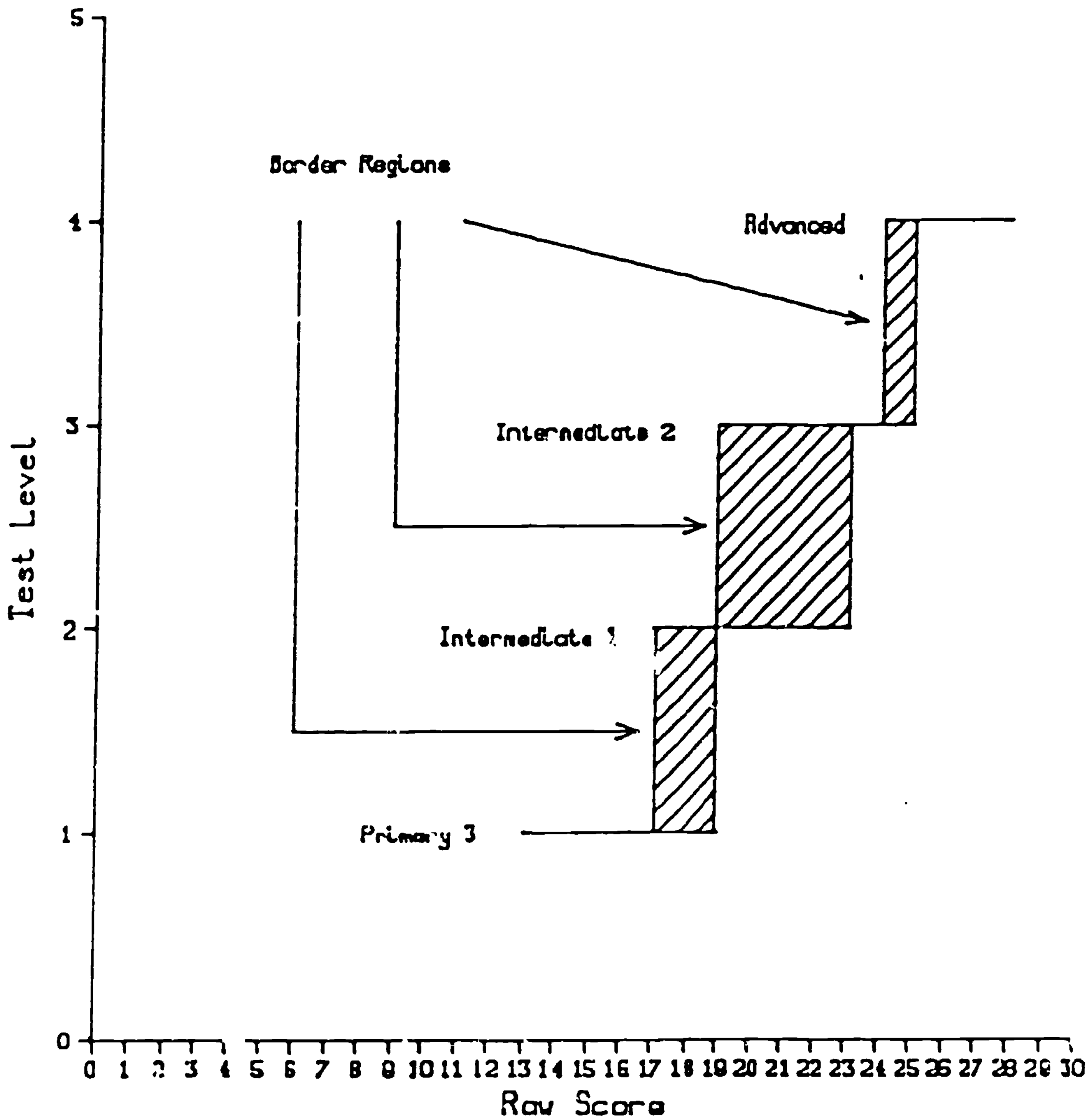


Figure 7

Interquartile Ranges of Form M1A Raw Scores
for Primary 1, Primary 2, Primary 3, and
Intermediate 1 Criterion Groups

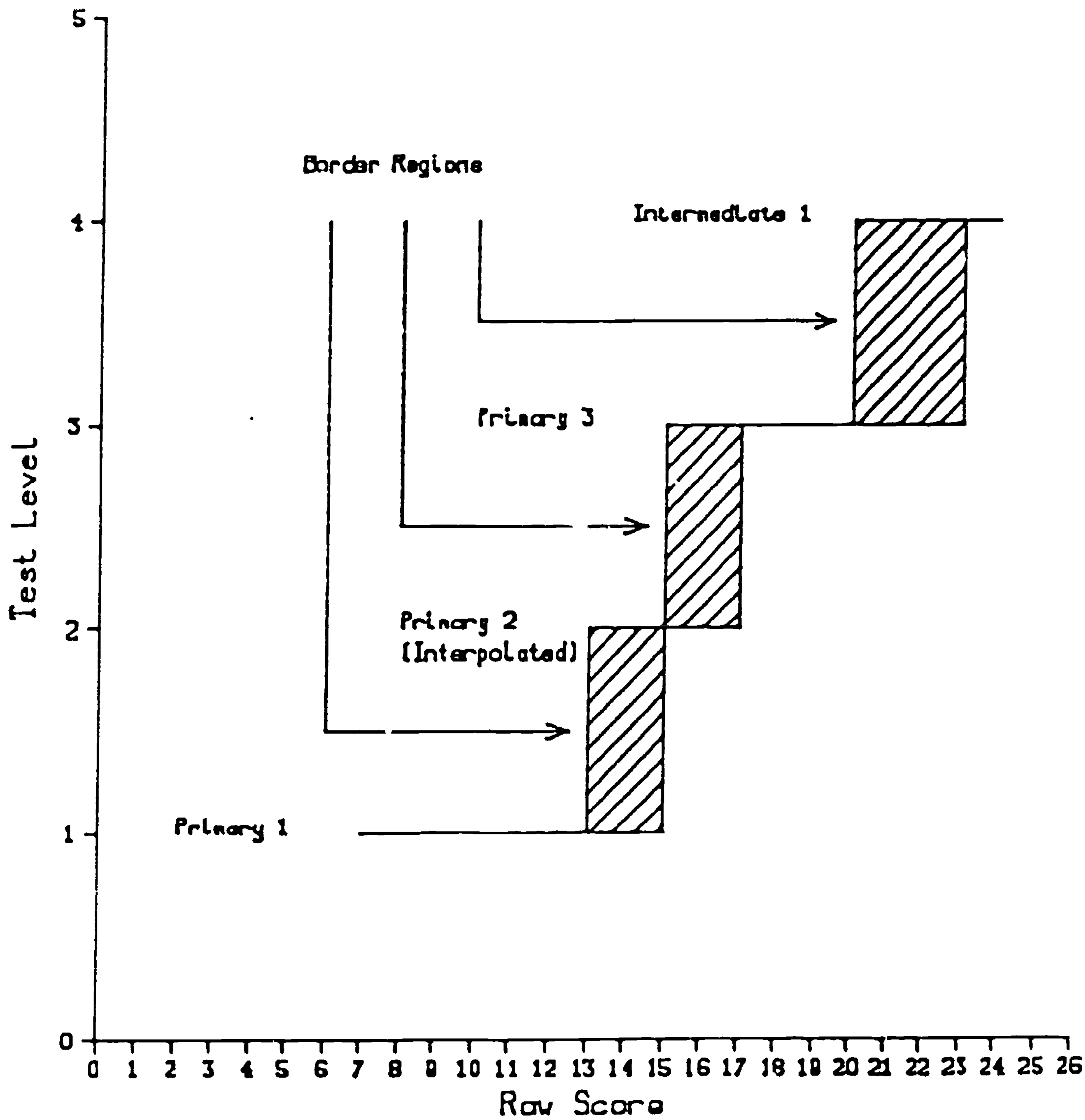


Figure 8

Interquartile Ranges of Form M2A Raw Scores for Primary 3, Intermediate 1, Intermediate 2 and Advanced Criterion Groups

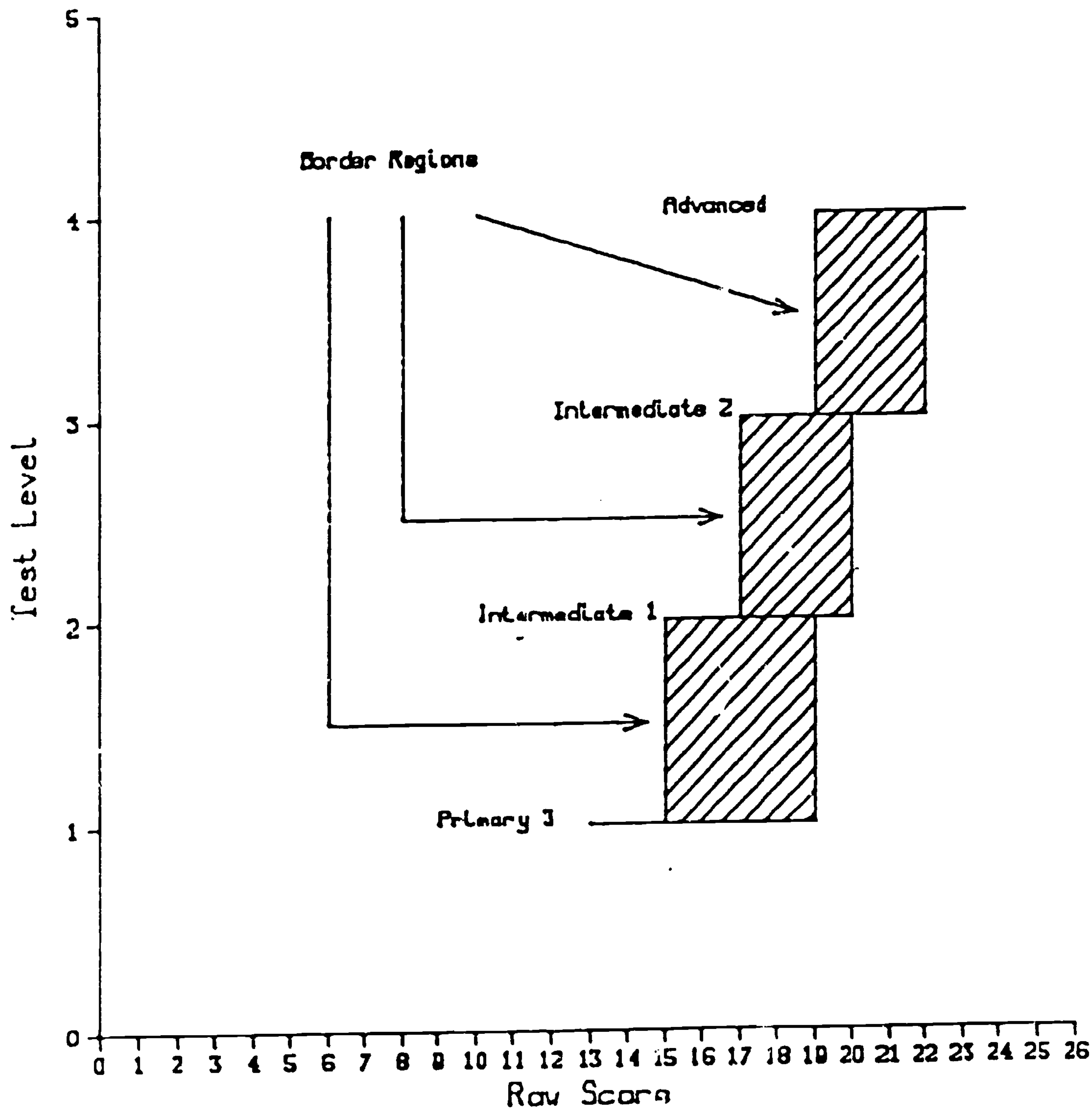
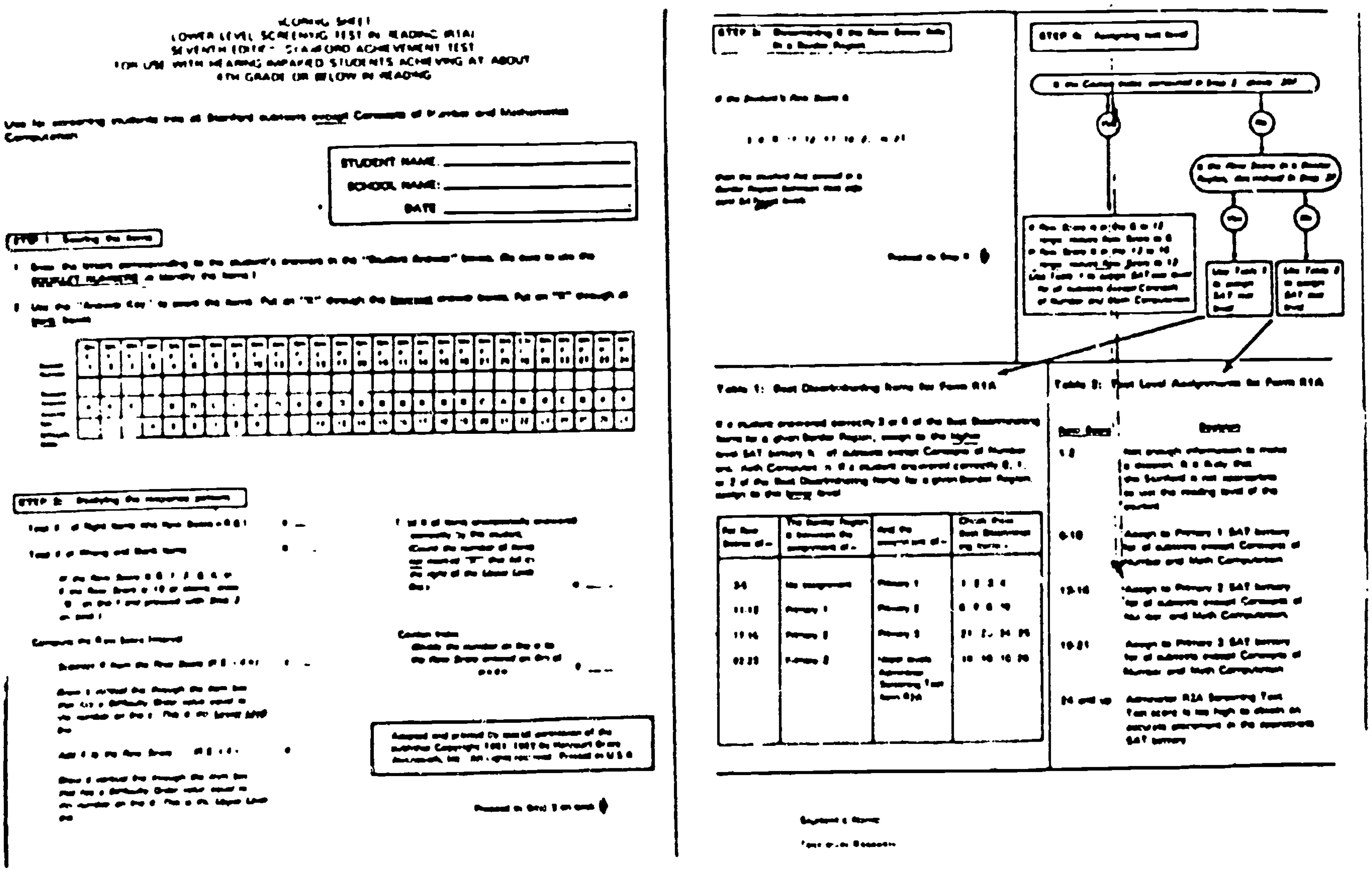


Figure 9


SCORING SHEET
LOWER LEVEL SCREENING TEST IN READING (R1A)
SEVENTH EDITION STANFORD ACHIEVEMENT TEST
FOR USE WITH HEARING IMPAIRED STUDENTS ACHIEVING AT ABOUT
4TH GRADE OR BELOW IN READING
STUDENT NAME:
SCHOOL NAME:
DATE

SAT Final Report Section 4:

A STUDY OF THE ACHIEVEMENT PATTERNS OF HEARING-IMPAIRED STUDENTS

SECTION 4: A STUDY OF THE ACHIEVEMENT PATTERNS OF HEARING IMPAIRED STUDENTS

Introduction

Many studies of the achievement levels of hearing-impaired students have been carried out over the last ten years by the Center for Assessment and Demographic Studies. Much of the data collection for this research has centered around two major norming projects: the 1974 norming of the Sixth Edition of the Stanford Achievement Test and the 1983 norming of the Seventh Edition of the Stanford with representative samples of hearing-impaired students from special education programs throughout the United States.

This chapter will examine these two norming projects in depth. It will address three major questions: 1) What are the average achievement levels obtained by hearing impaired students throughout the United States? 2) Have the achievement levels of hearing-impaired students changed over the last ten years? and, 3) What factors account for achievement among hearing-impaired students? The chapter will focus on achievement in two academic areas: reading comprehension and mathematics computation.

Throughout this chapter the phrase "achievement levels of hearing-impaired students" will be used often. At the outset, it should be noted that, in this chapter, achievement level is almost always determined by scaled score performance on either the Reading Comprehension or the Mathematics Computation subtest of the Stanford Achievement Test (Sixth and Seventh editions). The term should always be interpreted within that context. Its applicability to school achievement, in general, is limited to the domains of academic skill measured by the Stanford and is subject to the reliability of the battery.

Similarly, the term "hearing-impaired students" refers to those with hearing impairments between the ages of 8 and 18 who receive special education services in schools throughout the United States. The population is defined by the Annual Survey of Hearing-Impaired Children and Youth; detailed descriptions of this population appear elsewhere in this book. Part of this chapter will describe the degree to which the samples selected for norming the Sixth and Seventh editions of the Stanford are good representations of the Annual Survey population.

The chapter begins by noting an empirical finding: overall, hearing impaired students who comprised the 1983 standardization sample for the Seventh Edition of the Stanford showed higher math and reading achievement levels, as determined by their scaled scores, than did the hearing-impaired students who comprised the 1974 standardization sample for the Sixth Edition.

------------ ------

Insert Table 1 here

Table 1 shows the mean reading comprehension and mathematics computation scaled scores for each age group for each of the norming samples. For all ages, the means of the reading comprehension and mathematics computation scaled scores obtained in 1983 were higher than those obtained in 1974. It is important to note that the procedures used to scale the sixth and seventh editions with hearing students were different. Therefore, in all tables reported in this chapter the sixth edition scaled scores have been converted to the seventh edition scales using conversion tables published by the Psychological Corporation in conjunction with their publication of the seventh edition.

Insert Figures 1 and 2 here

Figures 1 and 2 present graphs of these scaled scores for reading comprehension and mathematics computation, respectively. The median scaled score performance of hearing students at each grade level have also been indicated on Figures 1 and 2 by the dotted horizontal lines. Assuming that the hearing students who comprised the group at the 3.0 grade level were 8 years old, that 9 year olds comprised the 4.0 hearing standardization group, etc., the median age-by-age scaled scores in reading comprehension and mathematics computation for hearing students between the ages of 8 and 15 have also been plotted on the figures. (Few hearing students beyond the age of 15 take the Stanford; thus data for older students have not been plotted.)

The means shown in Table 1 and in Figures 1 and 2 suggest the following overall picture regarding the achievement levels of hearing-impaired students: 1) they lag behind their hearing counterparts in reading and math; 2) the deficit is more profound in reading comprehension than it is in mathematics computation; 3) there appears to be a "levelling off" in their reading comprehension achievement at about the third to fourth grade level; 4) a levelling-off in mathematics computation is also apparent, but at about the sixth to seventh grade level; and 5) despite the limits to their obtained achievement levels, hearing-impaired students appear to have achieved higher in 1983 than in 1974.

The analyses that will be presented in the remainder of this chapter were designed to clarify and, in some cases, challenge the conclusions that are suggested from this examination of the means alone. In the first section, we will study more carefully the score distributions of the sixth and seventh edition standardization samples of both hearing and hearing-impaired students. This will provide a clearer picture of achievement patterns than is possible from an examination of means and medians alone. In the second section, we will consider alternative explanations for the apparent gains in achievement among hearing-impaired students from 1974 to 1983. In this section we will explore norming sample and test differences between the two norming projects which may explain the differences in mean achievement level performance noted in Table 1. We will also examine the relationship between the norming sample and the Annual Survey population from which it is drawn. In the third section, we will present normative information based on the 1983 norming project related to selected subgroups of the hearing-impaired student population.

Section 1: Scaled Score Distributions, 6th and 7th Editions of the Stanford Achievement Test for Hearing and Hearing-Impaired Students

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Insert Figures 3 and 4 here

Figures 3 and 4 summarize, for reading comprehension and mathematics computation, respectively, the distributions of both hearing and hearing-impaired students to the sixth and seventh editions of the Stanford, as determined by the relationships among the various normed scales that were developed. In these figures, the Seventh Edition scaled scores are defined as the interval level standard against which all of the other scales are plotted. Horizontal lines representing the seventh edition scales are drawn in the center of each of these graphs; they range from 400 to 800.

Conversions from the seventh edition scales to all the sixth edition scales appear above this center line; conversions to the other seventh edition scales appear below this line. Estimates of the equivalencies between any two sixth edition or seventh edition scales can be made by drawing a vertical line between any two horizontal scale lines that appear on this graph. For example, a student scoring a 120 scaled score on the sixth edition reading comprehension subtest (Figure 3), would have roughly the same level of achievement in reading comprehension as a student who scored between 510 and 520 on the seventh edition reading comprehension subtest. Or, to take a mathematics example (Figure 4), a student scoring 140 in mathematics computation on the sixth edition would have roughly the same level of achievement in mathematics computation as a student scoring between 550 and 560 on the seventh edition.

The importance of these scale score conversions can be seen by looking at the norm distributions of both hearing and hearing-impaired students to both editions of the test. It general, it appears that both hearing and hearing-impaired students showed gains between the two normings. Consider our two examples. When the sixth edition was normed with hearing students, a 120 scaled score in reading comprehension represented the median performance of students well into the second grade. When the seventh edition was normed with hearing students, a 515 scaled score (roughly equivalent to the sixth edition 120) represented the median performance of students at the end of the first grade. That is, hearing students in the seventh edition standardization sample appear to have acquired reading comprehension skills at a faster pace thar than did sixth edition standardization subjects. A similar shift in the norming distribution occurred with mathematics computation, as indicated in Figure 4.

A study of the percentile ranks for hearing-impaired students shows similar shifts. The deciles for 8, 12, and 16 year old hearing-impaired students for both the sixth and seventh edition standardizations have been plotted in Figures 3 and 4. Using our same examples, in 1974, when the sixth edition was standardized with hearing-impaired students, a 120 scaled score performance in reading comprehension represented approximately the 50th percentile among 12 year old hearing-impaired students. (Again, see Figure 3.) However, in 1983, when the seventh edition was standardized with hearing-impaired students, a 515 scaled score performance corresponded only to the 30th percentile among 12 year olds. In math computation, the results are similar: the 140 sixth edition scaled score represented the 80th to 90th percentile among hearing-impaired 8 year olds in 1974. The seventh edition equivalent, 560, represented the 60th to 70th percentile among hearing-impaired students the same age. These shifts in the normed scale values appear all along the reading and math scales for hearing-impaired students at all ages. Thus it appears that the norms have shifted dramatically upward for hearing-impaired students.

The fact that both hearing and hearing-impaired students have shown apparent gains in their achievement, as evidenced by the scale equivalencies and norm conversions displayed in Figures 3 and 4, has resulted in the following situation: the relationships between hearing-impaired percentile ranks and the hearing grade equivalent scales have not changed. Previously published research using the sixth edition hearing-impaired norming data (ref,....) has noted that meadian reading comprehension performance of hearing-impaired students beyond the age of 14 "levels off" at about the third to fourth grade equivalent. The more current 1983 norming data shows the same result. Therefore, a possible interpretation of the data that we have explored so far is that hearing-impaired students, as a group, acquire reading comprehension and mathematics computation skills at a faster pace than they did in 1974; however, they have not gained relative to their hearing cohorts.

Section 2: Gains in Achievement: Are they real or artificial

The gains shown in Figures 1 and 2 are dramatic. Nonetheless, it should be pointed out that the plotted scaled scores are derived from two different samples who have taken two different tests at two differnt points in time. Additionally, the lines which represent the 1974 sixth edition norming rely on the validity of the conversion tables for their interpretation. We therefore need to exercize extreme caution before making any claims about possible gains in the academic achievement of hearing-impaired students over the last ten years.

This section will present the results of three analyses. Each analysis will look at alternative explanations for the gains noted in Figures 1 and 2. The first analysis will compare the characteristics of the two norming samples and will present the achievement results for students with selected characteristics from both samples. If the two groups differ on characteristics known to affect achievement, then the observed mean differences noted in Figures 1 and 2 may be artifacts of these sample differences. Included with this analysis will be a discussion of how well the 1983 norming sample represented the Annual Survey population from which it was selected.

The second analysis studies differences in the testing situations between the sixth and seventh edition normings. The focus of this analysis will be on the assignment of students to levels of the battery. For both the 1974 and 1983 normings, screening tests were used to assign students to test battery level. However, the specific screening procedures changed markedly. Since scaled score is dependent, to some extent, on test level, it is possible that differences in achievement levels may be attributed to differences in the distributions of test level assignments. The third analysis will examine more directly the validity of the conversion tables provided by the test publisher when applied to the test scores of hearing-impaired students.

Analysis #1: Comparisons of the characteristics among the two norming samples and the 1983 target annual survey population

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Insert Table 2 here

Stratification variables. When the Stanford was normed in 1974, care was taken to assure that different types of educational programs were adequately represented. Three program types were identified: residential schools, day schools, and local public schools (including both self-contained special education classrooms and mainstreamed classrooms). In 1983, a new stratification variable was added, i.e., region of the country. Four regions were identified using standard census definitions: Northeast, North Central, South, and West. A comparison of the distributions of the two norming samples on the two variables used to stratify the population in 1983 reveals that they are similar with respect to their program type, but different with respect to their regional distributions.

Table 2 shows, for the two norming samples and for the 1983 Annual Survey population, the proportions of students in each of the eight cells formed by crosstabulating the two stratification variables. For simplification, residential and day school students have been combined into one category. Throughout this chapter this category is referred to as "Special Schools". Also, note that we have defined a "target" Annual Survey population that has a total N of 43,830. Before the population was stratified, the Annual Survey data base was reduced to more clearly define a target population. Students who were less than seven years of age at the time of the testing or who were greater than 19 were deleted from the Annual Survey data base. Also, surveyed programs that did not fit into the stratification scheme were also eliminated. For example, speech and hearing clinics, hospitals, and parent-child programs were not included in the data base when the sample was stratified. Therefore, these students who were not included in the sampling design were deleted from the 1983 Annual Survey data base. It should be pointed out that, in the current chapter, descriptions of the Annual Survey data base are limited to this targeted subgroup. Therefore, proportions reported in various demographic subgroups may differ than those reported in other chapters in this book.

The marginal proportions for program type and region are also shown in Table 2. Overall, students attending special schools accounted for 60.2% of the sample in 1974 and 61.8% in 1983. The two samples are highly similar in this respect. As regards region, considerable variation can be noted. In 1974, a large 42.4% of the sample came from the South. This compares to 34.9% in 1983, a figure much closer to the 36.3% noted for the Annual Survey population. Similarly, representation from the Northeast and North Central was less in 1974 than in 1983.

The individual cell proportions show more specifically how the samples differed with respect to the stratification variables. In 1974, southern residential/day school students comprised 6.6% more of the sample (28.8 versus 22.2) than they did in 1983. At the same time, residential/day students in the north central region comprised 6.3% less of the sample in 1974 than in 1983. Finally, northeastern students attending local public schools comprised 3.7% less of the sample in 1974 than in 1983. All other 1974 to 1983 cell comparisons show proportional differences less than 3%.

A striking difference can be noted between the proportions of students attending different types of educational programs in the two samples versus the proportions of Annual Survey students in those categories. While roughly 60% of both norming samples came from special schools (residentail and day), the target Annual Survey population was comprised of only 37.5% from special schools. This difference resulted from the method used to select the samples. Stratification is a sampling process by which various subgroups are identified. The purpose of stratification is to ensure that each subgroup is adequately represented in the sample. It does not ensure that the resulting sample will be composed of proportions of subjects in each subgroup equal to those found in the population. At the end of this section we will discuss the implications of these program differences on the results that we have found. This discussion will include an analysis of the 1983 sample weighted to more adequately represent the Annual Survey population.

The relevant question at this point in our discussion is whether the differences that we have noted between the two samples with respect to the stratification variables account for the diffeences in achievement levels between the two years. To answer this question, scaled scores from both normings were combined into one distribution. Then the scores were converted to Z-scores based on age groupings. This conversion was done to remove the effect of age on the different distributions that we wish to study. The resulting scores represent the number of standard deviations above and below the mean of a given age group. For example, an eleven year old obtaining a converted score of -1.3 indicates that the student's score was 1.3 standard deviations below the mean for all eleven year olds, including those in both the 1974 and 1983 samples.

Insert Figures 5 & 6 here

Figures 5 and 6 show, for reading comprehension and mathematics computation, respectively, the mean age adjusted z-scores for each of the stratification groups for each year. Since all of the scores have been converted to z-scores, the overall grand mean is equal to zero. The separate grand means for the 1974 and 1983 samples have been plotted as Xs on the vertical axes in the middle of the plots. These points correspond to the mean differences already noted in Figures 1 and 2. For both reading comprehension and mathematics computation, the 1983 sample averaged 0.2 stamdard deviations above their respective age-based means, while the 1974 sample averaged about 0.3 standard deviations below their respective age-based means. That is, the advantage shown by the 1983 norming sample, overall, translates to about one-half a standard deviation for all age groups combined.

The means for each region for each of the norming years are also indicated in Figures 5 and 6 by the Ms appearing in each segment of the plots. The changes in scaled scores from 1974 to 1983 differ markedly by region. For both reading and math, the difference in the means for the northeast between normings is about .8 standard deviations, whereas in the west, the difference is only about .25 standard deviations. Thus regional performance did not change at a constant rate across the normings.

The mean for each program type within each region for each norming year are also plotted. In this regard, considerable variation can be noted. For example, in the Northeast, students attending local public school districts outperformed, by far, students attending special schools. This result occurred for both normings, although the overall level for both program types was higher in 1983. In the South, however, the performance of local public school students and special school students did not differ a great deal. This result was also consistent accross the two normings. These findings imply that there are regional differences related to placement in special versus local public school programs. Furthermore, these differences have persisted over the last decade. While interesting, this result is not the focus of the current discussion.

The numbers in parentheses represent the proportion within each region who attended each of the different programs types in each norming. For example, of the students selected from the northeast in 1974, 77% attended special schools and 23% attended local public schools. In 1983, the percentage of northeast students attending special schools had dropped to 65%, with 35% attending local public schools. These differences do not reflect differences in enrollment patterns between the two norming years. Rather, they reflect the different methodologies used to stratify the population in the two different projects.

Recall that we are particularly interested in looking at three differences: 1) the underrepresentation of local public school students in the northeast in the 1974 norming; 2) the underrepresentation of residential/day students from the north central region in the 1974 norming; and 3) the overrepresentation of southern residential/day students in the 1974 norming. Consider first the northeast. It is true that the overrepresentation of special school students lowered the mean reading and math performance of the northeast region in the 1974 sample; however, if the proportions of students from the northeast attending special and local schools were .65 and .35, respectively, as they were in 1983, the mean northeast 1974 performance would still be considerably less than than the mean 1983 performance. This conclusion is obvious from the fact that the mean performance for local school district students in 1974 was still between .4 and same group.

In the north central region it was noted that special school students were underrepresented in 1974. The percentages indicated on the plots in Figures 5 and 6 show that residential/day school students accounted for 41% of the north central students selected in 1974 and 60% of the north central students selected in 1983. In this situation, a re-weighting of the 1974 north central sample to represent a 60/40 split in favor of special school students would actually lower the overall mean for the north central region. This would have the effect of increasing the differences noted in the national means between the two norming projects. However, in 1974, the north central means for special and local school district students differed by less than a quarter of a standard deviation. Therefore, re-weighting the sample would alter the national results by only a small amount.

In the south, the overrepresentation of students enrolled in special schools in 1974 should have had very little effect on the regional means. This is true be as noted above, the achievement levels in both reading a tn of special school students and local public school students id not differ appreciably in the south. This was especially true in 1974, when the means for special and local public school students differed by about .1 standard deviation.

In sum, the two norming samples did differ with respect to the proportions of students in each of the stratification groups. However, a study of the achievement levels of students within each group for the two norming years reveals that a reweighting of the 1974 norming sample to approximate the 1983 norming sample with respect to its stratification characteristics would not eliminate the noted achievement differences. After we have examined the demographic characteristics of the two samples more specifically, we will describe a more comprehensive statistical analysis which explores the effect of norming year on achievement with all of the stratification and demographic variables taken into account.

Demographic variables. Since both the 1974 and 1983 norming projects were linked to the Annual Survey of Hearing-Impaired Children and Youth, we can examine both samples very carefully to determine if the they differed with respect to important demographic and handicapping characteristics. Again, if it can be shown that the samples differed with respect to important characteristics, then we might conclude that these differences explain why the samples also differed with respect to their achievement.

Insert Table 3 here

Table 3 presents the demographic profiles of the 1974 and 1983 norming samples along with the profiles of the target 1983 Annual Survey population. The samples have been broken down with respect to age, sex, ethnicity, degree of hearing loss, status with respect to the presence of additional handicaps, age at onset of hearing loss, and cause of deafness. The percentages reported in Table 3 add up to 100% within each cell. The Ns on which the percentages are based are also given as well as the proportion of missing data for each variable within each group. Differences between the two samples as well as differences between the 1983 sample and the 1983 Annual Survey target population, are discussed sepatately for each variable:

Age: Predictably, the age distributions within the two norming samples differd due to the cohort of students born in 1964 and 1965, when an epidemic of rubella among pregnant mothers caused a dramatic increase in the incidence of deafness. The 20.3% "bulge" in the 9 year old category in 1974 is directly related to the higher percentages (12.2 and 16.9) of 17 and 18 year olds in 1983. In the other age groups, the percentages are comparable. As regards comparisons to the target Annual Survey population, the 1983 sample represents fairly well the age groups from 8 to 18, and under-represents the 7 and 19 year old students. This can be explained by the fact that, when testing materials were sent to the programs who participated in the norming, instructions to the test administrators required the administration of the test to students between the ages of 8 and 18. Administration to other age groups was declared optional. (Norms were not computed for these age groups.) In the current chapter, th 7 and 19 year olds have been included in the demographic comparison groups; the achievement results for these groups are not discussed.

Sex: The distribution of males and females in the two norming samples and in the target Annual Survay population are virtually identical.

Ethnicity: The proportional breakdowns for Whites, Blacks, Hispanics, and Other (or Multi-ethnic) students are quite similar for the two norming samples and for the target Annual Survey population. The two norming groups show virtually identical proportions of White and Hispanic students. The 1983 sample shows 1.6% higher proportion of Blacks, while the 1974 sample shows 2.5% higher proportion of students reported as other or multiethnic. It is possible that this difference represents a difference in reporting tendencies between the two surveys; i.e., students who were reported in 1974 as having multiple ethnic backgrounds were reported in 1983 as being black. The target Annual Survey population differs only slightly in its ethnic makeup from the 1983 norming sample. The proportion of Blacks and Other/multi-ethnic students are the same. There was a slightly higher percentage of Hispanic students in the sample (12.2 vs. 10.0) and a slightly lower percentage of Whites (65.9 vs. 67.7).

Degree of hearing loss: The distributions of students within each hearing loss group for the two samples and for the target Annual survey population were different. The 1983 norming sample was comprised of 5.0% more students with profound hearing loss than the 1974 sample (57.1 vs. 52.1), and 2.7% fewer students with less than severe hearing loss (17.6 vs 20.3). Also, the 1983 norming sample showed 12.7% more students with profound hearing loss (57.1 vs. 44.4) than did the target Annual Survey population and 16.7% fewer students with less than severe loss (17.6 vs. 34.3). This finding is related to the fact, discussed above, that students from local public schools, who we would expect to have lower levels of hearing loss, were underrepresented in the norming sample. It is also related to the fact that students with low levels of loss are not typically selected for testing with a measure designed for use with special populations. The implications for this noted difference between the 1983 norming sample and the Annual Survey population are discussed below.

Additional handicap status. The two norming samples did not differ by more than 1.5% in any of the three handicap categories indicated (none, additional physical handicaps only, additional cognitive or behavioral handicaps). However, the 1983 sample differed somewhat from the target Annual Survey population with 5.0% more students reporting no additional handicaps (73.8 vs. 68.8). Also, the sample contained 6.1% fewer students with cognitive handicaps (16.3 vs. 22.4). Clearly, a segment of the target Annual Survey population was considered too cognitively handicapped by their teachers to be administered the Stanford. This resulted in a sample that was, overall, less handicapped than the Annual Survey population.

Age-at-onset of hearing loss. The distributions of prelingually and postlingually deaf students in the two norming samples and in the target Annual Survey population are highly similar. The overwhelming majority of these students became hearing-impaired before the acquisition of language.

Cause of deafness. In discussing the reported causes of deafness for the two samples, it is important, first of all, to take note of the large percentages of missing data. The implications of this missing data for generalizing to the population at large are discussed elsewhere in this book in the chapter by Brown. Here, we should point out that the proportion of missing data was drastically reduced from 1974 to 1983 (from 46.7% down to 34.5%) With these high proportions of missing data it is difficult to make judgments related to the comparability of the samples. How ver, if we assume that the actual distribution of causes among the missing cases is the same for all groups, then we can compare the resulting adjusted values as they are entered in Table 3. Doing so, we note that the four specific causes studied - rubella, meningitis, heredity, and otitis media - are very similarly distributed in the two norming samples.

As for the Annual Survey comparisons, we note a slight increase in the 1983 sample in the proportion of students for whom maternal rubella was listed as the cause of deafness (35.6% vs 30%). This possibly resulted from the fact that persons with rubella-caused deafness tend to have accompanying additional handicaps in greater numbers than persons with other listed causes of deafness. Therefore they are perhaps more likely to be enrolled in special schools; we have noted above that special school students are over-represented in the 1983 norming sample. On the other hand we have also noted that the 1983 norming sample had a smaller proportion of students with additional handicaps. The differences are really not explainable. Furthermore, it is questionable as to how important these differences are to the achievement levels of students in the samples.

Summary. In only two instances did the proportions of students in the two samples differ on any characteristic by more that 2 percentage points. This was true within the age categories, which was explainable by the presence of the rubella cohort, and within the hearing loss categories, in which it was noted that the 1983 sample had 5% more students with profound hearing loss. These findings do not explain the achievement differences noted between the two samples at all. If anything, the greater proportion of students with profound hearing loss in 1983 would lead us to expect lower achievement in the more recent norming. However, the opposite was true, lending support to the hypothesis that hearing impaired students have shown gain in their reading and mathematics achievement levels over the last ten years.

Statistical analysis. So far, we have studied the characteristics of the two norming samples in search of possible explanations for the gains in scaled score performance described at the beginning of this chapter. We have seen no compelling reason to argue against the gain hypothesis. In this section we will study the statistical effect of norming year on achievement levels in a regression analysis that controls for differences in the samples of all of the variables that we have described so far. We expect a significant effect for norming year because of what we have observed already in our study of the characteristics of the two samples. In a sense, therefore, this statistical analysis is unnecessary. We include it for two reasons: 1) it allows us to assess the strength of the relationship between norming year and achievement level. That is, in more statistical terms, we will report the proportion of achievement variation that is attributable to norming year independent of all other demographic characteristics studied. 2) This analysis sets the stage for the final section of this chapter which studies the achievement patterns of different subgroups of the hearing-impaired student population.

Insert Tables 4 and 5 here

Tables 4 and 5 present the results of the regression analyses that were performed on the reading comprehension and mathematics computation scores. Age was not included in these analyses; the age-adjusted z-scores continued serving as the dependent measures. Our independent measures were categorical; therefore, they were all converted to dichotomized dummy variables for the purpose of this analysis. Descriptions of the dichotomies that were defined also appear in Tables 4 and 5 for the variables that were significant predictors of achievement. Only those variables which attained a level of significance at the .001 level are included. This conservative level of significance was adopted as the inclusion criteria because our sample size was very large, allowing factors with very small beta weights to obtain significance at the .05 or .01 levels.

Two regression analyses were run for each subject area, math and reading. In the first analysis, norming year was not included as an independent variable. In the second analysis, it was. The increase in the multiple R-square statistic between the two analyses indicates the proportion of variation accounted for by norming year. As indicated frmo Tables 4 and 5, norming year independently accounted for 7% of the variation in reading comprehension scores and 8% of the variation in mathematics computation scores. These figures indicate a very strong association between norming year and achievement levels in reading and math.

Studying the beta weights for the other variables provides some insight into other factors which accounted for achievement levels of students in both samples. It is helpful to divide the variables into three categories: weak predictors, i.e.,those with beta weights less than .10; moderate predictors, i.e., those with beta weights between .10 and .19; and strong predictors, i.e., those with beta weights of .20 or higher. Keep in mind that all reported weights were significant at the .001 level. The following summarizes the results for reading and math (the sign represents the direction of the relationship, i.e., + indicates a positive correlation with achievement; - represents a negative correlation with achievement):

Reading Comprehension

Weak Predictors
- -Living in the South (-)
- -Having profound hearing loss (-)
- -Having a prelingual age at onset of deafness (-)

Moderate Predictors
- -Attending local public school (+)
- -Being female (+)
- -Having an additional physical handicap (-)

Strong Predictors
- -Being a member of a minoroty ethnic group (-)
- -Having an additional cognitive handicap (-)
- -Being tested in 1983 (vs 1974) (+)

Math Computation

Weak Predictors
- -Living in the South (-)

Moderate predictors
- -Attending a local public school (+)
- -Being a member of a minority ethnic group (-)
- -Having an additional physical handicap (-)

Strong predictors
- -Having an additional cognitive handicap
- -Being tested in 1983

Ethnic status and additional handicap status exerted strong influences on reading comprehension achievement in both 1974 and 1983. Somewhat less important were sex and program type, with females outscoring males and local public school students outscoring students enrolled in special schools. Finally, hearing loss, age-at-onset of hearing loss, and region had weaker, but statistically significant effects.

For math the set of significant predictors was different. Sex, hearing loss, and age-at-onset of hearing loss were no longer statistically significant. Also, ethnic status showed somewhat less of an effect. Otherwise, additional handicap status continued to exert a strong influence on achievement, program type exerted a moderate influence, and region a weak influence. A more in-depth discussion of the achievement patterns of students with these characteristics appears below in the final section to this chapter.

Sample representativeness

Before beginning our analysis of test differences between the two normings, we will discuss the representativeness of the 1983 sample. We noted three differences between the two groups that may hinder our ability to generalize the results of the 1983 norming project to the target population: 1) the Annual Survey population was comprised of a greater proportion of students attending local public schools, as opposed to residential or day schools; 2) the Annual Survey population was comprised of a greater proportion of students having less-than-severe hearing loss; and, 3) the Annual Survey population was comprised of a greater proportion of students with cognitive additional handicaps. We have noted already possible reasons for these differences, i.e., students with low levels of impairment were systematically excluded from the norming because they are not normally administered tests designed for special populations; and, students with compounding cognitive additional handicaps are are also not selected for testing with standardized tests because of their inability to handle these tests.

To examine these biasing factors, the 1983 norming sample was weighted to more accurately reflect the Annual Survey population on the three variables of concern: program type, additional handicap status, and level of hearing loss. Each student in the sample was classified according to the three weighting variables and then assigned a weighting factor which was the ratio of the proportion of students in the Annual Survey population to the the proportion of students in the sample who possessed the same set of characteristics vis a vis the three variables.

Insert Tables 6 here

Table 6 summarizes the results of the weighted sample analysis. It shows, for 8, 12, and 16 year olds, the scaled scores associated with the 20th, 50th, and 80th percentiles in reading comprehension and math computation. Separate entries are included for both the weighted and unweighted samples. The table shows clearly that weighting the sample had very little effect on the scaled score distributions. The weighted percentiles never deviate from the unweighted percentiles by more than 13 scaled score points (549 vs 562 for the 50th percentile in reading comprehension for 12 year olds represents the largest deviation). Most comparisons show differences of less than four points.

These findings suggest that we need not worry about the 1983 norming sample's deviations from the Annual Survey population on these variables. However, the weighting technique assumes that the students in the sample with additional handicaps are representative of those outside the sample with additional handicaps. This assumption also holds for the program type and hearing loss variables. These assumptions may not be true. We have already pointed out that teachers exercised some judgment in selecting students for testing. Thus weighting the sample would not allow us to accurately estimate the performance of the students who were not sampled, even if we can identify subgroups of our norming sample who share handicapping, audiological, and program characteristics. The factor of teacher selection is unaccounted for. Because the weighting cannot completely remove the effects of possible sample bias, we must add another descriptor to our definition of the target population; i.e., students selected for achievement testing with a test designed for special use. The 1983 norming project can be seen as one in which the broad middle range of hearing-impaired students receiving special education were sampled. Students at both extremes, i.e., students with severe cognitive handicaps and students with low levels of loss have been systematically excluded.

Analysis #2: Comparisons of the screening results between the two normings

Both the 1974 and 1983 normings of the Stanford involved adapting procedures for administering the test so that the results would more fairly assess the achievement levels of hearing-impaired students. Central to the problem of assuring fairness is the issue of test level assignment. When hearing students take the Stanford they are assigned on the basis of their age or grade in school. Such a procedure is not adviseable for hearing-impaired students for two reasons. First, they lag behind their hearing counterparts, as Figures 1 and 2 indicate clearly. Second, their growth in the different subject areas is uneven. Assigning a student a test booklet containing a battery of tests designed for a single grade in school will not fairly assess the student's achievement in all areas if the student shows an uneven growth pattern across achievement areas.

The two norming projects chose different solutions to the problem of test level assignment. In 1974, the reading comprehension subtest from the Form B Stanford Achievement Test (6th edition) battery was used as a screening test. Additionally the subtests from the different levels of the battery were recombined into different booklets to more adequately reflect the growth patterns of hearing-impaired students in the different subject areas. Six levels of an adapted test battery were created. These levels were parallel to the regular Stanford with respect to reading comprehension, but were different with respect to math computation. More specifically, levels 1 through 4 of the adapted test contained the Primary 1, Primary 3, Intermediate 1, and Intermediate 2 levels, respectively, of the mathematics computation subtests. Levels 5 and 6 contained the Advanced level mathematics computation subtest. The Primary 2 level was skipped.

For the 1983 norming, test booklets were not adapted and subtests were not rearranged. Instead, separate short screening tests in both reading and math were developed for screening students into regular 7th edition battery levels. The items for these screening tests were taken from the bank of items which had been piloted by the Psychological Corporation during the item try-out associated with the development of the 7th edition of the Stanford.

The differences in these two procedures can be made clear by the following example: A student in 1974 takes the 1974 screening test. The student screens into Level 2. Because of the reconstruction of the battery, the student takes the Primary 2 reading comprehension subtest and the Primary 3 mathematics computation subtest. In 1983 the student would have taken two screening tests. It is therefore possible for this student to screen into the Primary 2 reading comprehension and the Advanced mathematics computation subtest. The student would then take the relevant subtests from the regular Stanford materials.

The question we are considering in our current discussion is whether these two different screening procedures have spuriously resulted in different scaled score distributions. Scaled scores are, to some extent, dependent on level assignment. If a student scores at chance on a test level that is too difficult, the scaled score assigned to that student will overestimate the student's true ability level. Therefore it is possible that the 1983 screening procedures systematically placed students in levels of the test that were too difficult, resulting in spuriously high mean scores.

The analysis will include two parts; first, we will study the distributions of test level assignment in reading and math for the two norming projects. This analysis will determine if, in fact, students tended to be assigned to higher levels of the battery in 1983. Second, we will consider the accuracy of test level assignment of both norming projects. In that analysis, we will define acceptable raw score ranges for each of the subtests at each of the levels, and we will study the proportions of each sample scoring in acceptable and unacceptable ranges.

Insert Tables 7 and 8 here

Tables 7 and 8 present the reading comprehension and mathematics computation test level assignments, respectively, for students in each age group within each norming sample. The Tables clearly demonstrate that students in the 1983 sample were assigned to higher test levels than they were in 1974. For example, note from Table 7 that, in 1974, 98.7% of the 8 year olds in the sample were assigned either to Primary 1 or Primary 2 levels for reading comprehension (75.5 + 23.2). In 1983, the percentage of 8 year olds taking the lower two levels of the test was 82.1. The 1983 sample therefore contained 16.6% more students taking levels of the Stanford higher than Primary 2.

In math computation (Table 8), note that there are no entries for Priamry 2 for the 1974 sample; this is due to the fact that the the Primary 2 math computation subtest was not included in the restructuring of the adaptation of the sixth edition of the Stanford. If we combine the lower three levels of the test, we see that, in 1974, 98.7% of the eight year olds were assigned (this percentage is equal to the percentage assigned to the lower two levels of the reading subtest because they are the same students who took levels 1 and 2 of the sixth edition adapted test). In 1983, 86.2% of the eight year olds were assigned to the lower three levels. This represents 12.5% fewer eight year olds than were assigned to these levels in 1974.

Insert Table 9 here

The differences in test level assignment distributions between 1974 and 1983 are significant enough to explain the differences in means described at the beginning of this chapter. Table 9 presents data relevant to the question of whether the differences in test level assignments reflect true differences in the abilities of the students or whether the differences arise out of errors in test level assignment in either of the two years. For reading and mathematics separately, students were divided up into three categories, depending on the raw scores they obtained. If they scored fewer than 25% of the items correct, they were classified as being in the Chance Level category. If they scored greater than 90% of the items correct, they were classified as scoring in the Top Out category. All other students were classified as being in the Acceptable category. Table 9 presents, for reading and mathematics separately, the proportions of students in each category for each test level for each norming sample. In reading, both screening procedures resulted in a high proportion of students being acceptably screened (94.0% in 1974 and 96.9% in 1983). In math computation, the results are not so good. While 83.6% of the 1983 sample scored in acceptable ranges on their math computation subtests, only 73.5% of the 1974 sample did so. This result is not surprising, considering the fact that the 1974 screening test was only a reading test and that these students were "forced" into a math test based on the reconstruction of the battery. What is surprising is the large number of students in 1974 who scored at chance level in math computation. As described above, chance level performance yields scaled scores which tend to overestimate rather than underestimate performance. Thus the results of this analysis would suggest that the 1974 scores should be inflated and not deflated. In short, this analysis provides support for the gain hypothesis; students were assigned to higher levels of the test in 1983; these higher test level assignments seem to be rooted in higher actual ability.

Analysis #3 - An assessment of the validity of the conversion tables when applied to hearing-impaired students

Throughout this chapter, we have placed a great deal of faith in the tables, provided by the test publisher, which convert the sixth edition scales to the seventh edition scales. These tables were developed using sophisticated item response theory analyses techniques in which large national samples of hearing students were administered test item sets containing items from both editions of the tests. The items from both editions wre statistically linked, and the resulting conversion tables accurately reflect the relationship between the two scales when applied to hearing students.

The data from the two norming samples cannot adequately be employed to study the appropriateness of the conversion tables for hearing-impaired students. This data comes from two different samples and the ten year lapse between the two administrations makes a study of the validity of the conversions impossible. There exists, however, a small data set of 512 students within the 1983 norming sample for whom data on both the sixth and seventh editions are available. A study of these students' performance on both tests will help us understand the relationship between the two scales. These students attended programs who had participated in the pilot testing of the screening tests which have become part of the procedures for administering the Stanford to hearing-impaired students. As part of that pilot project, these students had been administered the 6th edition of the adapted Stanford in the spring of 1982. In the following spring, they were administered the 7th edition of the Stanford as part of the norming project.

Insert Table 10 here

Students who have taken both the sixth and seventh editions of the Stanford at about the same time should show converted sixth edition scaled scores which are roughly equivalent to the scaled scores they obtain on the seventh edition. For our pilot sample students it is not reasonable to assume that their sixth and seventh edition performance would be equivalent, since an entire year elapsed between their two test administrations. We can, however, estimate the amount of longitudinal change we would expect after one year's growth by examining the cross-sectional differences shown by students in adjacent age categories from the norming sample itself. We can see the degree to which the pilot sample's "gain" from 1982 to 1983 matched our expected cross-sectional gain. If the means of the longitudinal differences are significantly greater than the differences between the means of the adjacent age categories, we can conclude that the converted scores from the sixth edition are not as accurate as we would like them to be, and that they have underestimated the performance of students taking the sixth edition.

Table 10 shows the results of these comparisons. For almost all age groups for both reading comprehension and mathematics computation, the longitudinal differences between the pilot subjects' converted sixth and seventh edition scores are greater than the expected differences, determined by cross-sectional analysis. For reading comprehension, the average difference between the longitudinal and cross-sectional columns of Table 10 is 24.6 points. For math computation, the average difference between the two columns 12.3 points. If we believe that students should gain, from year to year an amount equal to the cross-sectional differences shown by the norming sample, then it is possible that the conversion tables may, on average, be underestimating 6th edition reading comprehension performance by almost 25 points and mathematics computation performance by about 12 points. We have commented above that the apparent advantage shown by 1983 norming sample students was about one-half a standard deviation within each age group, which translates to about 30-40 points. (The overall standard deviations for the norming sample are 67.9 scaled score points for reading comprehension and 74.6 for mathematics computation.) Thus much of the gain that we have been discussing may, in fact, be attributable to the conversions. This distressing conclusion is not so much true for mathematics computation, in which the average 12 point discrepancy between the cross-sectional and longitudinal columns in Table 10 represent only about a third of the difference in performance levels noted in Analysis 2.

It should be noted that this brief study of the pilot sample is nowhere near conclusive, and it is not our intent to condemn the conversion tables when used with hearing-impaired students based on this analysis. There are a couple obvious limitations to this analysis. First, it is not clear that the pilot sample adequately represented the 1983 norming sample and, by implication, the target Annual Survey population itself. The pilot screening test project involved administering the sixth edition to nearly 1300 students. All of the programs which served these students were invited to participate in the norming during the following year. Obviously, there has been some self-selection between project years. It could be argued that programs who agreed to participate in the norming project were ones that had good experiences with the pilot project the year before. This may have biased the sample in favor of higher achieving students who should be expected to gain more than the amount suggested by the cross-sectional differences.

Another concern is the assumption that the cross-sectional differences from year to year are good estimates of longitudinal growth. There is evidence that the special education population is not stable; i.e., the group of students that enter the Annual Survey data base at the age of 8 are not the same students in the data base 10 years later. Students who prove themselves capable of regular classroom work are transferred into the mainstream; students who have begun in the mainstream but have been unable to keep up with hearing peers are transferred into special education. At the beginning of the chapter, we listed as one of our conclusions after examining Figures 1 and 2 the possibility that the academic achievement of hearing impaired students "levels off". It is likely that movement in and out of special education results in a more handicapped population among the older age groups. (This topic is discussed more fully in the chapter by Wolf.) If so, then the levelling off is artificial, and the cross-sectional means are not a good representation of longitudinal growth.

These two concerns, i.e., the representativeness of the pilot sample used in this analysis and the use of the cross-sectional differences to estimate expected longitudinal growth, shed doubt on our conclusion that the conversion tables are inappropriate. Nonetheless, we should point out that all of our arguments in favor of a gain hypothesis have relied on the validity of the conversion tables. If the analysis presented here has not proved the invalidity of these tables, it is hoped that these results lead us to be cautious about the strength of our conclusions. The sixth and seventh editions of the Stanford are not the same test, and the two samples, despite their similarities, were different groups of students. Thus the evidence presented in favor of the gain hypothesis can never be 100% convincing.

In conclusion to this section, we will review the evidence that we have seen. First, we noted that the two samples used to norm the sixth and seventh editions of the Stanford were very similar with respect to the distributions of students attending different types of educational programs. Second, although the samples differed with respect to their regional breaksowns, we noted that achievement differences between the stratification cells comprising the two samples were not great enough to discount the gain hypothesis. As regards the demographic and handicapping characteristics of the two norming samples, we noted that the samples were extremely similar. There was, however, a higher proportion of students with profound hearing loss in the 1983 sample. This finding argued in favor of a gain hypothesis, since the achievement differences were noted, despite a more severely handicapped sample. A statistical analysis which included both the both the demographic and stratification variables revealed that norming year accounted for a significantly high proportion af achievement variation.

The screening procedures used to assign students to test level changed markedly between the two normings. Nonetheless, both screening procedures resulted in a very high proportion of students scoring in acceptable ranges of the reading comprehension subtests. In math, the results were not so encouraging, especially for the 1974 sample, in which only 73% scored in an acceptable range. For this test, a far higher proportion of students in the 1974 sample scored in the chance level. Typically, this overestimates the actual performance of a given group. Thus, again we have support for the gain hypothesis.

Finally, we noted that there are questions left unanswered about the validity of the conversion tables used to link the sixth and seventh editions of the test. It is possible that use of the conversion tables underestimates achievement level.

In sum, there is good reason to believe that hearing-impaired students' achievement levels are higher now than they were in 1974 when the sixth edition of the Stanford was normed.

Unfortunately, the degree of uncertainty introduced by the conversion tables does not permit us to assess directly the amount of achievement gain that has taken place.

Section 3: Achievement Patterns of various subgroups of the 1983 norming sample

The purpose of this section is to provide some summary normative data for various subgroups of the hea g-impaired student population based on the 1983 norming. In the previous section, we took note of some factors which significantly affected achievement for the combined 1974 and 1983 achievement data base in a regression design which controlled statistically for other important demographic variables. The fact that so many of the variables had significant effects on the reading and mathematics achievement levels of hearing-impaired students indicated clearly that this population of students is heterogeneous with respect to variables which have predictive power on their achievement.

Questions are often asked about the published hearing-impaired percentile ranks related to the definitions of the target norming population. Answers to these questions help educators decide on the utility of the percentile rank in various test reporting contexts, e.g., IEPs, parental conferences, district or statewide reports, etc. Behind these questions lie concerns over whether an individual student or a group of students fit the target group to such an extent that the percentile rank has meaning. In many cases, it is difficult to ascribe meaning to the percentile rank, because students are individuals with unique characteristics, and the norming sample was composed, as we have seen, of students with widely differing characteristics.

Clearly, the utility of normative data is enhanced if we can more specifically define subgroups upon which normative comparisons are made. The purpose of this section is therefore to summarize the percentile distributions of the various subgroups discussed above, in Section 2. For these summaries, we have focused on the scaled scores of 8, 12, and 16 year olds. We will report the 20th, 50th, and 80th percentiles of the various groups under analysis. (Complete decile tables for all ages of the different population subgroups have been published with the Stanford Achievement Test norms for hearing-impaired students by the Center for Assessment and Demographic Studies). The tables and figures that are presented allow the description of the achievement patterns of these subgroups and also allow for the estimation of percentile ranks of more specifically defined populations.

The tables and figures presented summarize the percentile distributions for the following subgroups:

Region of the country (Table 11 and Figure 7), including-

- Northeast
- North Central
- South
- West

Program Type (Table 12 and Figure 8), including-

- Special Schools (Residential and Day)
- Local public school districts

Ethnic Group (Table 13 and Figure 9), including-

- Whites
- Blacks
- Hispanics

Degree of hearing loss (Table 14 and Figure 10), including-

- Less than severe
- Severe, Profound (combined)

Additional Handicap (Table 15 and Figure 11), including-

- No additional handicaps
- Additional handicaps (Physical or cognitive)

Because the specific percentiles presented require breaking down the population by two variables (age plus the variable of interest), it was sometimes necessary to combine categories to ensure that the total sample size upon which the norms were based was of adequate size. For example, note that severe and profoundly deaf students are combined, as are the physical and cognitive additional handicap categories. The age at onset variable could not be included since the overwhelming majority of the data base were prelingually deaf.

Insert Tables 11-15 and Figures 7-12 here

These tables and figures will be briefly described.

Region

No consistent pattern can be determined from Figure 7; i.e., in no region was the distribution of scores lower or higher in math and reading across all age groups. It is interesting to note that, among eight year olds, the Northeast students showed considerably more variation in both reading and math, indicating a more heterogeneous population of students enrolled in special education at this age. Interestingly, the 16 year old Northeast subgroup shows the least amount of variation in test scores, especially in reading comprehension. Perhaps there is more migration out of special education throughout the schooling years in the Northeast such that the older students are more homogeneous.

It should be noted that what is true for the medians in these plots is not necessarily true for the other percentile ranks. For example, look at the eight year old math scores. Note that the 50th percentile score is 37 points above the 50th percentile score for the eight year old students in the Northeast. Yet the 80th percentile score is identical for both groups. The smarter students in both regions scored about the same on the test, while lower deciles scored much higher in the North Central region, resulting in a sizeable difference in the reported medians. This example provides us with a lesson for interpreting all of these percentile distributions: Do not characterize a population performance by its median alone.

School Type

As indicated in Table 12 and Figure 8, the distributional differences between special school and local public school students are consistent and fairly straightforward. Local public school students show slight advantages in both reading and math for all age groups. It should be emphasized at this point that this finding in no way implies a causal relationship between program type and academic achievement. It simply describes a fact of life: at the current time, the population of students receiving special educational services within the public schools achieve at higher levels, on average, than do students attending special schools. Many factors affect achievement, as we hope this chapter has made very clear. Figure 8 should not, therefore be interpreted as an endorsement for public school over residential or day school education.

Ethnicity

Figure 9 and Table 13 present the somewhat distressing results for the different ethnic groups within the broader population. Recall from our regression analysis that ethnic status was one of the strongest predictors of achievement. This fact is dramatically illustrated by these percentile distributions. For example, note that the 50th percentile for Hispanic 12 year olds is 11 scaled score points less than the 50th percentile for White 8 year olds. We see here that Hispanics perform more poorly than do Blacks in reading comprehension, but that there performance is similar to black students' performance in math computation. We also see that the distributions are far less varied for math computation. This is consistent with our regression analyses, in which the beta weights reported for minority status were less significant for math computation.

Again, it should be stressed that these analyses do not imply cause of any kind. Ethnicity is a surrogate variable for other characteristics, most notably SES. Also, it is known that Black hearing-impaired students have higher proportions with additional handicaps. (See chapter by Wolff). Thus, it should not be concluded that racial background causes achievement in any way.

Hearing Loss

Students with severe and profound hearing loss performed more poorly in reading comprehension than did students with less than severe loss, as indicated in Table 14 and Figure 11. In math the differences are not as great. In fact, the severe and profound 16 year olds scored higher than their age cohorts with less than severe hearing loss. This fact is surprising and is perhaps more evidence for the notion that the older students in the data base have higher proportions of additional handicaps.

Additional handicap status

Table 15 and Figure 11 show the results for students with and without additional handicaps. Quite clearly, students with additional handicaps achieve at lower levels than do students with no additional handicaps. Also, the differences between the two groups seems to widen as the students get older. For example the median reading comprehension performance of 16 year olds with additional handicaps is 56 points below the median performance of 16 year olds with no additional handicaps. For 8 year olds the same comparison shows a difference of only 32 points. Thus it appears that hearing-impaired students in special education who have compounding additional handicaps achieve farther and farther behind as they move through school.

Conclusion

At the beginning of this chapter we drew some tentative conclusions based on our study of Figures 1 and 2. As the conclusion of this chapter we will reconsider those conclusions based on our inquiries into the norming data bases of 1974 and 1983.

The first conclusion was that hearing-impaired students lag behind their hearing counterparts in reading and math. This is undoubtedly a fair statement to make; however we have noted the danger of drawing conclusions based on the study of measures of central tendency alone. In situations where there are far greater proportions in the lower deciles in one group, the median for that group will be lowered. It may be that students in the upper deciles perform comparably to their hearing counterparts. Also, we have noted that accurate definitions of the term "hearing-impaired students" are difficult to come by. Careful descriptions of subgroups of the population allow for more meaningful discussions of student performance.

The second conclusion was that the deficit between hearing and hearing-impaired performance is more profound in reading than in math. This is clearly true. Throughout the entire chapter, math computation achievement level was higher than reading comprehension level, no matter what subgroup we were discussing.

The third and fourth conclusions took note of a "levelling off" in the achievement capabilities in reading and math. This conclusion is not warrented. There is plenty of reason to con clude that the cross-sectional mean performance of each age group represented by the math and reading curves drawn in Figures 1 and 2, are not adequate representations of longitudinal growth. This entire book grapples with the task of describing a non-stable heterogeneous population. The levelling off that we see in the curves representing hearing-impaired student performance in Figures 1 and 2 may result from the increasing proportions of students with additional and more severely handicapping characteristics among the older students in the data base. A more radical interpretation is that students who cannot achieve beyond a third or fourth grade reading level stay in special education. Thus the Stanford norming project may simply validate this selection process. In any case, it should not be concluded of any young hearing-impaired student that he or she will never achieve beyond such and such a level.

The final conclusion was that hearing-impaired students have shown gain in their reading and math achievement over the last 10 years. Happily, (and it is nice to end this chapter on an optimistic note) much of the evidence we explored pointed to the truth of this statement. It is true that some ambiguity exists related to the validity of the conversion tables. Nonetheless, it appears certain that students demonstrated higher achievement levels on the seventh edition of the Stanford.

Table 1

Mean Scaled Score Comparisons of 1974* and 1983
Norming Samples, Broken Down By Age

	Reading Comprehension						Math Computation					
	1974			1983			1974			1983		
Age	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
8	517	467.0	42.6	349	506.8	58.5	486	503.0	53.8	356	545.9	65.7
9	1358	470.6	44.3	398	522.2	68.9	1246	513.6	51.9	399	569.5	69.8
10	509	492.6	58.3	435	538.6	65.3	495	543.6	55.8	422	589.6	69.3
11	429	505.6	59.9	575	543.9	61.6	419	561.1	56.4	572	608.5	65.0
12	477	521.7	64.8	584	558.0	61.0	468	582.4	57.2	578	622.2	67.8
13	489	523.2	68.5	616	569.7	64.5	479	595.9	56.5	616	640.1	67.3
14	573	533.2	70.3	658	580.7	64.8	563	607.0	62.2	649	651.0	61.8
15	797	542.3	72.6	622	586.7	63.8	787	614.0	60.5	616	662.7	60.0
16	491	556.3	73.3	648	586.1	67.7	487	627.6	63.1	643	661.9	66.0
17	394	567.5	71.8	904	584.8	64.8	391	641.2	63.5	893	664.6	61.4
18	318	571.8	73.4	262	578.8	59.6	319	642.9	66.5	1260	661.2	60.3

* Throughout this paper, 1974 scaled scores have been converted from the 6th edition scale to the 7th edition scale using conversion tables provided by the test publisher.

Table 2
Comparisons of 1979 and 1983 Norming Samples
On Proportions Contained Within Each Stratification Group

Stratification Groups	1974 N=6,870	1983 N=7,557	1983 Annal Survey N=43,830*
Northeast			
Resid/Day Schools	13.0%	14.1%	9.1%
Local School Districts	3.8%	7.5%	12.6%
	Total % = 16.8	Total % = 21.6	Total % = 21.[illegible]
North Central			
Resid/Day Schools	9.2%	15.5%	6.9%
Local School Districts	13.2%	10.5%	16.6%
	Total % = 20.4	Total % = 26.0	Total % = 23.5
South			
Resid/Day Schools	28.8%	22.2%	14.7%
Local School Districts	13.6%	12.7%	2[illegible].6%
	Total % = 42.4	Total % = 34.9	Total % = 36.3
West			
Resid/Day Schools	9.2%	10.0%	6.7%
Local School Districts	9.2%	7.6%	11.8%
	Total % = 18.4	Total % = 17.6	Total % = 18.6

Program Type Totals Across Regions

Resid/Day Schools	60.2%	61.8%	37.5%
Local School Districts	39.8%	38.2%	62.5%

*This number represents students in the Annual Survey population who were between the ages of 7 and 19 in the Spring of 1983, and who were reported to the survey by residential, day or local district special education programs.

Table 3

Demographic Profiles of 1974 and 1983 Norming Samples, Compared to 1983 Annual Survey Sample*

	1974	1983	1983 Annual Survey
Age			
7	1.6%	2.3%	5.5%
8	7.7%	4.7%	6.2%
9	20.3%	5.3%	6.4%
10	7.6%	7.8%	6.3%
11	6.3%	7.7%	7.3%
12	7.0%	7.8%	7.5%
13	7.3%	8.2%	7.8%
14	8.4%	8.8%	7.8%
15	11.7%	8.3%	7.5%
16	7.2%	8.7%	7.5%
17	5.7%	12.2%	11.1%
18	4.6%	16.9%	14.2%
19	4.5%	3.4%	5.0%
	N=6,870 (0% missing)	N=7,624 (1.7%missing)	N=43,830 (0% missing)
Sex			
Males	53.3%	53.3%	53.7%
Females	46.7%	46.7%	46.1%
	N= 6,852 (0.3% missing	N= 7,730 (0.3% missing)	N= 43,830 (0% missing)
Ethnic Background			
White	65.0%	65.9%	67.7%
Black	16.7%	18.3%	18.5%
Hispanic	12.1%	12.2%	10.0%
Other, or Multi-Ethnic	6.1%	3.6%	3.7%
	N= 6,870 (0% missing)	N= 7,740 (0.2% missing)	N= 42,558 (2.9% missing)
Hearing Loss			
Less than severe	20.3%	17.6%	34.3%
Severe	27.6%	25.3%	21.3%
Profound	52.1%	57.1%	44.4%
	N= 6,646 (3.3% missing)	N= 7,662 (1.2% missing)	N= 43,047 (1.8% missing)

* See note for Table 2

Table 3 (cont.)

	1974	1983	1983 Annual Survey
Additional Handicaps			
None	72.4%	73.8%	68.8%
Physical only	10.0%	9.9%	8.8%
Cognitive (w. and w/out physical)	17.6%	16.3%	22.4%
	N=6,035 (12.2% miss)	N=7,523 (1.7% miss)	N=42,099 (3.9% missing)
Age-at-onset of hearing loss			
Prelingual (0-2 yrs)	93.9%	94.8%	92.8%
Post lingual (3 yrs or older)	6.1%	5.2%	7.2%
	N= 5,917 (13.9% miss)	N= 6,915 (10.9% miss)	N= 35,787 (18.4% missing)
Cause of Deafness			
Maternal Rubella	36.1%	35.6%	30.0%
Meningitis	11.3%	12.1%	10.9%
Hereditary	16.3%	19.2%	18.3%
Otitis Media	1.9%	2.3%	4.6%
Other at birth	19.4%	12.4%	14.5%
Other after birth	9.2%	9.4%	10.6%
Other not listed	5.8%	9.0%	11.1%
	N=3,208 (46.7% miss)	N= 5,080 (34.5% miss)	N= 36,868 (38.7% missing)

Table 4
Significant Effects in Regression
Analysis for
Reading Comprehension

Description of Dichotomous Variables	Beta weight	Significance
1. Attending a local school district, (versus attending a special school)	.14	<.001
2. Living in the South (versus living in other regions of the country).	-.08	<.001
3. Being Female (versus being male)	.11	<.001
4. Being member of minority ethnic group (versus being white)	-.23	<.001
5. Having profound hearing loss >90dB average threshold in the better ear (versus having a less than profound loss).	-.07	<.001
6. Becoming hearing-impaired before the age of 3 (versus becoming impaired at or after the age of three).	-.07	<.001
7. Having one or more additional physical handicaps (versus having no additional handicaps or having additional cognitive handicaps).	-.10	<.001
8. Having one or more additional cognitive handicaps, with or without additional physical handicaps (versus having no additional handicaps or having additional physical handicaps only).	-.25	<.001
9. Being tested in 1983 (versus being tested in 1974).	.25	<.001

Multiple R-square for model which does not include norming year as an independent measure	.18
Multiple R-square for model which does include norming year as an independent measure.	.25
Proportion of variation attributable to Norming year, independent of all other effects.	.07

Table 5
Significant Effects in Regression
Analysis for
Math Computation

Description of Dichotomous Variables	Beta weight	Significance
1. Attending a local school district, (versus attending a special school)	.11	< .001
2. Living in the South (versus living in other regions of the country).	-.09	< .001
3. Being member of minority ethnic group (versus being white)	-.17	< .001
4. Having one or more additional physical handicaps (versus having no additional handicaps or having additional cognitive handicaps).	-.11	< .001
5. Having one or more additional cognitive handicaps, with or without additional physical handicaps (versus having no additional handicaps or having additional physical handicaps only).	-.30	< .001
6. Being tested in 1983 (versus being tested in 1974).	.27	< .001

Multiple R-square for model which does not include norming year as an independent measure	.15
Multiple R-square for model which does include norming year as an independent measure.	.23
% variation attributable to Norming year, independent of all other effects.	.08

Table 6
Reading Comprehension and Mathematics Computation Scaled Scores Associated With 20th, 50th, and 80th Percentiles for 8, 12, and 16 year olds: Comparisons of Weighted and Unweighted Samples

Reading Comprehension

	Age 8		Age 12		Age 16	
	Unweighted Sample	Weighted Sample	Unweighted Sample	Weighted Sample	Unweighted Sample	Weighted Sample
80 %ile	552	553	606	613	641	646
50 %ile	496	499	549	562	594	596
20 %ile	450	452	489	495	531	531

Mathematics Computation

	Age 8		Age 12		Age 16	
80 %ile	587	570	573	672	710	709
50 %ile	533	537	623	623	673	671
20 %ile	467	473	556	559	618	613

Table 7
Reading Test Level Assignment in the 1974 and 1983 Norming
of the Stanford Achievement Test
(6th and 7th editions)

Test Level

Year	Total		P1		P2		P3		I1		I2		AD	
Age	74 (N)	83 (N)	74 (%)	83 (%)	74 (%)	83 (%)	74 (%)	83 (%)	74 (%)	83 (%)	74 (%)	83 (%)	74 (%)	83 (%)
8	530	354	75.5	56.5	23.2	26.6	0.9	10.5	0.2	5.4	0.0	0.0	0.2	1.1
9	1395	400	67.0	44.8	29.7	27.3	2.6	14.3	0.7	11.3	0.0	0.5	0.0	2.0
10	520	436	50.2	37.4	38.7	28.2	7.7	16.1	2.5	13.3	0.6	1.6	0.4	3.4
11	435	578	38.3	32.5	46.6	27.3	8.7	21.3	3.2	13.8	1.6	1.7	1.6	3.3
12	484	584	26.9	23.5	50.0	26.0	10.7	30.0	7.2	12.3	2.5	2.4	2.7	5.8
13	499	622	22.8	19.5	50.3	25.4	13.8	26.2	6.6	15.0	2.0	2.4	4.4	11.6
14	580	661	17.8	15.1	49.5	22.7	13.8	25.6	7.4	15.4	5.0	5.0	6.6	16.2
15	801	628	14.9	12.1	47.1	18.4	12.7	28.0	8.4	17.3	9.9	4.0	7.1	20.3
16	494	655	11.3	14.4	42.3	17.3	12.6	25.7	9.5	15.9	12.8	5.6	11.5	21.2
17	394	915	10.7	13.9	33.8	16.9	16.2	25.7	10.4	18.9	13.2	4.9	15.7	19.7
18	319	1277	8.8	13.3	32.6	18.2	12.2	28.5	13.2	17.9	19.7	5.5	18.5	16.6

Table 8
Mathematics Test Level Assignments in the 1974 and 1983 Normings
of the Stanford Achievement Test
(6th and 7th editions)

Test Level

Year Age	Total 74 (N)	Total 83 (N)	P1 74 (%)	P1 83 (%)	P2 74 (%)	P2 83 (%)	P3 74 (%)	P3 83 (%)	I1 74 (%)	I1 83 (%)	I2 74 (%)	I2 83 (%)	AD 74 (%)	AD 83 (%)
8	530	357	75.5	68.3		15.1	23.2	8.4	0.9	7.6	0.2	0.6	0.2	0.0
9	1395	399	67.0	48.6		17.5	29.7	20.1	2.6	12.0	0.7	1.3	0.0	0.5
10	520	425	50.2	37.2		13.2	38.7	28.2	7.7	16.2	2.5	3.8	1.0	1.4
11	436	574	38.3	22.3		15.7	46.6	24.7	8.7	27.5	3.2	7.8	3.2	1.9
12	484	579	26.9	18.0		10.0	50.0	24.7	10.7	30.1	7.2	12.6	5.2	4.7
13	499	619	22.8	10.8		10.0	50.3	23.4	13.8	28.6	6.6	16.5	6.4	10.7
14	580	654	17.8	6.9		6.9	49.5	21.7	13.8	28.7	7.4	17.7	11.6	18.0
15	801	623	14.9	7.1		5.3	47.1	16.1	12.7	28.7	8.4	20.9	17.0	22.0
16	494	644	11.3	7.1		5.4	42.3	14.6	12.6	25.3	9.5	20.8	24.3	26.7
17	394	903	10.7	6.0		4.8	33.8	13.2	16.2	29.3	10.4	19.4	28.9	27.4
18	319	272	8.8	6.7		5.9	32.6	14.2	12.2	29.7	13.2	19.5	33.2	24.0

* In the SAT-~~III~~ NI (6th edition) the Primary 2 Mathematics Computation was not included in the battery because of the restructuring of the subtests.

Table 9
Percent Scoring in Each of Three Performance Categories
For Reading Comprehension, and Math Computation
Each of the Six Stanford Achievement Te. , Battery Levels
For 1974 and 1983 Norming Samples

	N		Chance < 26%		Acceptable 26%-90%		Top-out >90%	
	1974	1983	1974	1983	1974	1983	1974	1983
Reading Comprehension								
Primary 1	2372	1335	4.8%	0.9%	94.9%	96.0%	0.9%	3.1%
Primary 2	2641	1694	8.0%	2.3%	91.5%	97.6%	0.5%	0.1%
Primary 3	624	1788	0.0%	1.3%	99.2%	98.6%	0.8%	0.1%
Interm. 1	404	455	4.2%	1.3%	95.8%	98.5%	0.0%	0.1%
Interm. 2	370	268	2.2%	4.5%	97.3%	95.1%	0.5%	0.4%
Advanced	355	959	1.4%	5.0%	94.4%	93.7%	4.2%	1.3%
Overall	6766	6499	5.2%	2.1%	94.0%	96.9%	0.8%	1.0%
Mathematics Computation								
Primary 1	2201	958	19.1%	1.6%	64.8%	76.1%	16.0%	22.3%
Primary 2	--	516	--	0.0%	--	88.0%	--	12.0%
Primary 3	2601	1399	5.1%	1.1%	75.2%	77.3%	19.7%	21.6%
Interm. 1	625	1648	5.0%	1.1%	73.1%	85.9%	21.9%	13.0%
Interm. 2	402	1094	4.2%	0.5%	83.1%	83.9%	12.7%	15.6%
Advanced	721	1178	3.1%	0.9%	90.0%	91.7%	6.9%	7.4%
Overall	6550	6793	9.5%	1.0%	73.5%	83.6%	16.8%	15.4%

* See note, table 7

Table 10
Comparison of the Mean Differences between 6th Edition and 7th Edition Scaled scores after a 1 year interval with Cross-sectional differences of adjacent 1983 norming age categories

Ages	Reading Comprehension		Math Computation	
	Longitudinal[1]	Cross-sectional[2]	Longitudinal	Cross-sectional
8 to 9	22.6 (N=17)	15.4	25.5 (N=16	10.6
9 to 10	37.4 (N=19)	16.4	3.6 (N=19)	30.0
10 to 11	34.1 (N=45)	5.3	21.8 (N=45)	17.5
11 to 12	45.3 (N=54)	14.1	26.5 (N=53)	21.3
12 to 13	39.7 (N=59)	11.7	37.9 (N=58)	13.5
13 to 14	41.8 (N=61)	11.0	31.8 (N=58)	11.1
14 to 15	34.9 (N=55)	9.0	29.5 (N=49)	7.0
15 to 16	16.4 (N=43)	0.0	32.5 (N=43)	13.0
16 to 17	30.7 (N=54)	-1.3	33.7 (N=53)	14.0
17 to 18	18.8 (N=71)	-6.0	20.3 (N=70)	1.7

[1] Longitudinal differences represent the mean scaled score "gain" in pilot sample students from converted 6th edition scaled scores in 1982 to 7th edition scaled scores in 1983.

[2] Cross-sectional differences are computed from the 1983 norming sample data by subtracting the mean scaled scores of each age cohort from the mean scaled score of the next higher age group.

Table 11
20th, 50th & 80th Percentiles in Reading Comprehension
and Mathematics Computation for
Hearing-Impaired Students in Different
Regions of the Country
Stanford Norming Project, Spring 1983

Reading Comprehension

	Age 8				Age 12				Age 16			
	NE	NC	South	West	NE	NC	South	West	NE	NC	South	West
80%ile	566	549	543	548	614	608	597	599	646	646	635	638
50%ile	500	499	493	475	555	555	543	544	618	591	590	585
20%ile	442	454	454	449	494	510	478	483	557	545	530	513

Math Computation

	Age 8				Age 12				Age 16			
	NE	NC	South	West	NE	NC	South	West	NE	NC	South	West
80%ile	590	590	585	582	683	678	654	664	721	713	698	710
50%ile	514	551	527	527	635	639	602	632	686	672	670	671
20%ile	446	497	475	464	580	555	550	567	636	617	620	610

Table 12
20th, 50th & 80th Percentiles in Reading Comprehension
and Mathematics Computation for
Hearing-Impaired Students in Different
Types of Special Education Programs
Stanford Norming Project, Spring 1983

Reading Comprehension

	Age 8		Age 12		Age 16	
	Special Schools	Local District	Special Schools	Local District	Special Schools	Local District
80%ile	533	563	589	618	635	656
50%ile	485	510	536	572	589	604
20%ile	447	456	480	503	526	545

Math Computation

80%ile	567	603	667	679	707	717
50%ile	517	550	613	635	669	681
20%ile	455	491	551	568	611	634

Table 13

20th, 50th, 80th Percentiles in Reading Comprehension
and Mathematics Computation for
Hearing-Impaired Students in Different
Ethnic Groups
Stanford Norming Project, 1983

Reading Comprehension

	Age 8			Age 12			Age 16		
	White	Black	Hispanic	White	Black	Hispanic	White	Black	Hispanic
80%ile	564	511*	482*	615	570	570	646	608	595
50%ile	510	468*	450*	569	525	499	608	566	531
20%ile	462	442*	430*	512	470	471	556	491	476

Math Computation

	Age 8 White	Age 8 Black	Age 8 Hispanic	Age 12 White	Age 12 Black	Age 12 Hispanic	Age 16 White	Age 16 Black	Age 16 Hispanic
80%ile	599	544*	553*	683	632	640	715	688	693
50%ile	550	501*	490*	642	588	596	680	646	657
20%ile	493	456*	453*	571	529	553	631	577	614

*N is < 50

Table 14

20th, 50th, 80th Percentiles in Reading Comprehension
and Mathematics Computation for
Hearing-Impaired Students with Different
Degree of Hearing Loss
Stanford Norming Project, 1983

Reading Comprehension

	Age 8		Age 12		Age 16	
	Less Than Severe	Severe-Profound	Less Than Severe	Severe-Profound	Less Than Severe	Severe-Profound
80%ile	572	540	626	602	647	639
50%ile	518	488	583	544	606	590
20%ile	458	449	527	486	552	528

Math Computation

	Less Than Severe	Severe-Profound	Less Than Severe	Severe-Profound	Less Than Severe	Severe-Profound
80%ile	595	585	666	673	700	709
50%ile	540	528	619	625	659	673
20%ile	496	465	567	557	594	622

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Table 15

20th, 50th & 80th Percentiles in Reading Comprehension
and Mathematics Computation for
Hearing-Impaired Students With and Without Additional Handicaps**

Reading Comprehension

	Age 8		Age 12		Age 16	
	NoAHC	AHC	NoAHC	AHC	NoAHC	AHC
80%ile	553	517*	612	573	644	612
50%ile	498	466*	565	519	601	545
20%ile	453	438*	503	470	548	472

Math Computation

	NoAHC	AHC	NoAHC	AHC	NoAHC	AHC
80%ile	594	563*	679	638	714	683
50%ile	539	485*	636	569	680	630
20%ile	489	429*	583	526	640	546

*N < 50

** The Additional Handicap group includes students with physical handicaps and students with cognitive handicaps.

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Figure 1
Mean Reading Comprehension
Scaled Scores for 1974 and 1983
Norming Samples, Broken Down by Age
Plotted with Median performance of Hearing Students

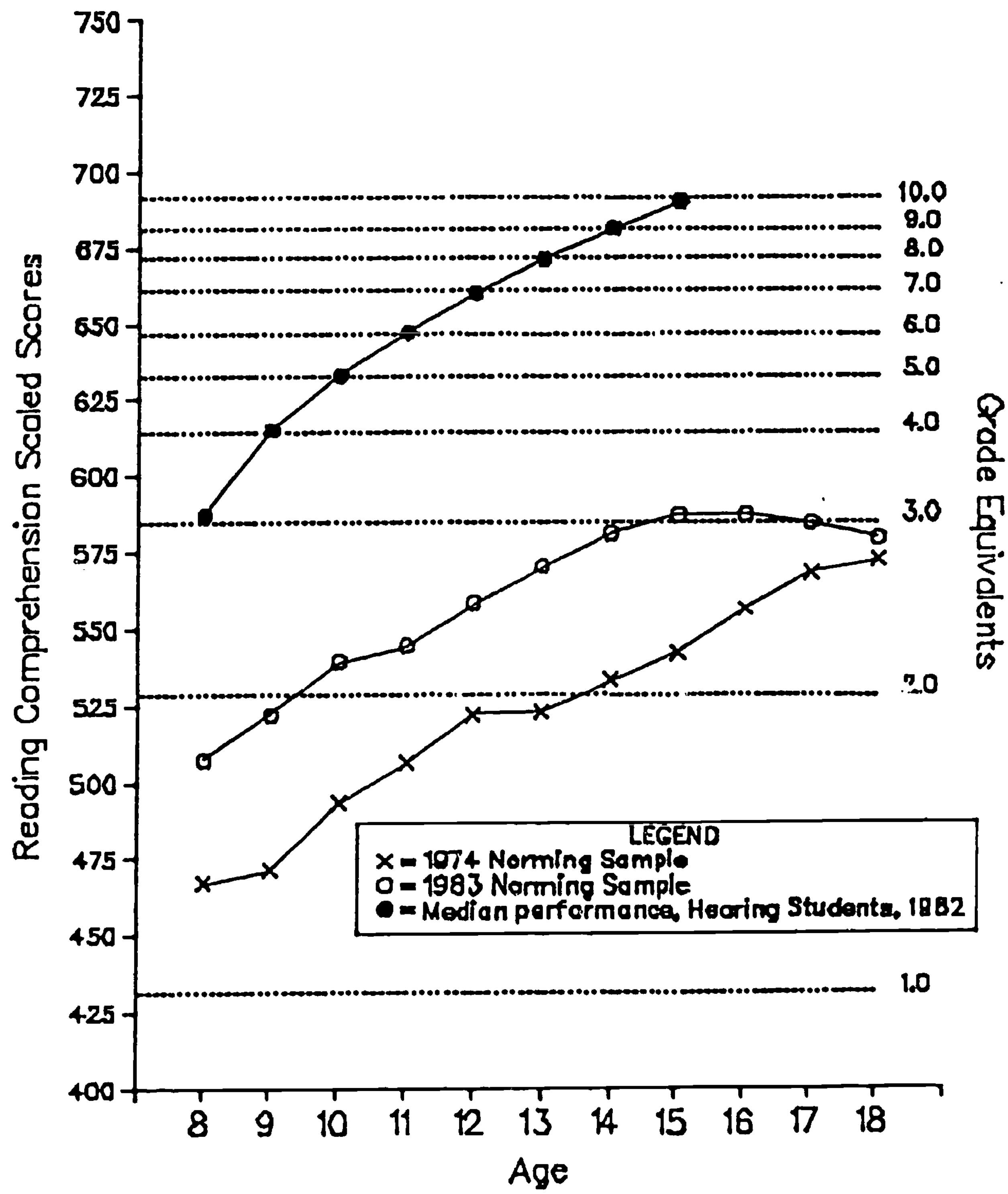

Figure 2

Mean Mathematics Computation
Scaled Scores for 1974 and 1983
Norming Samples, Broken Down by Age
Plotted with Median performance of Hearing Students

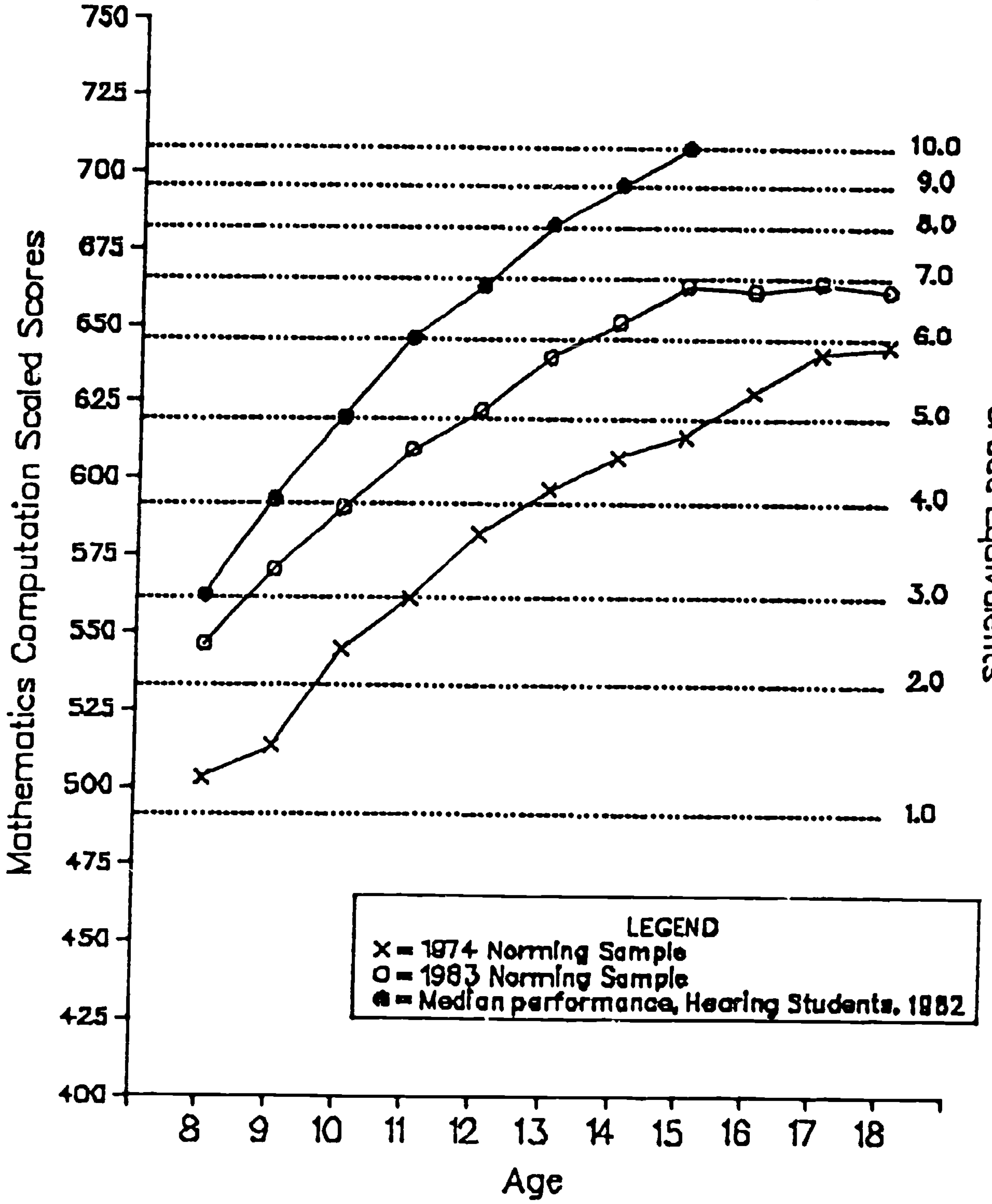

Figure 3

Reading Comprehension

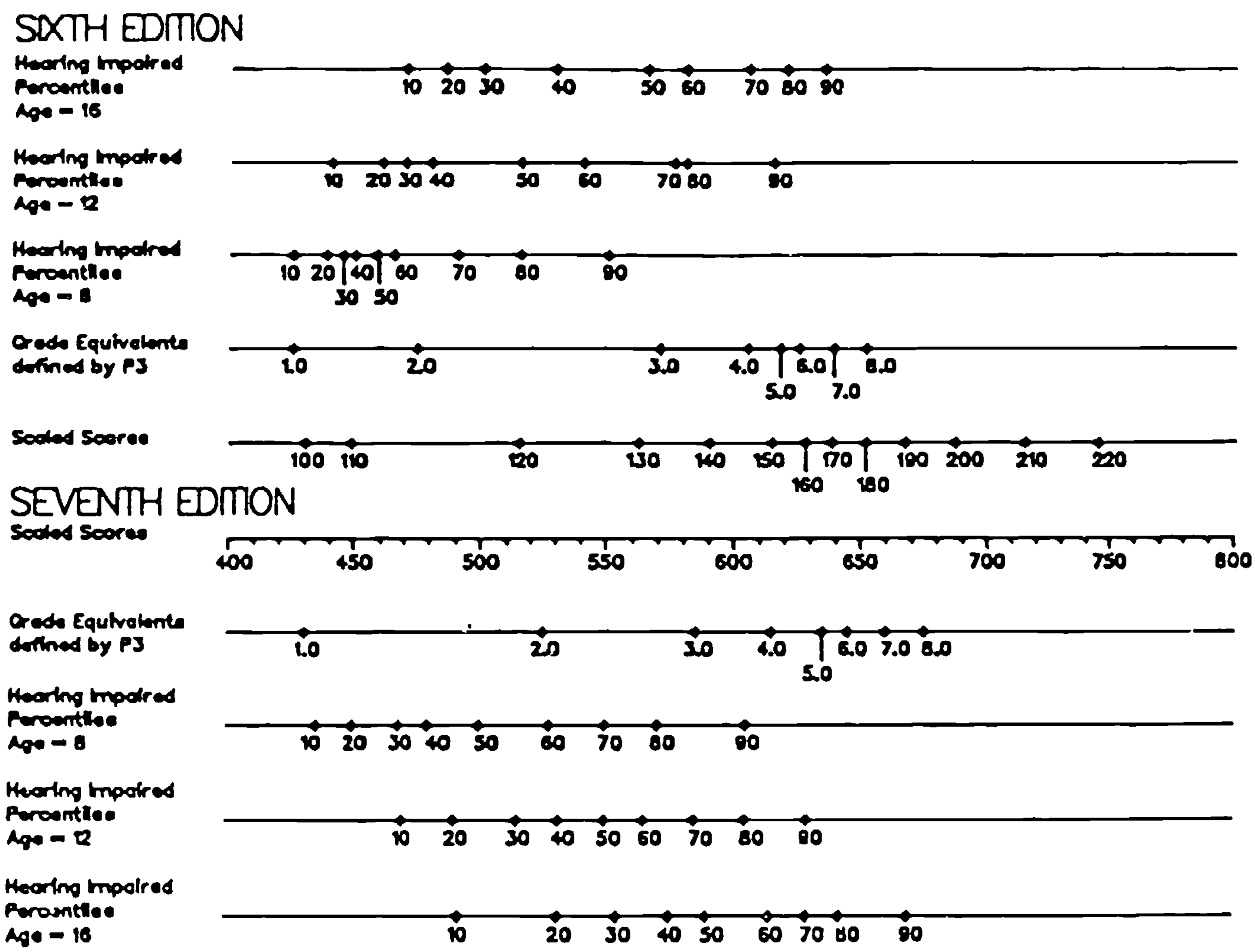

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Figure 4
Math Computation

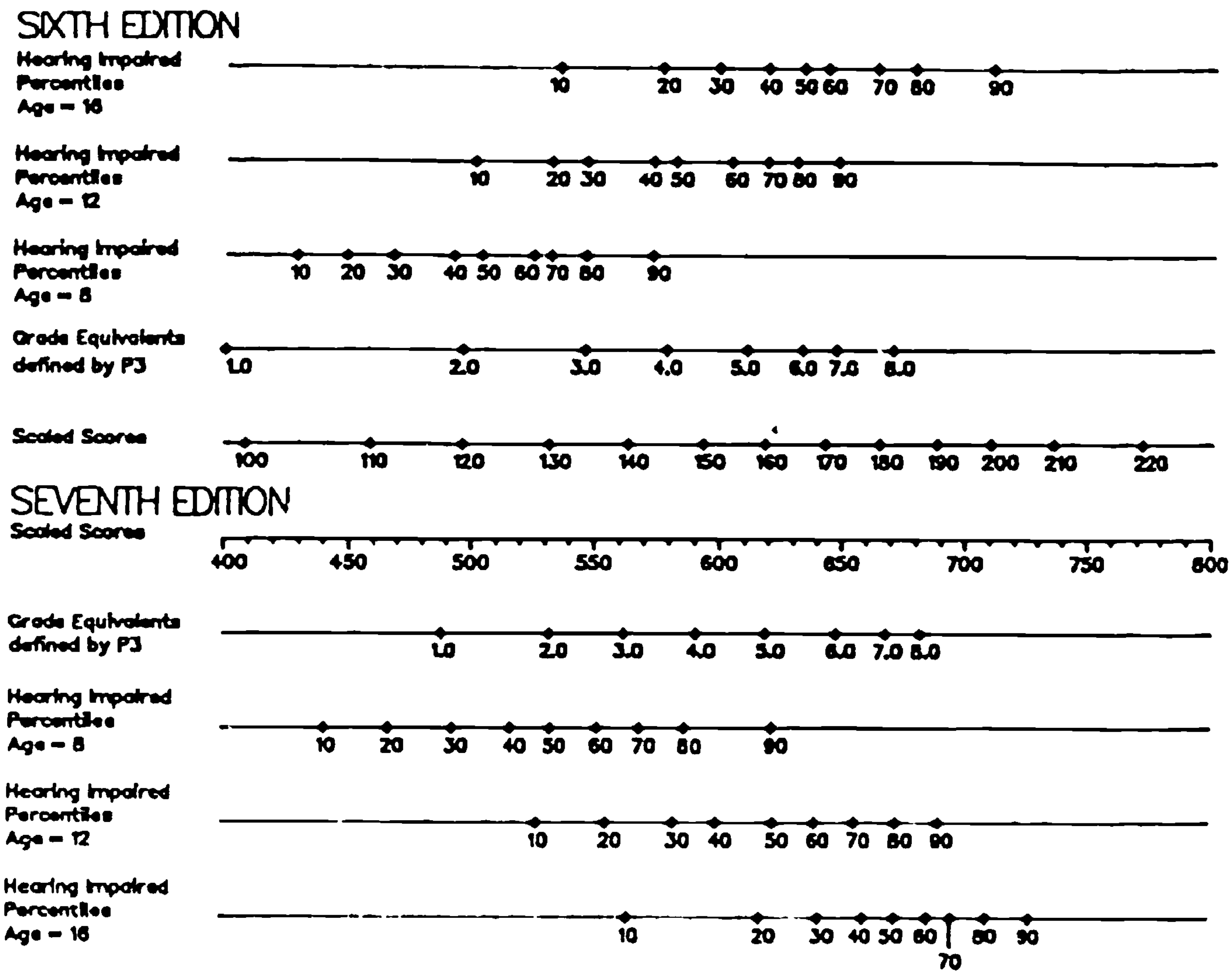

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Figure 5

Mean Reading Comprehension Scores for Different Types of Schools Across Norming Year and Region

(S-Special schools L-Local Public schools)

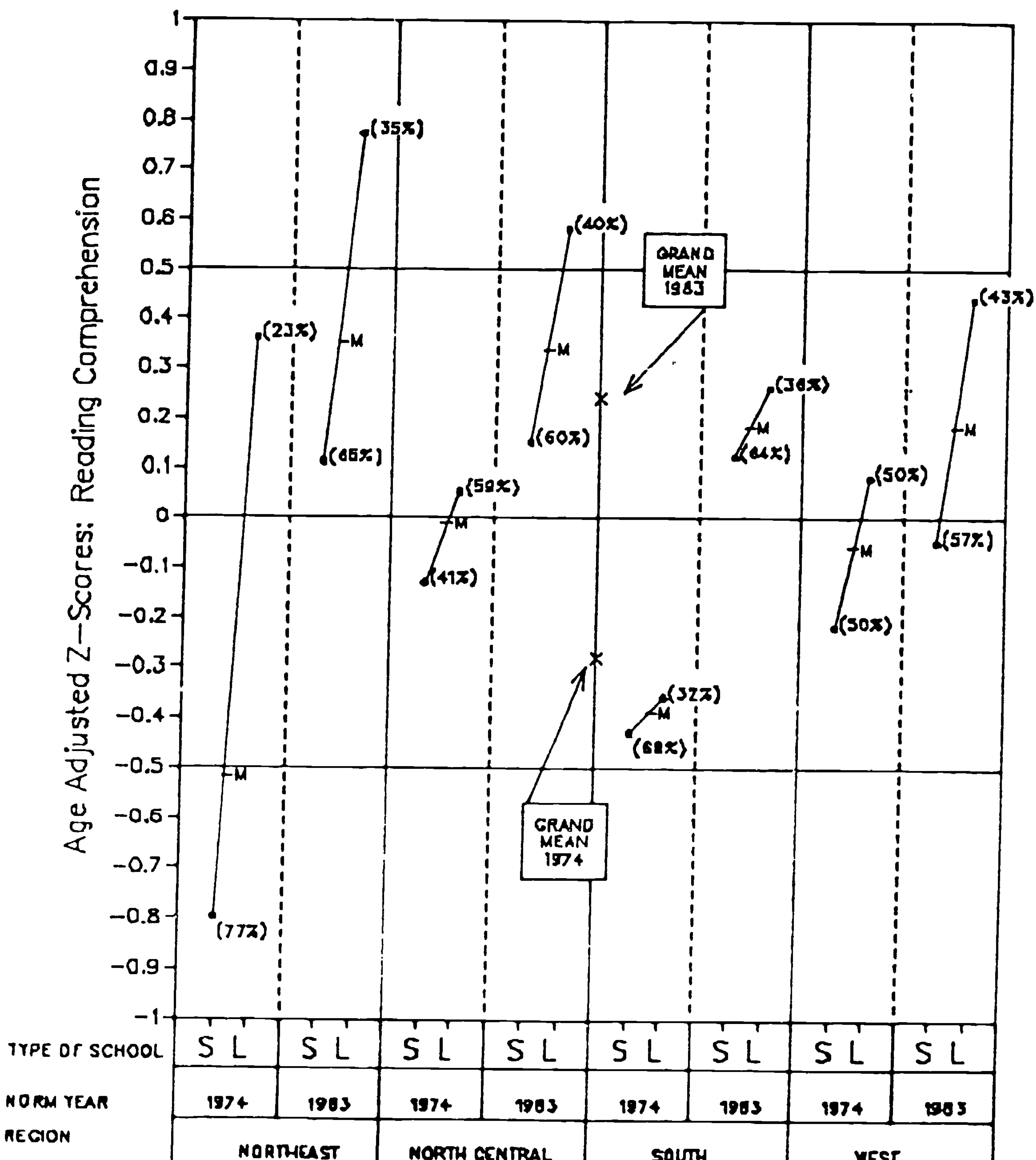


Figure 6
Mean Math Computation Scores
for Different Types of Schools
Across Norming Year and Region
(S–Special schools L–Local Public schools)

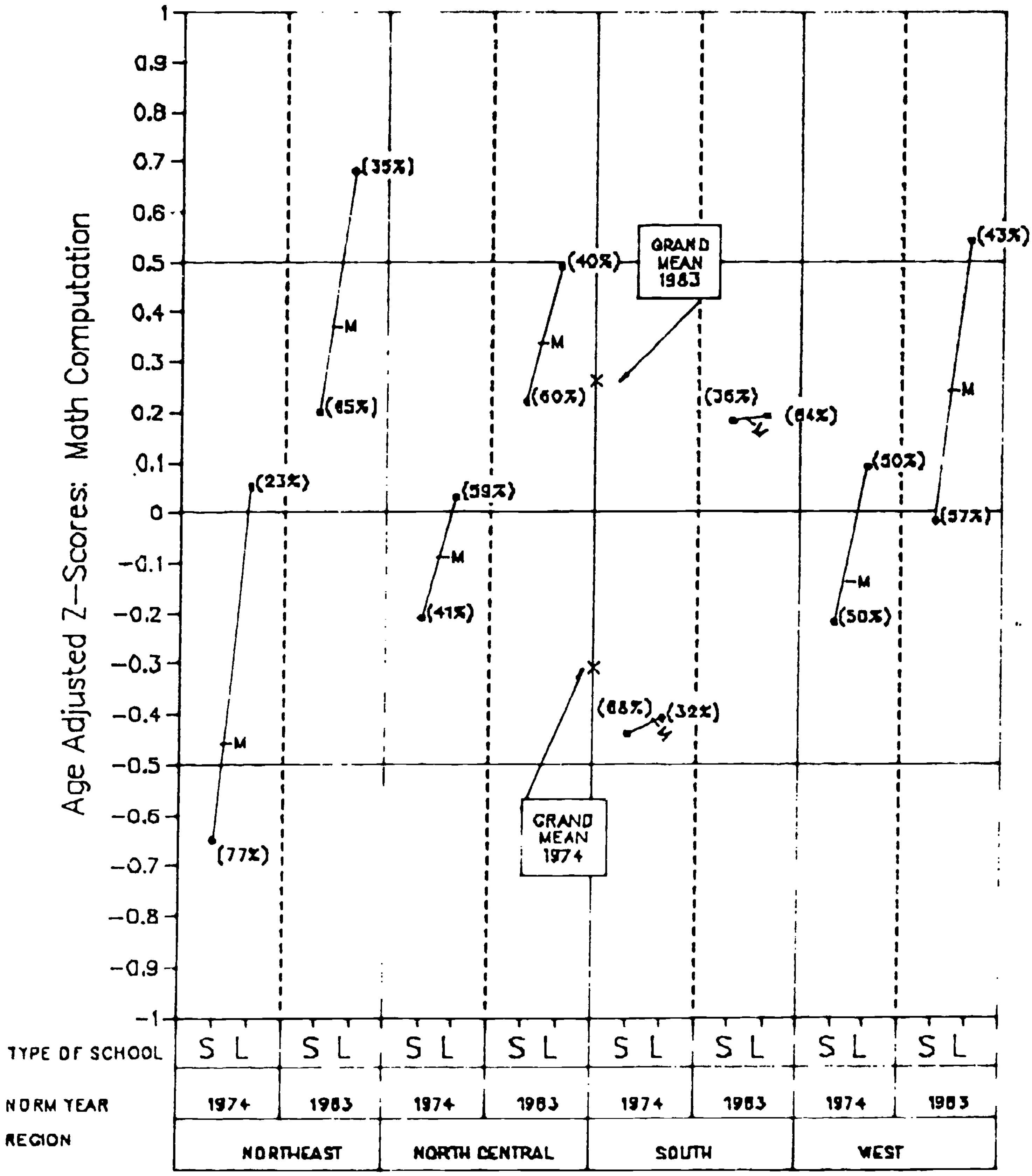
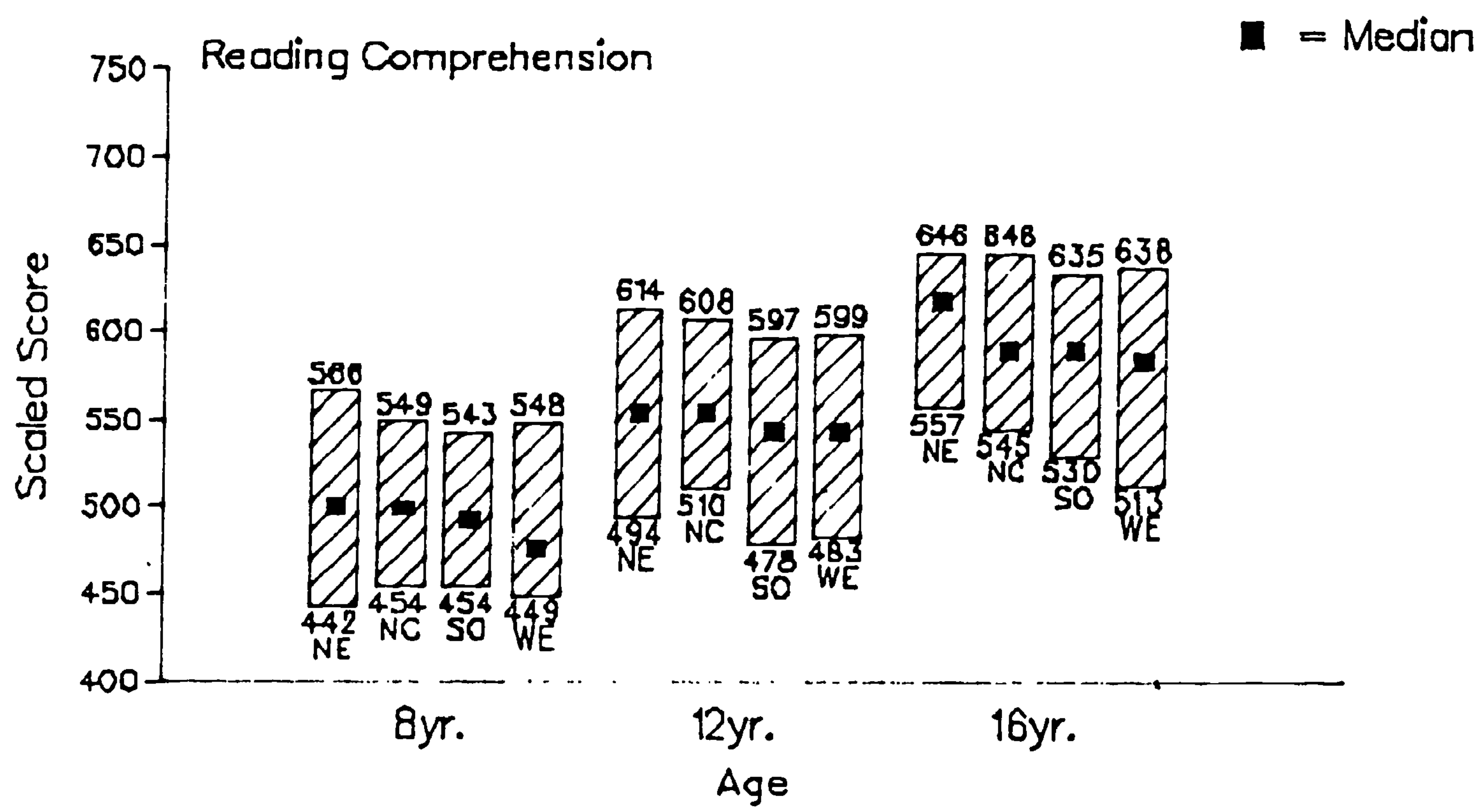


Figure 7

20th to 80th Percentile Ranges for Hearing Impaired 8, 12 and 16 Year Olds in Different Regions of Country



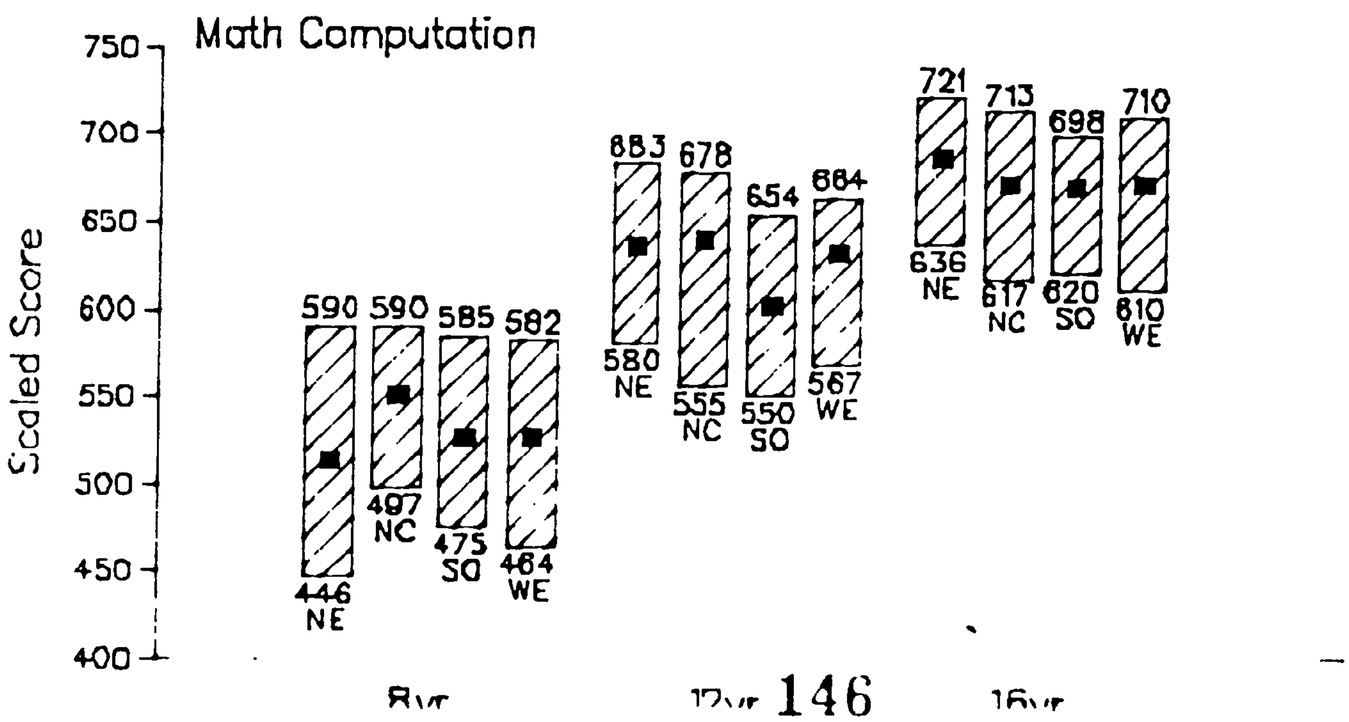


Figure 8

20th to 80th Percentile Ranges for Hearing Impaired 8, 12 and 16 Year Olds in Different Types of Special Education Programs

SS=SPECIAL SCHOOLS, LD=LOCAL DISTRICTS

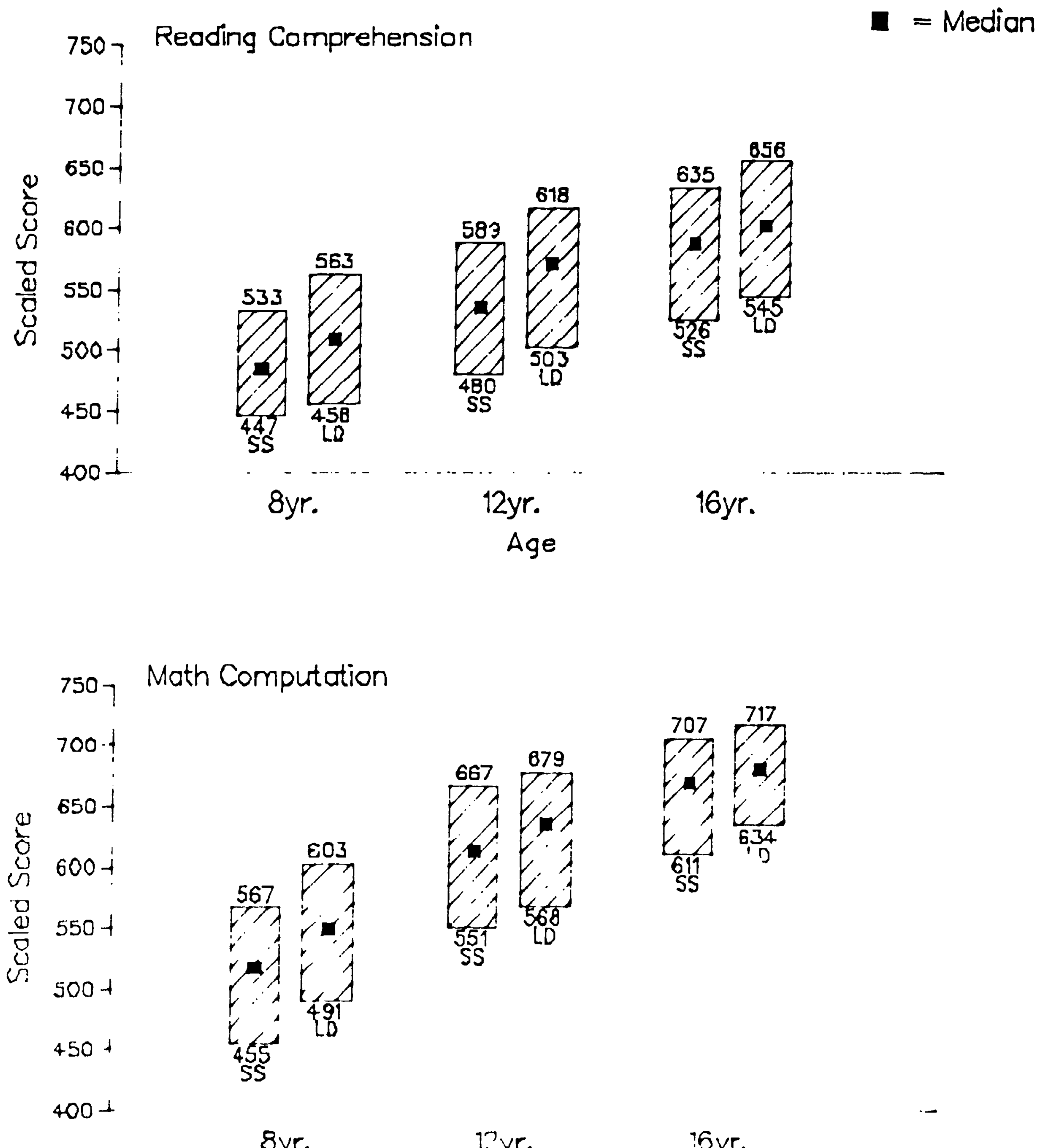
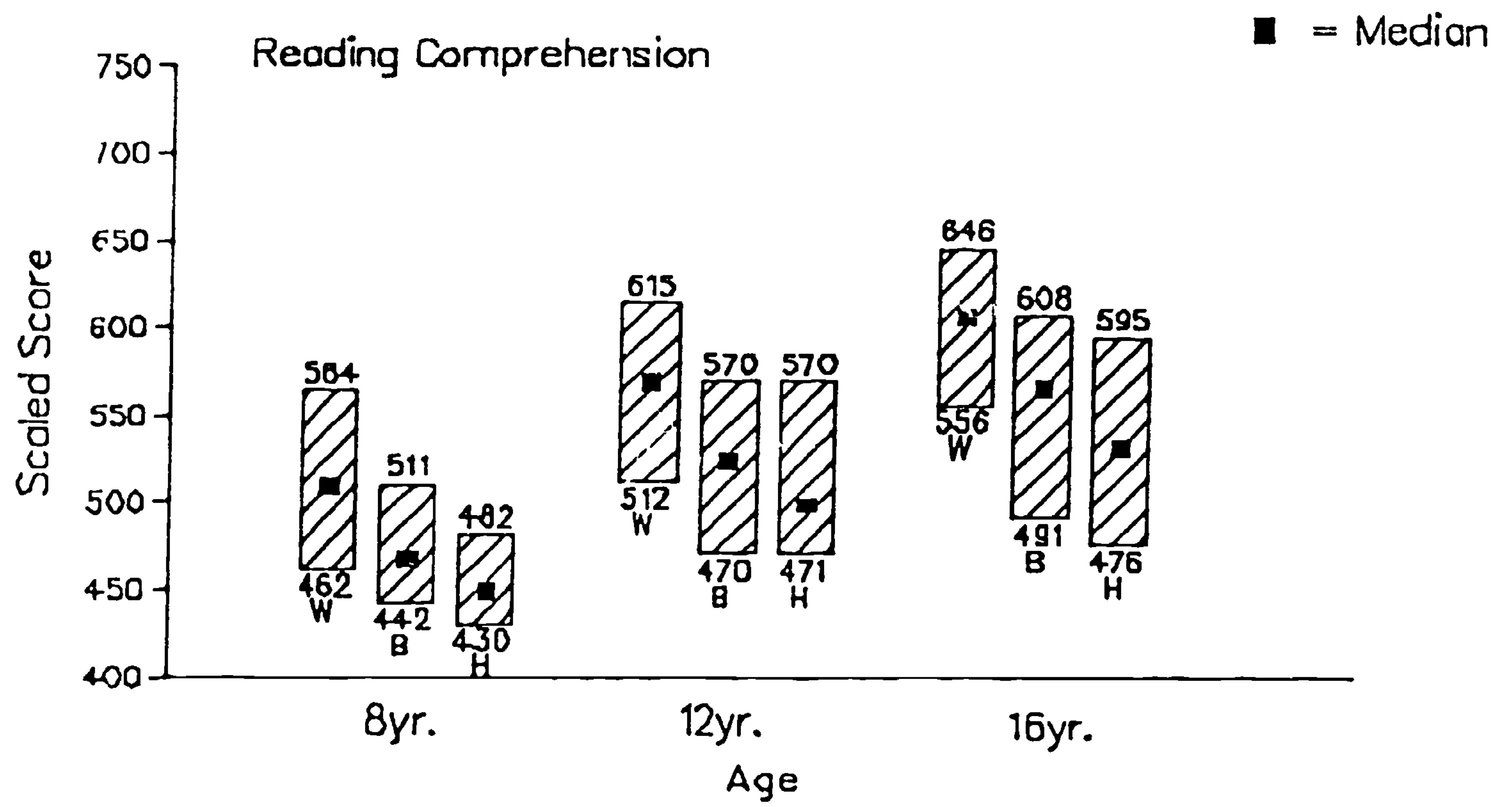


Figure 9

20th to 80th Percentile Ranges for Hearing Impaired 8, 12 and 16 Year Olds in Different Ethnic Groups

W=WHITE, B=BLACK, H=HISPANIC



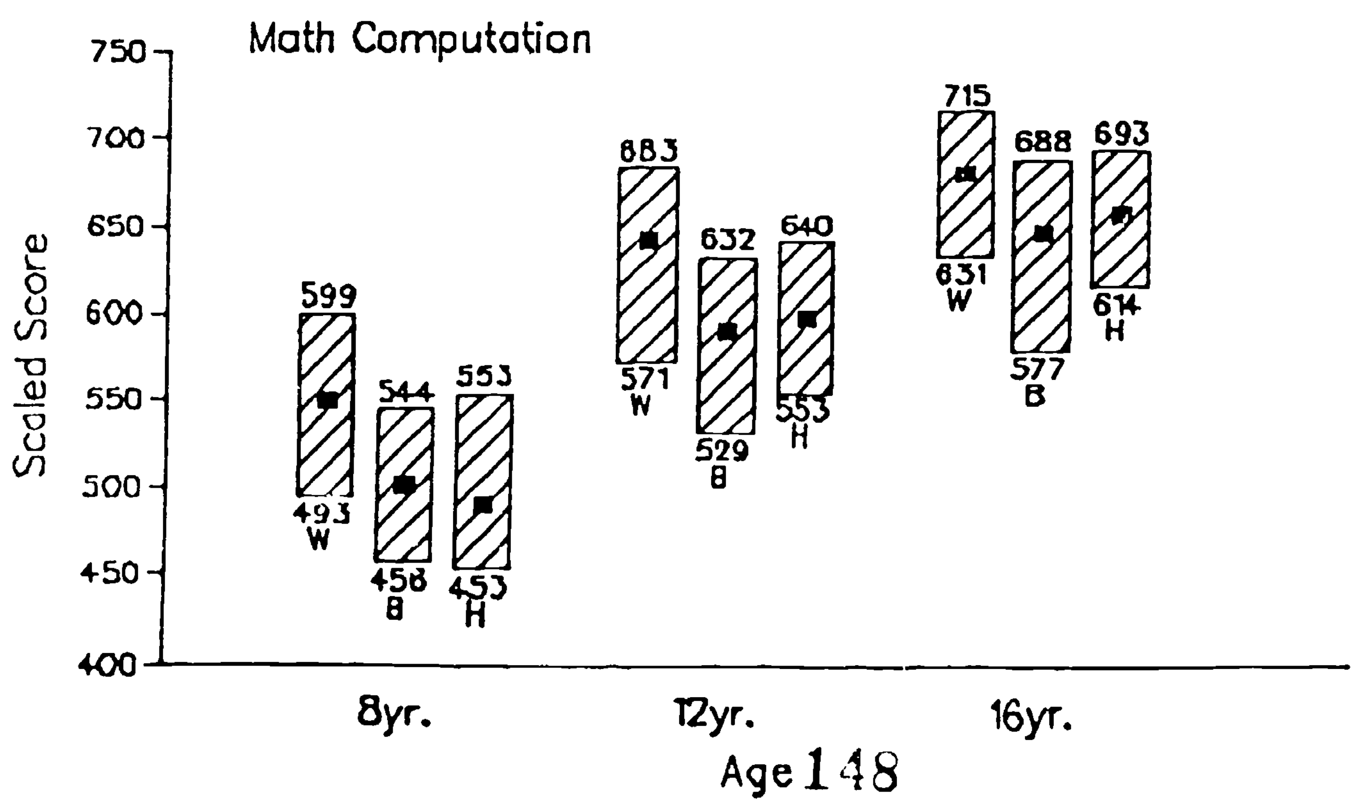
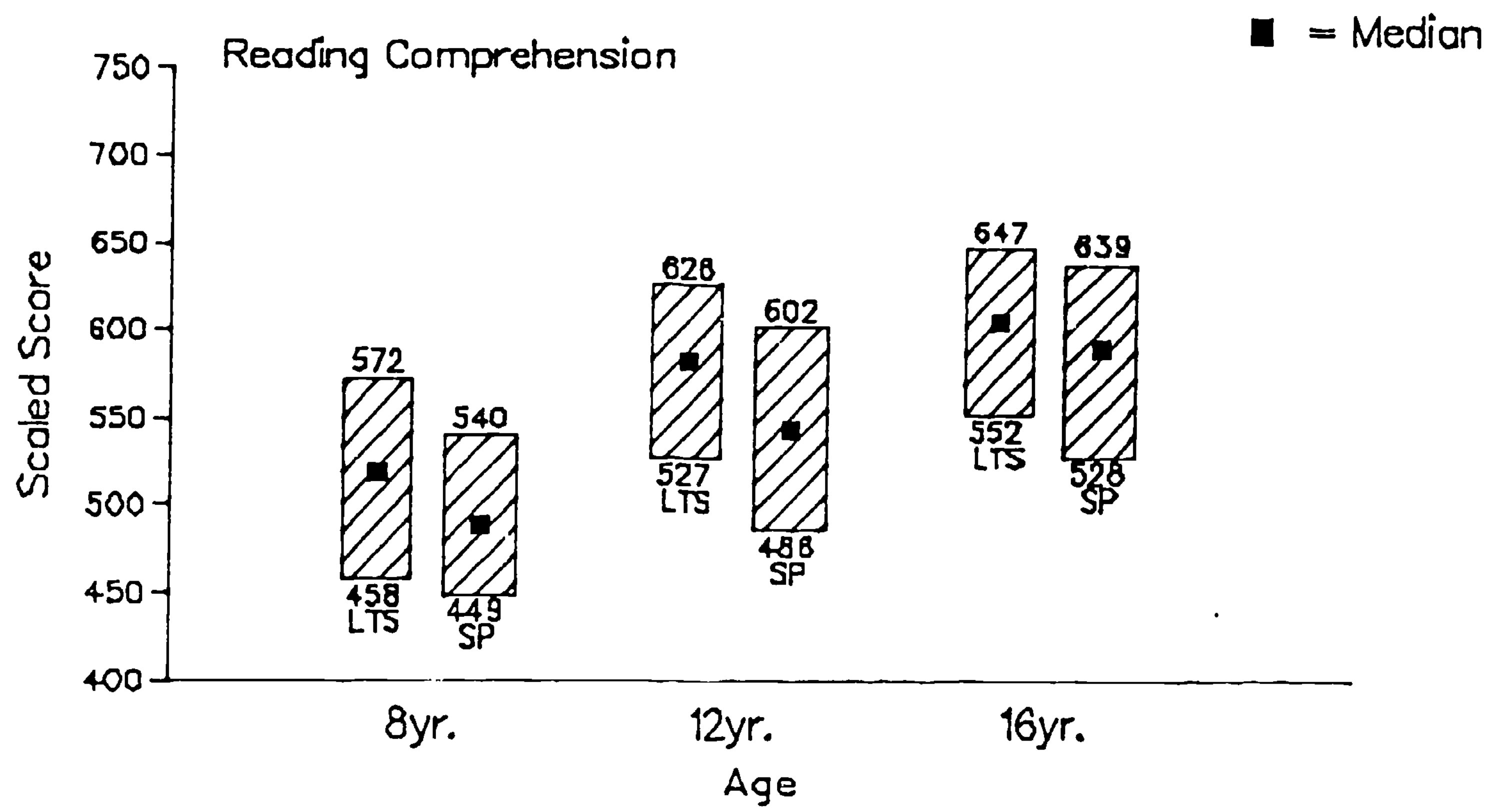


Figure 10

20th to 80th Percentile Ranges for Hearing Impaired 8, 12 and 16 Year Olds with Different Degrees of Hearing Loss

LTS= < SEVERE, SP=SEVERE-PROFOUND



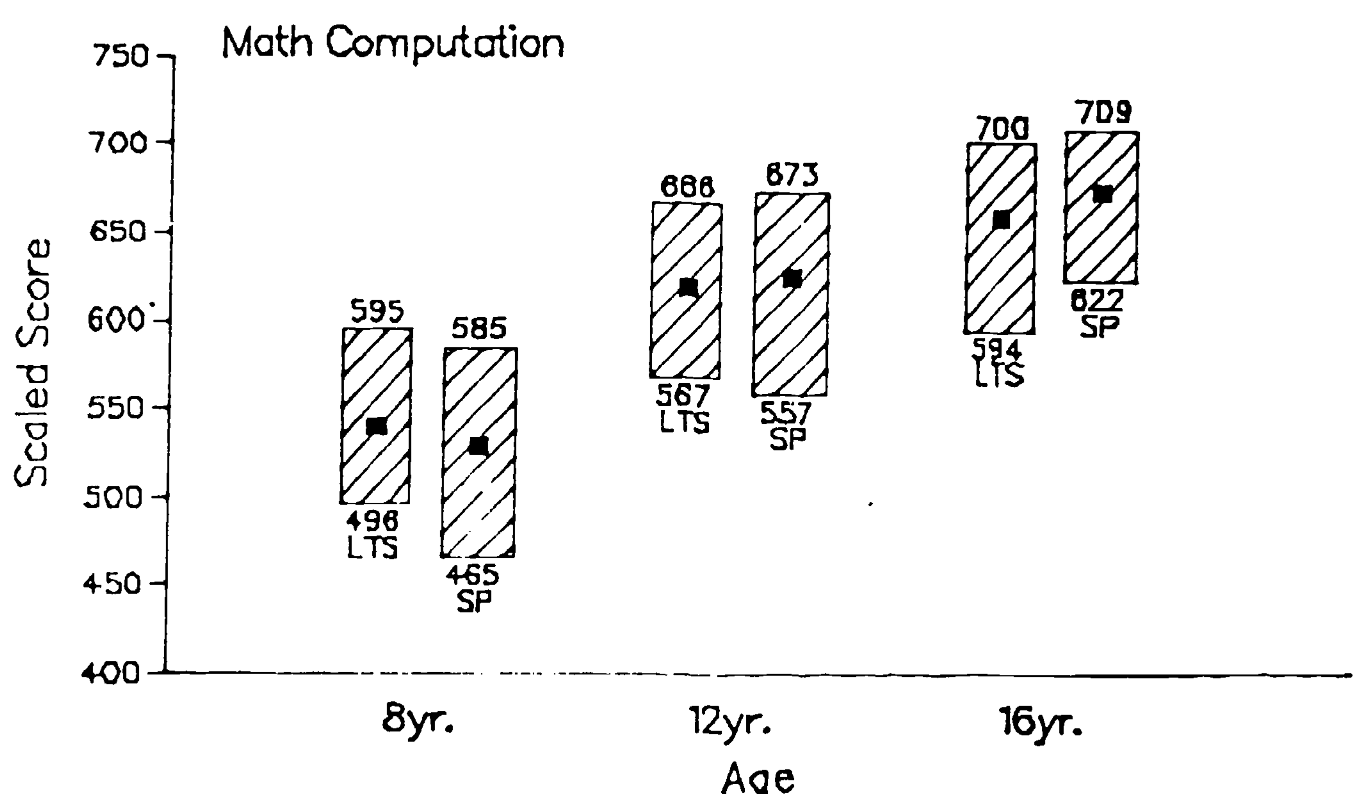
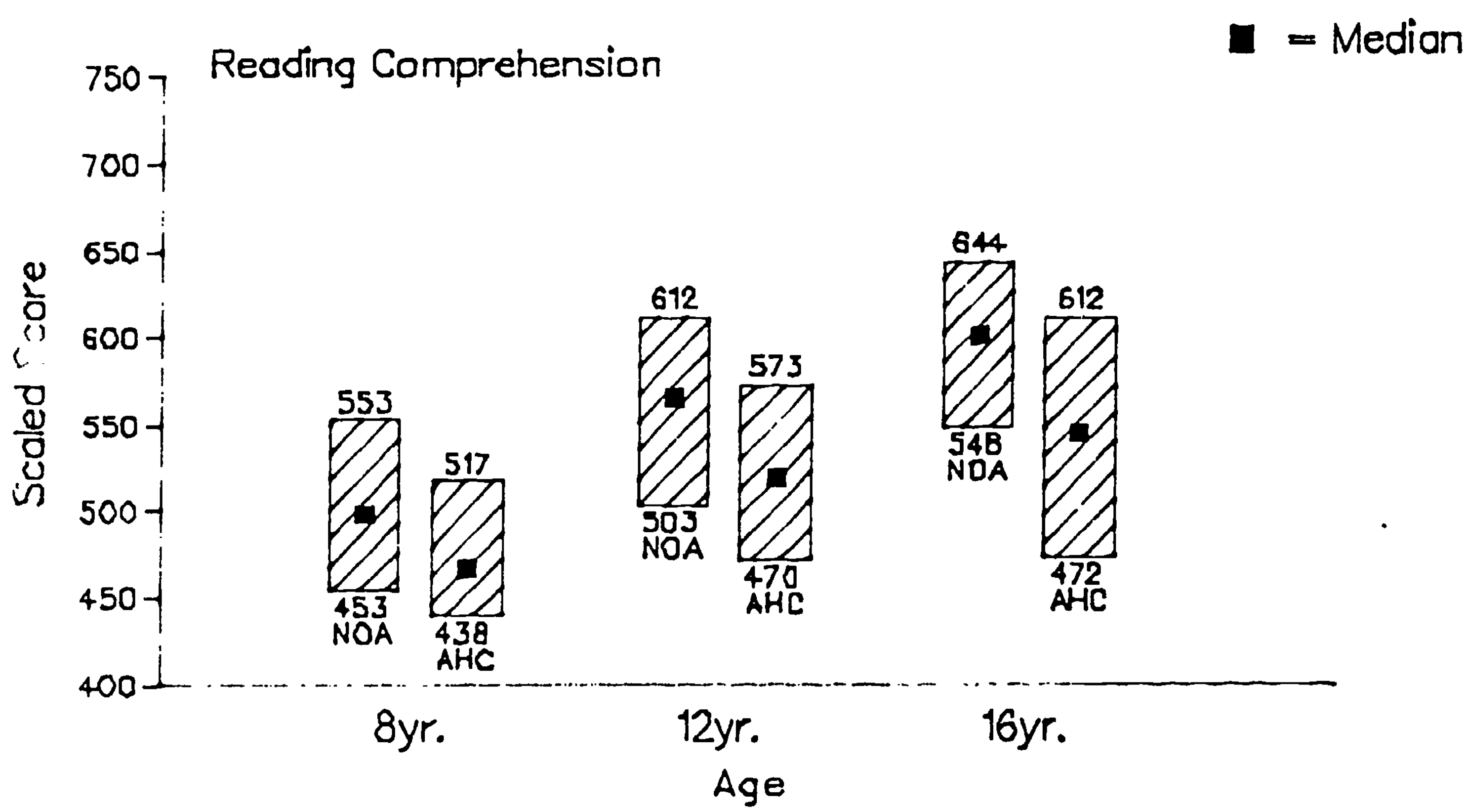
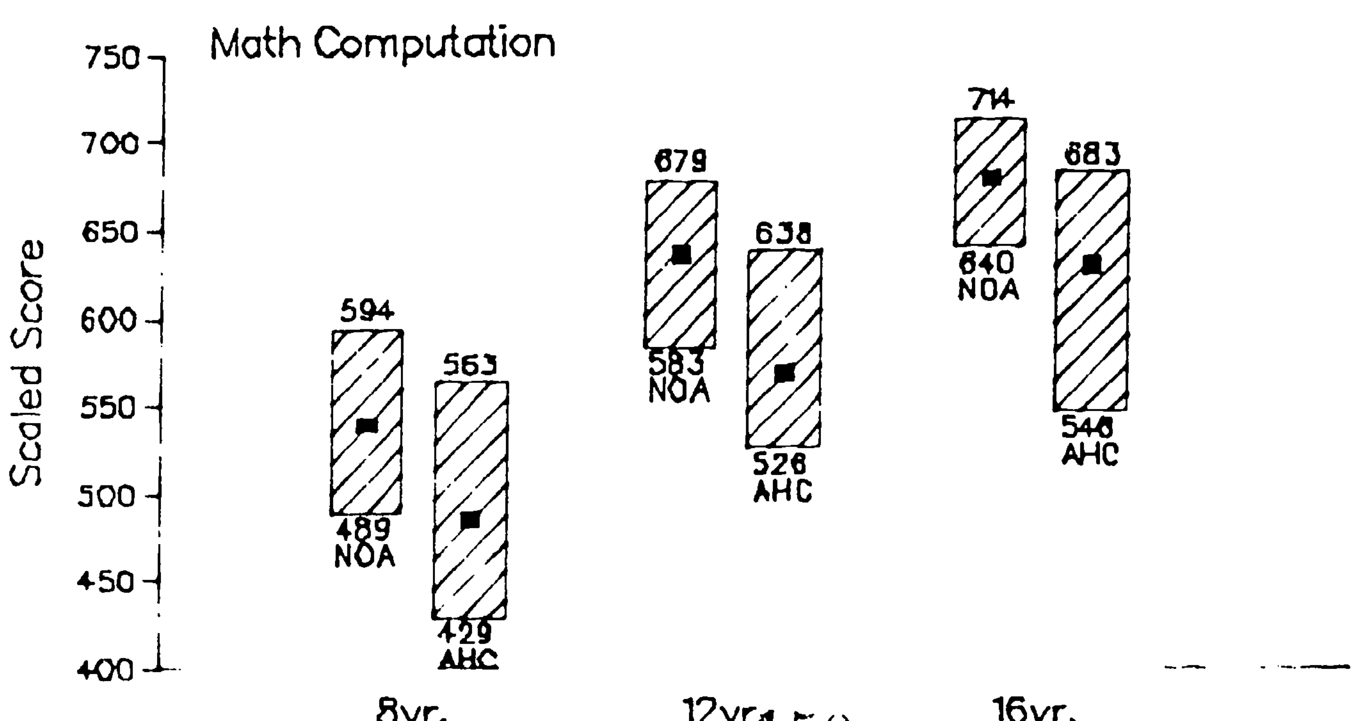


Figure 11

20th to 80th Percentile Ranges for Hearing Impaired 8, 12 and 16 Year Olds With and Without Add. Handicapping Conditions

NOA=NO ADD. HCPS, AHC=ADD. HCPS





Appendix A

ORDER FORM, 1982-83
STANFORD ACHIEVEMENT TEST FOR USE WITH HEARING-IMPAIRED STUDENTS

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ORDER FORM

1984-85

(Please complete reverse side of this form)

1982 STANFORD ACHIEVEMENT TEST, FOR USE WITH HEARING IMPAIRED STUDENTS, FORM E

STANDARD RECORD FORM

CENTER FOR ASSESSMENT AND DEMOGRAPHIC STUDIES
GALLAUDET COLLEGE
800 Florida Avenue, N.E.
Washington, D.C. 20002
Phone: (202) 651-5300 (Voice)
(202) 651-5302 (TDD)

QNTY	ITEM	COST Per COPY	TOTAL
	1982 STANFORD ACHIEVEMENT TEST, Form E		
	SCREENING TEST MATERIALS (includes one scoring sheet for each test)		
	Lower Level (achieving at 4th grade or below)		
	Reading	$ .35	
	Mathematics	.35	
	Upper Level (achieving at 5th grade or above)		
	Reading	.35	
	Mathematics	.35	
	PRACTICE TESTS and DIRECTIONS (at levels P 1, 2, and 3 only)		
	Primary 1	$ .05	
	Primary 2	.05	
	Primary 3	.05	
	Directions, Primary 1	.05	
	Directions, Primary 2	.05	
	Directions, Primary 3	.05	
	DIRECTIONS FOR ADMINISTERING COMPLETE BATTERY *(includes Special Instructions)*		
	Primary 1	$ 3.45	
	Primary 2	3.45	
	Primary 3	3.45	
	Intermediate 1	3.45	
	Intermediate 2	3 45	
	Advanced	3.45	
	DIRECTIONS FOR ADMINISTERING MATHEMATICS TEST *(includes Special Instructions)*		
	Primary 1	$ 2.30	
	Primary 2	2 30	
	Primary 3	2.30	
	Intermediate 1	2 30	
	Intermediate 2	2.30	
	Advanced	2 30	
	COMPLETE BATTERY TEST BOOKLETS (Form E)		
	Primary 1	$ 1 25	
	Primary 2	1 25	
	Primary 3	1 00	
	Intermediate 1 (*Reusable*)	1 00	
	Intermediate 2 (*Reusable*)	1 00	
	Advanced (*Reusable*)	1 00	
	MATHEMATICS TEST BOOKLETS (Form E)		
	Primary 1	$ 85	
	Primary 2	85	
	Primary 3	55	
	Intermediate 1 (*Reusable*)	55	
	Intermediate 2 (*Reusable*)	55	
	Advanced (*Reusable*)	55	

QNTY	ITEM	COST Per COPY	TOTAL
	ANSWER SHEETS or DOCUMENTS (Students mark in test booklets for P 1 & 2)		
	COMPLETE BATTERY		
	Primary 3	$ .25	
	Intermediate 1	.25	
	Intermediate 2	.25	
	Advanced	.25	
	MATHEMATICS TEST		
	Primary 3	$ .20	
	Intermediate 1	.20	
	Intermediate 2	.20	
	Advanced	.20	
	SAMPLE SET		
	Complete Sample Set	$28.00	
	HANDSCORING MATERIALS		
	Complete Set *(includes all materials for scoring all levels: (1) correct-answer keys; (2) transformation tables for converting raw scores into grade equivalents and into scaled scores; and (3) age-based, percentile norms for hearing impaired students)*	$ 2.50	
	Norms only (2 and 3 above)	$ 2.00	
	Correct answer keys for the individual test levels may also be ordered separately		
	ANSWER KEYS		
	Primary 1	$ .10	
	Primary 2	.10	
	Primary 3	.10	
	Intermed. 1	.10	
	Intermed. 2	.10	
	Advanced	.10	
	STANDARD RECORD FORM	$ .20	
		TOTAL	

Check here if this order confirms an order previously made by phone.

N.B.: Handling is 7% of above TOTAL. Postage extra. If amount is prepaid, handling and postage will be billed later

(Allow 2-3 weeks for delivery)

PLEASE COMPLETE REVERSE SIDE OF THIS FORM ⟶

NOTE: Check this box for "Special Order for Machine Scoring Services" if you plan to send your tests to Iowa City for machine-scoring:

☐ SEND MACHINE-SCORING FORM

Check the following box if you plan to use the Center for Assessment and Demographic Studies' special scoring analysis: ☐

Payment should accompany order under $5.00. Make check payable to:

CENTER FOR ASSESSMENT & DEMOGRAPHIC STUDIES
GALLAUDET COLLEGE

BOX 1: SEND MATERIALS TO:

(Name) ____________________

(Program) ____________________

(Address) ____________________

(City) (State) (Zip) ____________________

(Phone—in case of questions) ____________________

PLEASE COMPLETE if known: Does your program participate in the Annual Survey of Hearing Impaired Children and Youth?
Yes No

BOX 2: BILL TO: (If different from Box 1)

(Name or Department) ____________________

(Program) ____________________

(Address) ____________________

(City) (State) (Zip) ____________________

FOR QUESTIONS OR FURTHER INFORMATION, CONTACT:
Center for Assessment & Demographic Studies
Gallaudet College
800 Florida Avenue, N.E.
Washington, D.C. 20002
Phone: (202) 651-5300 (Voice)
(202) 651-530_ (TDD)

Appendix B

SAMPLE SCREENING TEST AND SCORING SHEET

This booklet is to be used only in conjunction with special administration procedures devised by the Center for Assessment and Demographic Studies, Gallaudet College, Washington, D.C. for hearing impaired students.

Form M1A

Stanford Achievement Test

Special Edition for Hearing Impaired Students

Eric F. Gardner • Herbert C. Rudman • Bjorn Karlsen • Jack C. Merwin

Lower Level Screening Test In

MATHEMATICS

Student's Name______________________________

Student's Birthdate ______________________________
Mo. Day Year

School Name______________________________

School Address ______________________________
City State

THE PSYCHOLOGICAL CORPORATION HARCOURT BRACE JOVANOVICH, PUBLISHERS

WHAT TO DO

1. Solve the following problems.

2. Look at the answers on the right side of the problem.
   Is your answer here?

3. If your answer is here, then mark the circle for your answer.
   OR
   If your answer is not here, then mark the circle for NH.

4. Continue until you see the word STOP.

EXAMPLE

$4 + 1 = \square$

a. ○ 1
b. ○ 2
c. ○ 4
d. ○ 5
e. ○ NH

1 $8 + 7 = \square$

a. ○ 13
b. ○ 15
c. ○ 17
d. ○ 19
e. ○ NH

2 $38 + 50$

a. ○ 43
b. ○ 78
c. ○ 89
d. ○ 98
e. ○ NH

3 $9 + 8 + 3$

a. ○ 17
b. ○ 18
c. ○ 19
d. ○ 20
e. ○ NH

4 $11 - 4$

a. ○ 5
b. ○ 6
c. ○ 8
d. ○ 9
e. ○ NH

5 $6 + \square = 11$

a. ○ 4
b. ○ 6
c. ○ 7
d. ○ 17
e. ○ NH

6 $471 + 308$

a. ○ 779
b. ○ 789
c. ○ 819
d. ○ 879
e. ○ NH

7
$$\begin{array}{r} 10 \\ -\ 7 \\ \hline \end{array}$$

a. ○ 3
b. ○ 4
c. ○ 5
d. ○ 6
e. ○ NH

8 12 - □ = 7

a. ○ 3
b. ○ 4
c. ○ 5
d. ○ 6
e. ○ NH

9
$$\begin{array}{r} 87 \\ -\ 70 \\ \hline \end{array}$$

a. ○ 10
b. ○ 16
c. ○ 17
d. ○ 80
e. ○ NH

10
$$\begin{array}{r} 33 \\ +\ \ 8 \\ \hline \end{array}$$

a. ○ 31
b. ○ 32
c. ○ 41
d. ○ 42
e. ○ NH

11 98 + 9 = □

a. ○ 105
b. ○ 107
c. ○ 26
d. ○ 917
e. ○ NH

12
$$\begin{array}{r} 4978 \\ -\ \ 305 \\ \hline \end{array}$$

a. ○ 4773
b. ○ 4673
c. ○ 4572
d. ○ 3673
e. ○ NH

13 8 x 5 = □

a. ○ 45
b. ○ 42
c. ○ 40
d. ○ 20
e. ○ NH

14 4 x 4 = □

a. ○ 20
b. ○ 16
c. ○ 12
d. ○ 8
e. ○ NH

15
$$\begin{array}{r} 376 \\ -\ \ 42 \\ \hline \end{array}$$

a. ○ 323
b. ○ 324
c. ○ 234
d. ○ 224
e. ○ NH

16
$$\begin{array}{r} 6 \\ \times\ 4 \\ \hline \end{array}$$

a. ○ 10
b. ○ 18
c. ○ 28
d. ○ 30
e. ○ NH

17
$$\begin{array}{r} 164 \\ -\ 131 \\ \hline \end{array}$$

a. ○ 33
b. ○ 93
c. ○ 133
d. ○ 233
e. ○ NH

18 18 ÷ 2 = □

a. ○ 6
b. ○ 7
c. ○ 8
d. ○ 9
e. ○ NH

19
$$\begin{array}{r} 268 \\ 303 \\ +\ 89 \\ \hline \end{array}$$

a. ○ 550
b. ○ 559
c. ○ 659
d. ○ 660
e. ○ NH

20
$9\overline{)36}$

a. ○ 3
b. ○ 4
c. ○ 5
d. ○ 6
e. ○ NH

21
$$\begin{array}{r} 95 \\ -\ 16 \\ \hline \end{array}$$

a. ○ 89
b. ○ 81
c. ○ 79
d. ○ 78
e. ○ NH

22
$$\begin{array}{r} 611 \\ -\ 208 \\ \hline \end{array}$$

a. ○ 393
b. ○ 403
c. ○ 413
d. ○ 417
e. ○ NH

23
$$\begin{array}{r} \frac{1}{3} \\ +\ \frac{1}{3} \\ \hline \end{array}$$

a. ○ $\frac{1}{6}$
b. ○ $\frac{1}{9}$
c. ○ $\frac{2}{6}$
d. ○ $\frac{2}{3}$
e. ○ NH

24
$$\begin{array}{r} 1049 \\ -\ 673 \\ \hline \end{array}$$

a. ○ 476
b. ○ 436
c. ○ 376
d. ○ 336
e. ○ NH

25
$4\overline{)344}$

a. ○ 96
b. ○ 86
c. ○ 81
d. ○ 79
e. ○ NH

26
$64.6 + 7.5 = \square$

a. ○ 139.6
b. ○ 72.1
c. ○ 71.65
d. ○ 61.1
e. ○ NH

STOP

SCORING SHEET
LOWER LEVEL SCREENING TEST IN MATHEMATICS (M1A)
SEVENTH EDITION STANFORD ACHIEVEMENT TEST
FOR USE WITH HEARING-IMPAIRED STUDENTS ACHIEVING AT ABOUT 4TH GRADE OR BELOW IN MATHEMATICS

Use for screening students into Stanford Concepts of Number and Mathematics Computation Subtests.

STUDENT NAME: ______________________

SCHOOL NAME: ______________________

DATE: ______________________

STEP 1: Scoring the items

1. Enter the letters corresponding to the student's answers in the "Student Answer" boxes. (Be sure to use the **BOOKLET NUMBERS** to identify the items.)

2. Use the "Answer Key" to score the items. Put an "X" through the incorrect answer boxes. Put an "X" through all blank boxes.

Booklet Number	Itm # 1	Itm # 2	Itm # 3	Itm # 4	Itm # 5	Itm # 6	Itm # 7	Itm # 8	Itm # 9	Itm # 10	Itm # 11	Itm # 12	Itm # 15	Itm # 14	Itm # 16	Itm # 17	Itm # 18	Itm # 13	Itm # 19	Itm # 20	Itm # 21	Itm # 22	Itm # 23	Itm # 24	Itm # 25	Itm # 26
Student Answer																										
Answer Key	B	E	D	E	E	A	A	C	C	C	B	B	E	B	E	A	D	C	D	B	C	B	D	C	B	B
Difficulty Order	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26

STEP 2: Studying the response pattern

Total # of Right Items (the Raw Score = R.S.) a. ______

Total # of Wrong and Blank Items b. ______

(If the Raw Score is 0, 1, 2, 3, 4, or if the Raw Score is 17 or above, enter "0" on line f and proceed with Step 3 on back.)

Compute the Raw Score Interval

- *Subtract 4 from the Raw Score (R.S. − 4 =)* c. ______
- *Draw a vertical line through the item box that has a Difficulty Order value equal to the number on line c. This is the **Lower Limit** line.*
- *Add 4 to the Raw Score (R.S. + 4 =)* d. ______
- *Draw a vertical line through the item box that has a Difficulty Order value equal to the number on line d. This is the **Upper Limit** line.*

Total # of items unexpectedly answered correctly by the student. *(Count the number of items not marked "X" that fall to the right of the Upper Limit line.)* e. ______

Caution Index *(Divide the number on line e by the Raw Score entered on line a)* $e \div a =$ f. ______

Proceed to Step 3 on back ➧

STEP 3: Determining if the Raw Score falls in a Border Region

If the Student's Raw Score is

3, 4, 5, 13, 14, 15, 16, 17, 20, 21, or 22

then the student has scored in a Border Region between two adjacent SAT test levels.

Proceed to Step 4

STEP 4: Assigning test level

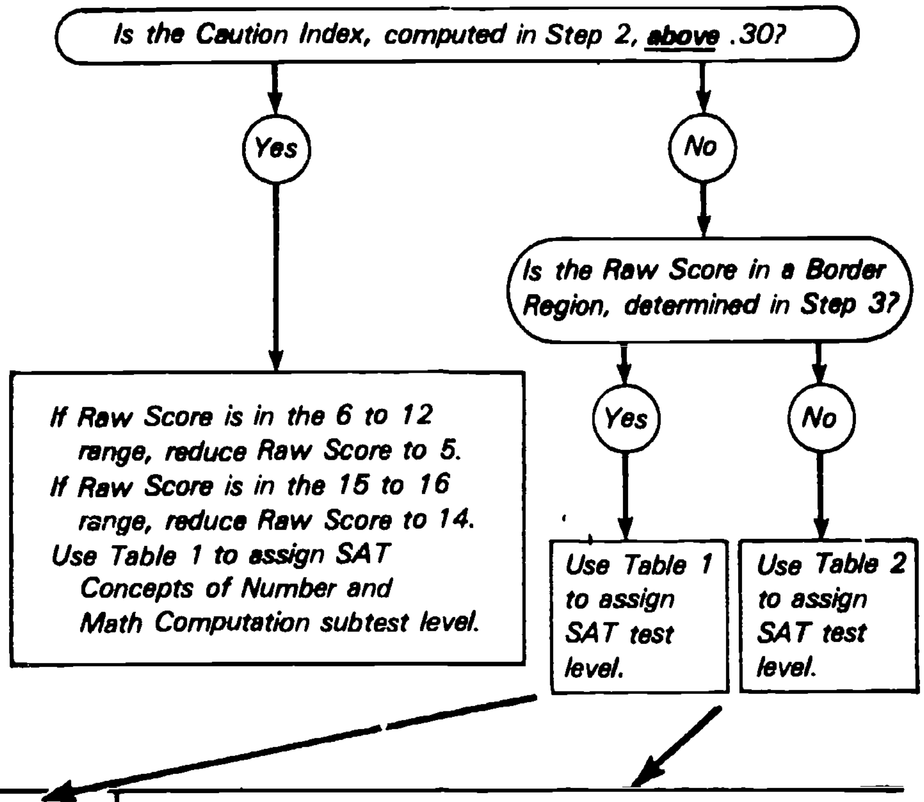

Table 1: Best Discriminating Items for Form M1A

If a student answered correctly 3 or 4 of the Best Discriminating Items for a given Border Region, assign to the **higher** level for Concepts of Number and Math Computation. If a student answered correctly 0, 1, or 2 of the Best Discriminating Items for a given Border Region, assign to the **lower** level.

For Raw Scores of—	The Border Region is between the assignment of—	And the assignment of—	Check these Best Discriminating Items—
3-5	No assignment	Primary 1	1, 2, 3, 4
13-14	Primary 1	Primary 2	11, 12, 14, 15
15-17	Primary 2	Primary 3	13, 14, 17, 20
20-22	Primary 3	Intermediate 1	21, 24, 25, 26

Table 2: Test Level Assignments for Form M1A

Raw Score	Decision
1-2	Not enough information to make a decision. It is likely that the SAT is not an appropriate test for this student in Concepts of Number and Math Computation.
6-12	Assign to Primary 1 SAT Booklet for Concepts of Number and Math Computation.
18-19	Assign to Primary 3 SAT Booklet for Concepts of Number and Math Computation.
23-24	Assign to Intermediate 1 SAT Booklet for Concepts of Number and Math Computation.
25 and up	Administer M2A Screening Test. Test score is too high to obtain an accurate placement in the appropriate SAT Booklet for Concepts of Number and Math Computation.

Student's Name: ______________________

Test level Assignment: ______________________

Appendix C

SPECIAL INSTRUCTIONS BOOKLET
FOR USE WITH HEARING-IMPAIRED STUDENTS
TAKING THE 7TH EDITION
STANFORD ACHIEVEMENT TEST

ADMINISTERING THE
1982 STANFORD ACHIEVEMENT TEST (SEVENTH EDITION)
TO HEARING-IMPAIRED STUDENTS

Center for Assessment and Demographic Studies
Gallaudet Research Institute
800 Florida Avenue, N.E.
Washington, D.C. 20002
(202) 651-5300

1983

****

FOR FURTHER INFORMATION OR QUESTIONS

PLEASE CONTACT:

Center for Assessment and Demographic Studies
Gallaudet Research Institute
800 Florida Avenue, N.E.
Washington, D.C. 20002
(202) 651-5300

****

TABLE OF CONTENTS

****
* For staff administering the Stanford to hearing-impaired students: *

* Please review these instructions carefully before reading the regular "Directions for Administering" booklets and then again after doing so. *
****

ADMINISTERING THE 1982 STANFORD ACHIEVEMENT TEST (SEVENTH EDITION) TO HEARING-IMPAIRED STUDENTS

The Stanford Achievement Test, Seventh Edition, was published by the Psychological Corporation in 1982. Special procedures for using the Stanford with hearing-impaired students were developed in 1983 in conjunction with the norming of the Stanford with a national sample of hearing-impaired students. Throughout this booklet, the terms "1982 Stanford" and "Stanford (Seventh Edition)" have been used interchangeably. They both refer to the most recent edition of the Stanford. The 1982 Stanford with these special procedures will replace the Special Edition for Hearing-Impaired Students of the 1973 Stanford Achievement Test (Sixth Edition) which has been distributed by the Center for Assessment and Demographic Studies (CADS) at Gallaudet College. CADS now makes available to educators of hearing-impaired students all Stanford testing materials as well as all special supplemental materials designed to facilitate its use with hearing-impaired students.

The actual Stanford Achievement Test materials that you will administer, including test booklets, answer sheets, and teacher manuals, have been ordered directly from The Psychological Corporation, the test publisher. No test, answer sheet, or teacher instruction manual has been altered in any way. This fact does not imply that hearing-impaired students should take the Stanford Achievement Test, using identical procedures that are used with hearing students. Many procedures are different. For example, it is strongly recommended that hearing-impaired students take two short screening tests in reading and math to determine the manner in which the various subtests contained in the six different difficulty levels of the battery should be assigned. Hearing students do not take screening tests; they are assigned on the basis of their grade in school.

This informational booklet reviews the special procedures which are necessary to ensure that hearing-impaired students are as fairly tested as possible. It is not meant to replace the regular teacher directions. Its intention is to alert you to the special problems of using the Stanford with hearing-impaired students and to offer suggestions for administering the test which will help you resolve these problems.

It is your responsibility, as an administrator of the Stanford to hearing-impaired students, to study carefully both the regular teacher directions for administering the Stanford and the procedures suggested in this booklet. In developing these procedures, we have tried to make the Stanford a more individualized test.

Much of the responsibility for that individualization must be assumed by the person administering the tests. Therefore we strongly recommend that you allow extra time to study all materials carefully before you begin administering the tests to your students.

The single most important problem when administering the Stanford to hearing-impaired students is that of adequately communicating the test items and instructions. The solution to this problem lies in your studying the test and preparing an approach to communication which is appropriate to the content area being tested and compatible with the modes of communication ordinarily utilized with the students in their instructional situation.

1.0 THE 1983 STANFORD NORMING PROJECT

The 1982 Stanford Achievement Test was normed in the spring of 1983 on approximately 8200 hearing-impaired students from 41 states and over 600 schools, a project which was largely financed by a grant from the U.S. Department of Education, Special Education Programs. The programs which participated in the norming project were picked randomly from among the programs which participate in the Annual Survey of Hearing-Impaired Children and Youth, conducted by the Gallaudet Research Institute's Center for Assessment and Demographic Studies. The sample of students selected represents the population of hearing-impaired students receiving special education services throughout the United States. The norms that were developed in this project will allow you to compare the academic performance of your students in subject areas to both hearing and hearing-impaired students across the United States.

2.0 THE STANFORD ACHIEVEMENT TEST

The Seventh Edition of the Stanford Achievement Test measures a student's level of academic achievement in a wide range of content areas. It is published in six difficulty levels. Each level has been written to cover curriculum material that is specifically related to different grade levels in educational programs throughout the United States. As indicated by the publishers, the test level-grade level correspondence is as follows:

Primary 1:	1.5 to 2.9
Primary 2:	2.5 to 3.9
Primary 3:	3.5 to 4.9
Intermediate 1:	4.5 to 5.9
Intermediate 2:	5.5 to 7.9
Advanced:	7.0 to 9.9

Each battery level is also published in two forms (E and F). At this time, the special procedures for use with hearing-impaired students have been developed only for Form E.

The Stanford is a norm-referenced test. That means that the scores that will be derived from your students' responses to the test will emphasize a comparison of their individual performance with the performance of a representative norming population. The Psychological Corporation has standardized this test with a large national sample of hearing students. It is possible for you to administer the Stanford to your hearing-impaired students and to compare their performance with the hearing students who took the same level of the test. Our norming study extends the work of The Psychological Corporation by allowing comparisons with hearing-impaired students as well. The score information that is available for hearing-impaired students is described at the end of this booklet in a section called "Special Score Reports."

3.0 PRETEST CONSIDERATIONS

Not all of the Stanford subtests should be given to every hearing-impaired student. Indeed, ten years experience with the Sixth Edition of the Stanford has shown us that some subtests are not appropriate for many hearing-impaired students. The subtests in the Stanford fall into three categories of appropriateness.

Category 1

Those which are appropriate for most hearing-impaired students and are recommended:

-Word Reading	Primary 1, Primary 2
-Reading Comprehension	All levels
-Concepts of Number	All levels
-Math Computation	All levels
-Math Applications	Primary 1 only!
-Spelling	All levels
-Language	Primary 3 through Advanced

Category 2

Those which are appropriate for only some students because they are closely tied to curricula:

-Environment	Primary 1, Primary 2
-Math Applications	Primary 2 through Advanced
-Science	Primary 3 through Advanced
-Social Science	Primary 3 through Advanced

Category 3

Those which are appropriate for only a few students due to their reliance on auditory experience and also to their likely statistical unreliability when used with many hearing-impaired students:

-Listening Comp.	All levels
-Word Study Skills	Primary 1 through Intermed. 2
-Vocabulary	All levels

For Categories 2 and 3, consider the curriculum of your individual program and study the items on the test before you decide whether or not to administer these subtests.

4.0 TEST LEVEL ASSIGNMENT

As indicated earlier, assignment of the proper level of the 1982 Stanford for each student should generally be made on the basis of two brief screening tests: one in reading, the second in mathematics. (This is a different, and more individualized, procedure than the single screening test in reading employed with the 1974 Stanford Achievement Test for hearing-impaired students.) For students achieving at the fourth grade or below in reading/math, the lower level screening tests are assigned (Form R1A for reading and Form M1A for math); for students achieving at the fifth grade or above in reading/math, the upper level screening tests are given (Form R2A for reading and Form M2A for math).

On the basis of the scores on these two screening tests, the student is assigned the proper level of the Stanford (1) for reading and reading-related subtests, including (in most cases) Mathematics Applications, and (2) for Mathematics Computation and Concepts of Number. Carefully examining the raw scores on the screening test and the patterns of individual test item responses, the test administrator will be able to determine the proper battery test levels for individual students. All the information for scoring the screening tests are printed on the scoring sheets. Also, a special instruction sheet with scoring examples has been prepared and will be sent with all screening test orders from CADS. The test administrator should carefully read these sheets before giving and scoring the screening tests.

CADS offers a computerized screening test scoring service. This service will score screening tests and assign students to test levels. Lists which group students by test level will be generated by the computer, which will also automate the preparation of an order form by summarizing the materials needed for a particular group. Call CADS with inquiries about the screening test scoring service.

After administering and scoring the two screening tests, the test administrator will have two test level assignments for each student. (1) The reading level assignment tells which Complete Battery Test Booklet to assign to the student. From the Complete Battery Test Booklet, administer all subtests that you choose to administer except for Concepts of Number and Math Computation. (2) The math level assignment tells you which Math Separate Test Booklet to assign to the student. Administer the Concepts of Number and Math Computation subtests from the assigned Math Separate Test Booklet. For students whose math and reading level assignments are the same, all subtests should be administered from the same Complete Battery Test Booklet.

If you feel strongly that a student has been misassigned through the initial screening test procedure, please consider giving that student a second screening test.

5.0 MATH APPLICATIONS: A SPECIAL CASE

We have said that the Math Separate Test Booklets should be used for the Concepts of Number and Math Computation subtests. You will note that the Math Separate booklets contain the Math Applications subtests as well. Our experience with the Sixth Edition of the Stanford has shown us that Math Applications performance is dependent on both computational skill and reading/language ability. Therefore, as a general rule, the level of Math Applications subtest which should be assigned should be the same as for the other reading-related subtests, and the student should take the Math Applications subtest from the Complete Battery Test Booklet.

There are some exceptions to the general rule. When a student's reading level assignment is Primary 1 and the math assignment is higher (Primary 2 through Advanced), there is a problem in assigning the appropriate Math Applications subtest. At the Primary 1 level, Math Computation and Math Applications are combined into one subtest, and normative data are not available on the applications section alone. At the same time, we are hesitant to recommend, for these students, assigning Math Applications at the level of their other math assignments. This is because these students have a limited reading ability compared with their math ability. The problem is compounded by the fact that Math Applications, at the Primary 1 and Primary 2 levels, is a "dictated" subtest. Thus, many communication, memory, and language factors contribute to a student's performance.

The other exception occurs when a student's reading level is higher than the math level. Our studies have shown that it is not common for hearing-impaired students to have a higher reading achievement level than math achievement level. When that happens, however, the student should be administered the Math Applications at the same level as the other Math subtests.

Our recommendations are as follows:

--When both reading and math assignments are at Primary 1, administer the Primary 1 Combined Math Computation/Applications subtest from the Complete Battery Test Booklet.

--When the student's math assignment is Primary 1, but his/her reading assignment is higher, administer the combined Math Computation/ Applications subtest from the Primary 1 Math Separate test booklet.

--When the student's reading assignment is Primary 1, but his/her math assignment is higher, no Applications assignment is recommended.

--When both the reading and math assignments are Primary 2 or above, the general rule applies: administer the Math Applications subtest at the same level as other reading-related subtests. If, however, a student has a higher reading level than math level, consider administering the Math Applications from the Math Separate test booklets with the other Math subtests.

6.0 ANSWER DOCUMENTS

The term "answer document" refers to the document on which the student marks answers. At the Primary 1 and Primary 2 levels, the answer documents are the machine-scorable test booklets. (This will be true whether you plan to send your tests to Iowa City for machine-scoring or to score them at the school). At the other levels, they are the separate answer sheets.

Students should mark their answers directly in the test booklets at the Primary 1 and Primary 2 levels. This holds true for both the Complete Test Battery Booklets and the Math Separate test booklets. Students who are assigned to different reading and math levels may need to use the machine-scorable booklets for some subtests and separate answer sheets for other subtests. For example, a student who was assigned to Primary 2 in reading and Primary 3 in math will need to mark answers to the reading-related subtests directly in the Primary 2 Complete Battery Test Booklet. The student will then have to use a separate answer sheet in conjunction with the Primary 3 Math Separate when taking the Concepts of Number and Math Computation subtests. Test administrators should make special note of this in ordering their test materials.

The answer sheets that correspond to the Math Separate booklets at the Primary 3, Intermediate 1, Intermediate 2, and Advanced levels contain answer grid areas for some reading-related subtests as well. When administering these subtests to students who are using math separate booklets at these levels, make sure that students understand which sections of the answer sheets should be used. Be familiar with the answer sheets so that you can demonstrate to the students where to mark their answers.

If you plan to have your tests machine-scored in Iowa City, student identifying information must be correctly entered on all answer documents (machine-scorable booklets and answer sheets). It is essential that the birthdate be entered accurately for all students. If students have separate answer documents for reading and math, the name entry must be identical, character for character, and the birthdate must be entered on both documents. For younger students not familiar with test taking, we recommend that the test administrator complete these identification grids for the students.

7.0 LOGISTICS

Because of the individualized nature of these testing procedures, arranging the testing schedule may be tricky. Within a given classroom students may be assigned to different levels of the test. Furthermore, some of the students (who screened into different reading and math levels) will need to take the Concepts of Number and Math Computation subtests from the Math Separate Test Booklets and the reading-related subtests from the Complete Battery Test Booklets at a different level.

We recommend the following approach to scheduling the tests:

--Complete all reading-related subtests first (including Math Applications at the Primary 2 through Advanced levels, if you opt to administer this subtest). All these tests are administered from the Complete Battery Test Booklets for all students.

--When all reading-related subtests have been administered, regroup the students based on their math level assignments.

--A given math testing session of, for example, the Primary 2 Concepts of Number and Computation subtests may contain two types of students- those who were also assigned to Primary 2 for the reading-related subtests and those who were assigned to a different level for the reading-related subtests. To economize on materials it is necessary for the former group to use their full battery test booklets and answer documents. Thus, these materials must be redistributed to these students at the time of the math testing. The students whose math and reading levels differ must be given math separate booklets and answer documents.

--It is possible for all students taking the same level of the math subtests to be tested as a group, even though some will be using their full battery answer documents and some will be using math separate answer documents.

The schedule and organization of the testing periods should be planned carefully before the actual testing begins.

8.0 TESTING CLIMATE

It is very important that students be as alert and relaxed as possible when taking the test. Regardless of the method of communication used, it is important to be aware of the visual fatigue factor for hearing-impaired students whose communication is visually oriented. Rest periods should be used liberally between tests, and overloading of testing should be avoided. Other factors assume special importance: a room free of visual distractions; a student group small enough and well enough arranged so that all individuals can easily see the test administrator; clothing and background colors which contrast appropriately with the test administrator's skin color so that speech movements or manual signs are easily visible; and, equally important, test administrators familiar with the test materials so that they can concentrate on communicating with the students rather than on trying to decipher test items for the first time.

9.0 ADMINISTRATION

The use of time limits on the various subtests is described in the "Directions for Administering" booklets at each test level under the heading "Proposed Schedule for Administering." Because different programs will choose to administer different optional subtests and because of the different groupings of students resulting from the screening procedure, it is not possible to specify "FIRST SITTING," "SECOND SITTING," etc. However, you should develop for your own situation a blueprint for the testing schedule. The time limits listed in the "Directions for Administering" booklets are approximate for the teacher-dictated subtests. Assume that you will need more than the amount of time listed to administer these subtests. Time should not be a factor in the student's performance on the dictated tests.

Students taking the Primary 1 and Primary 2 levels of the test may not be familiar with taking standardized tests. Students who have little or no experience taking standardized tests should take the Primary 1 Practice Tests which is the same test used with the 1974 Stanford. Practice tests, when used, should be given a day or two before the regular tests are administered.

The sample items included in the test booklets are extremely important. Their intent is to ensure that students understand and become familiar with the format of the items on the test and the manner in which they are to mark their answers. You can eliminate many student misunderstandings by carefully monitoring the practice tests and sample items. Clarifying the test instructions before the testing begins is encouraged. Adding your own practice items is permissible if done fairly. Avoid any temptation of "teaching to the test" if you choose to write new practice items.

10.0 COMMUNICATION MODE

Many hearing-impaired students do poorly on achievement tests because they do not understand the tasks that they are required to perform, not because they lack the skills necessary to make correct test item responses. Communicating the intent of the tasks required for the tests is thus of paramount importance. We face a dilemma when we administer this test to hearing-impaired students. The variety of communication contexts that are used in programs for hearing-impaired students around the country forces us to be flexible in our prescriptions for administering the test instructions. At the same time, we realize that, to some extent, flexibility may compromise standardization. The use of norms presupposes that the testing situation is similar for the populations in which the test was standardized and in which the test will be used. Ironically, flexibility can both ensure standardization, if it ensures that the test is adequately understood, and can undermine standardization if it unfairly assists students to detect correct answers.

The method of communication to be used in the administration of the test is the method normally employed, in the instructional context, with the students being tested (e.g., speech only, a combination of speech and signs, etc.). Throughout the "Directions for Administering" at each test level such directions as "say," "dictate," "listen carefully," "read," etc. are meant to be interpreted within the context of this "usual method" of communication employed with the students being tested.

While flexibility is allowed in communicating the test instructions to the students, do not alter the individual test items in any way. For the non-dictated test, this means you should not give individual assistance to students after the testing has begun. For dictated tests, you should try to stay as close as possible to the format of the item as it is presented in the teacher directions.

11.0 DICTATED SUBTESTS

Dictated subtests are those in which each of the item strings is dictated to the student and is not printed in the test booklet. By test level, the dictated subtests are as follows:

Primary 1

Word Study Skills
Concepts of Number
Math Computation/Application
(Application portion only is dictated; computation items are printed in booklet)
Spelling
Environment
Vocabulary
Listening Comprehension

Primary 2

Word Study Skills
Concepts of Number
Math Applications
Environment
Vocabulary
Listening Comprehension

Primary 3

Concepts of Number
Vocabulary
Listening Comprehension

Intermediate 1,
Intermediate 2, and
Advanced

Vocabulary
Listening Comprehension

For these subtests, it is essential that the test administrator be thoroughly knowledgeable about the format of the test and the vocabulary of the items that are to be dictated.

The following comments will alert you to some of the important issues related to administering the dictated subtests. Some of these comments pertain only to situations in which signs are used as the mode of communication.

1) In the dictated spelling test at the Primary 1 level, do not fingerspell the target word.

2) The Math Applications items are written to measure a student's ability to deduce what mathematical operation will solve a given word problem. When the items are not well communicated, students will often not be able to make a correct deduction. Make sure that students completely understand the sample items before beginning the test. It is permissible to prepare overheads with the text of the dictated portions of the item. This will help to ensure that the items are understood.

3) Certain words and phrases, used mainly in the Math Applications subtests, cause special problems for many hearing-impaired students. These include:

- "left" or "left over"
  (e.g., "How many are left?")
- "many more"

(e.g.,"How many more?")
-"more than","greater than", "fewer than","least","most", "greater","greatest", etc.

When previewing the test, you should consider carefully how these concepts will be best communicated to students. Also, in deciding whether or not to administer the Math Applications subtest, you should give thought to whether a student's educational experiences have included the decoding of word problems which use words and phrases such as these.

4) Tense of verbs is a potential source of confusion in dictated items. Understanding a time sequence may be important to solving a problem. For example, in the item :

Jane's cat had 5 kittens. Jane gave 3 kittens away. How many kittens does Jane have now?

the understanding of tense is crucial to the understanding of the problem.

5) Some test items contain words in the item stems which, if signed, would reveal the correct answer to the student. This is especially true in the Concepts of Number subtests. Words such as "circle", "triangle", and "square" should be fingerspelled.

6) Technical terms, such as words which refer to the metric system, e.g., "millimeter," "gram," "liter," etc., should also be fingerspelled. It is permissible to use classroom or regional signs for these terms if such signs have been developed and are commonly used in your program. It is also permitted to use abbreviations known to the students for these words.

7) Idioms, figures of speech, and metaphorical expressions appear occasionally throughout the dictated items. These expressions are commonly understood by hearing children at very young ages, but they may not be familiar to hearing-impaired students. Present these items in a way that ensures that the students understand the idiomatic content of the expressions.

8) In the Math Applications subtests, there are long sentences with subordinate clauses and phrases. Consider carefully how these relationships might best be communicated to the students.

12.0 MACHINE-SCORING

If you plan to send your tests to Iowa City for machine-scoring you must first obtain a "Special Order for Scoring Services" from CADS at Gallaudet. Then:

--For a group of students, put all answer documents (machine scorable booklets or answer sheets) of a given level and type together. For example, put all Primary 1 Complete Battery Test Booklets together. Likewise, put all Advanced Math Separate answer sheets together. And so on.

--Prepare a "Scoring Service Identification Sheet" (Form 4-1-2000) for each group tested. If students from a given class or group have taken different levels of the test, it is permissible to group all the different answer documents together under one Identification Sheet before they are sent to Iowa. The Identification Sheet must be marked "Ungraded." The "number of documents" refers to the actual number of answer documents included for each group and not the number of examinees. Remember that students who have used separate Math and Reading Booklets will have two answer documents.

--Check all answer sheets and erase all stray marks.

--Make sure that the student identification grids are filled out correctly. If a student has used two answer documents, e.g., the Complete Battery Booklet for Reading and a Math Separate Test Booklet, be sure the name and birthdate grids are completed identically on both test booklets.

--DO NOT SCORE THE BOOKLETS OR ANSWER SHEETS YOURSELF BY MAKING CHECK MARKS ON THE SHEETS.

13.0 SPECIAL SCORE REPORTS

The special individual student score reports prepared by CADS contain information that combines relevant normative data from the national standardization of the Stanford Achievement Test (Seventh Edition) with hearing students carried out during the 1981-82 school year by the test publisher, and from the national standardization of the test with hearing-impaired students carried out during the 1982-83 school year by the Center for Assessment and Demographic Studies, Gallaudet College.

If a school wishes to obtain individualized student score reports from the Center for Assessment and Demographic Studies, a magnetic tape with the school's testing results must be obtained from the Iowa City scoring center. (This must be ordered on the "Special Order for Scoring Services.") After the school receives the tape from Iowa, it can be forwarded to CADS for the production of the individual score reports. A sample of these reports appears at the end of this booklet.

Student identifying information appears at the top of this report. (See the sample report, Note A) This includes the student's name, birthdate, level and form of the test taken, test date, age at time of testing, and the form of the answer document used by the student in taking the test. Many students will have two score reports - one for the subtests they took from the complete battery booklets and one for the subtests they took from the math separate booklets. The score information for the subtests taken from each booklet appears on its respective report.

Three types of score information appear on this report: Raw Score, Norm Score, and Cluster Score.

13.1 Raw Score Information

For each subtest taken, the raw score information is broken down into three components: the number answered correctly (Note B), the Number answered incorrectly (Note C), and the number not attempted (Note D). The percent of items in each subtest answered correctly is also printed (Note E).

Subtests which have raw scores that are at or below chance level are indicated with an asterisk (Note J). These are scores which might be obtained from guessing alone and should be interpreted with caution.

13.2 Norm Score Information

Three norms are printed: Scaled Scores (Note F), Grade Equivalents (Note G) and hearing-impaired Percentiles (Note H).

<u>Scaled Scores</u>. These scores represent approximately equal units on a continuous scale. For example a difference of 10 scaled score points between two students' scores or between a single student's scores from one year to the next represents the same amount of difference wherever it occurs on the scale. The advantage of the scaled score (especially for groups of students who are tested "out of level") is that the scaling proce-

dure used to derive the scale values links together the different levels of the Stanford for a given content area. Thus, the reading comprehension scale, for example, is continuous across the six levels of the battery. After the scaled score has been derived, it is no longer important to consider the particular level of the test taken by the student. This is why educators of hearing-impaired test-takers, who have been placed into levels of the battery via a screening procedure and not by their grade level in school, are encouraged to make use of scaled scores when they report their students' achievement levels.

Scaled scores are not equivalent across content areas. A 610 scaled score on Math Computation, for example, is not equivalent to a 610 scaled score on Reading Comprehension. Each subject area has its own system of scaled scores. They cannot be used to create a score profile across subtests. Likewise, you may not sum the scores for an individual student to obtain an average scaled score.

<u>Grade Equivalents</u>. These represent the average performance of hearing students tested in a given month of the year with a specific subtest. The Stanford grade equivalent scale ranges from K.0 (beginning kindergarten) to 12.9, with scores above 12.9 designated as PHS (post high school).

Grade equivalents are often misinterpreted. While scaled scores can be interpreted independently of the specific level of the test that the student took, grade equivalents cannot be. Obtaining a grade equivalent of 6.2, for example, on a test designed for third graders, such as the Primary 2 Reading Comprehension subtest, does not imply that the student is capable of performing well on the Intermediate 2 Reading Comprehension subtest which was designed for sixth graders. Obtaining a 6.2 grade equivalent on the Primary 2 Reading Comprehension subtest means that the student performed on that test in a similar fashion as would be expected from an average sixth grader taking that same test.

Put another way, consider two students who score at 6.2 grade equivalents in reading comprehension. Student 1 took the Primary 2 level of the Stanford Reading Comprehension test, and Student 2 took the Intermediate 2 level of the test. You cannot conclude that these students have an equivalent achievement level in reading comprehension. Student 1 is performing as you would expect an average sixth grader to perform, were the sixth grader to take the second grade test. Student 2 is performing as you would expect the average sixth grader to perform, were he/she to take the sixth grade test. Grade equivalents are not necessarily equivalent across test levels; this non-equivalence is worsened when students are incorrectly placed in the wrong test level.

Grade equivalents are especially problematic for groups in which a large proportion of students are tested out of level. In many programs for hearing-impaired students, students within a class are assigned to a variety of test levels based on their scores on the screening tests. There is an overwhelming temptation to compare these students' grade equivalents when the scoring is complete. It should not be done. The scaled score is a better comparative measure.

<u>Hearing-impaired Percentiles</u>. The percentiles are based on comparisons among hearing-impaired students of the same age. Based on scaled scores which have been equated across levels of the test, hearing-impaired percentiles have been derived from the distributions of these scores within age groups for given content areas. Percentile ranks range from a low of 1 to a high of 99. The hearing-impaired percentile represents the percentage

of hearing-impaired students of the same age in the norming sample who scored equal to or less than that score. For example, a ten-year-old hearing-impaired student who scored at the 65th percentile in Spelling obtained a scaled score on the Spelling subtest which was equal to or greater than the Spelling scaled scores of 65% of all the ten-year-old hearing-impaired students in the norming sample, regardless of the test levels taken by each of the ten-year-olds.

Unlike scaled scores, percentile ranks can be used to create score profiles across content areas. However, percentiles do not represent equal achievement units. For example, the difference between percentile ranks of 10 and 20 does not necessarily represent the same difference in ability as the difference between percentile ranks 60 and 70.

13.3 Cluster Score Information.

Clusters are specifically defined content domains that are contained within the larger subtests (Note I). For example, at the Primary 3 level, the Reading Comprehension subtest is divided into five smaller objective groups: textual reading, functional reading, recreational reading, literal comprehension, and inferential comprehension. The clusters are related to the educational objectives that the test authors used when they wrote the test questions. The total number of items contained in each cluster, the number answered correctly, and the percent answered correctly are listed on the report.

Clusters within subtests for which no items were attempted by the student are indicated with an N.A. under the percent right column (Note K). These represent subsets of items within individual subtests which were all left blank by the student.

14.0 SCALED SCORES/GRADE EQUIVALENTS

A question often asked by educators of hearing-impaired students is, "How are my students achieving, compared to hearing students?" While grade equivalent scores have an obvious appeal to these educators, we have noted above the problems inherent in interpreting grade equivalents when students are tested out of level, i.e., at a level that is different from the level given to most hearing students at the same age. We recommend using the scaled scores to track performance and to make comparisons with hearing students. However, we realize the "arbitrariness" of the scale values which comprise the scales. This situation is made more complicated by the fact that scale values are not comparable across content areas within a battery.

There is no simple rule for discussing scaled scores within the context of a grade level interpretation. In fact, one of the benefits of the scaled score is that it discourages such interpretations. It places the skills being acquired as students progress through school on scales that are independent of grade. In that respect, it is an ideal measure for students who are in ungraded situations and for students who are tested out of level.

Note that the scaled scores wich accompany the 1983 Seventh Edition of the Stanford Achievement Test are very different from the scaled scores which accompanied the 1973 Sixth Edition of the Stanford. Note also that their interpretation differs. We used to talk about an average scaled score gain per year (e.g., 10 scaled score points a year for the average hearing student); we no longer can talk in those terms.

The following table should help you think about scaled scores:

Stanford Scaled Scores Corresponding to 50th Percentile Raw Scores from National Standardization with Hearing Students, Fall, 1981

NORM GROUP	Word Reading	Reading Comp.	Word Study Skills	Concepts of Number	Math Comp.	Math Appl.	(Math Comp/ Appl)	Spelling	Environment	Vocabulary	Lang.	Social Science	Science
P1: 2.1	536	542	550	534	—	—	532	513	570	571	—	—	—
P2: 3.1	592	591	591	561	562	565	—	581	587	594	—	—	—
P3: 4.1	—	616	615	600	595	602	—	624	—	622	629	613	618
I1: 5.1	—	629	630	624	619	626	—	642	—	640	640	632	629
I2: 6.1	—	651	642	641	648	645	—	660	—	654	656	640	643
Ad: 7.1	—	662	—	662	667	662	—	675	—	668	664	654	653

The table shows you the scaled scores associated with median performance in each subtest at each level for the students in the fall, 1981, standardization sample of hearing students. It will give you an idea where your student is performing, compared to hearing students in the norm sample. It also shows the magnitude of the scale value differences, as the battery progresses from level to level of the test.

As an example, look at the Reading Comprehension column. Remember that each level of the test was normed with a group of hearing students who were of similar age and place in school. Thus, when Primary 1 was normed, it was done on a sample of hearing students who were in the first month of the second grade; Primary 2 was normed with students in the first month of the third grade; and so on. The 542 scaled score represents the median Reading Comprehension performance of second graders during their first month in school when they took the Primary 1 level. The 591 represents the median scale score performance of third graders taking Primary 2, and so on.

A crucial aspect of the scales is the magnitude of the differences as students move through school. Note that the median performance of third graders in reading comprehension (591) is 49 scale score points higher than the median performance of second graders (542). However, note also that the median performance of seventh graders (662) is only 11 points higher than the median performance of sixth graders (651). Clearly, reading comprehension is a skill that develops rapidly in the early grades, and then slows down as the students progress

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The median is the score at which 50% of a given population score above and 50% score below.

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through school. It should be apparent that speaking of "one academic year's growth" is ambiguous and of limited value.

15.0 SAMPLE SCORE INTERPRETATIONS

Look at the attached sample score reports. The 14-year-old student whose scores appear in the first box received a scale score of 612 in Reading Comprehension. This value is closest to the 616 which appears in the table for the fourth grade hearing students who took Primary 3 in the norming sample. It is fortunate that this student also took the Primary 3 battery. The student performed on this test slightly below the median performance of the fourth grade hearing students who took this test in the standardization project. We can conclude that the test level assignment was appropriate and that the student's performance was typical of fourth graders who score near the median.

Consider now the student whose math scores appear in the second box. The Concepts of Number scale score of 530 is closest to the median performance of second grade students. However, it is highly unfortunate in this case that the student took the Advanced level of the test, and achieved at a level commensurate with students who took Primary 1. (Note also that the student only got one item correct, which is, of course, below chance level.) In this case we can conclude that the test level was not appropriate. When such a conclusion is drawn, the normed score information is not useful.

Use the table on page 13 to become familiar with scaled scores. Compare your students' scaled scores to the values in the table under the appropriate subtest column headings. Check which norm group (grade level and battery used) had that scaled score as its median. Now determine whether the test level that the student took was appropriate for each subtest, i.e., by how many levels do the student's test level and the median norm group's test level differ? (If they are two levels apart, be cautious; if they are three or more, be extremely cautious in interpreting the scores). Finally, use care in reporting the results of this test to others. We suggest something like, "Susie performed on the Spelling test in a manner that was similiar to the way that average hearing fourth graders performed on tests that were similiar in difficulty." Try to avoid the temptation of relying too heavily on grade level interpretations.

CENTER FOR ASSESSMENT AND DEMOGRAPHIC STUDIES
STANFORD-7 ACHIEVEMENT TEST INDIVIDUAL SCORE REPORT
NORMING PROJECT PRELIMINARY REPORT

EXAMINEE:
TEST LEVEL: P3 FORM: E
ANSWER DOC: FULL BATTERY ANSWER SHEET

BIRTH DATE: 07-27-68
TEST DATE: 04-01-83
AGE AT TESTING: 14

SUBTEST AREA / ITEM GROUP DESCRIPTION	NO. OF ITEMS	RIGHT	WRONG	BLANK	PERCENT RIGHT	SCALE SCORE	GRADE EQUIV	H.I. RANK
READING COMPREHENSION	60	43	17	0	71	612	3.9	UNKN
TEXTUAL READING	20	16			80			
FUNCTIONAL READING	20	12			60			
RECREATIONAL READING	20	15			75			
LITERAL COMPREHENSION	30	24			80			
INFERENTIAL COMPREHENSION	30	19			63			
SPELLING	35	33	3	0	93	677	7.3	UNKN
SIGHT WORDS	9	8			100			
PHONETIC PRINCIPLES	16	15			93			
STRUCTURAL PRINCIPLES	12	10			83			
LANGUAGE	46	28	18	0	60	619	3.9	UNKN
CONVENTIONS	26	16			61			
LANGUAGE SENSITIVITY	10	5			50			
REFERENCE SKILLS	10	7			70			
MATH APPLICATIONS	38	29	9	0	76	613	4.6	UNKN
PROBLEM SOLVING	18	13			72			
GEOMETRY/MEASUREMENT	14	12			85			
GRAPHS/CHARTS	6	4			66			
SOCIAL SCIENCE	44	21	23	0	47	575	2.6	UNKN
GEOGRAPHY	6	2			33			
HISTORY-ANTHROPOLOGY	9	4			44			
SOCIOLOGY	6	4			66			
POLITICAL SCIENCE	4	1			25			
ECONOMICS	10	5			50			
INQUIRY SKILLS	9	5			55			
TOTAL LANGUAGE	82	61			74			

CENTER FOR ASSESSMENT AND DEMOGRAPHIC STUDIES
STANFORD-7 ACHIEVEMENT TEST INDIVIDUAL SCORE REPORT
NORMING PROJECT PRELIMINARY REPORT

EXAMINEE:
TEST LEVEL: AD FORM: E
ANSWER DOC: MATH SEPARATE ANSWER SHEET

BIRTH DATE: 12-26-64
TEST DATE: 04-01-83
AGE AT TESTING: 18

SUBTEST AREA / ITEM GROUP DESCRIPTION	NO. OF ITEMS	RIGHT	WRONG	BLANK	PERCENT RIGHT	SCALE SCORE	GRADE EQUIV	H.I. RANK
CONCEPTS OF NUMBER	34	1*	6	27	2	530	2.0	UNKN
WHOLE NOS.-PLACE VALUE	8	1			12			
RATIONAL NUMBERS	8	0			N.A.			
OPERATIONS AND PROPERTIES	8	0			N.A.			
MATH COMPUTATION	44	6*	4	34	13	600	4.3	UNKN
MULT. W. WHOLE NUMBERS	4	4			100			
DIVISION W. WHOLE NOS.	6	2			33			
COMPUTATION W. DECIMALS	9	0			N.A.			
COMPUTATION W. FRACTIONS	9	0			N.A.			
PERCENT	4	0			N.A.			
ESTIMATION	3	0			N.A.			
PROPORTIONS-LINEAR EQUAT.	9	0			N.A.			

* - THIS SCORE IS AT OR BELOW CHANCE LEVEL.

N.A. - NO ITEMS IN THIS CLUSTER WERE ATTEMPTED.

Appendix D

SAMPLE SPECIAL QUESTIONNAIRE

STANFORD NORMING PROJECT
Supplemental Questionnaire

This questionnaire should be filled out by the teacher who is primarily responsible for the reading instruction of the student whose name appears on the following label:

General Instructions

There are two sections to this questionnaire. The first part asks some questions related to the educational setting of the student, the communication modes used in instruction, and the hearing and language characteristics of the student's family. A few questions about you, the teacher, are also included.

The second part of the questionnaire asks you to evaluate the reading comprehension subtest of the Stanford Achievement Test that the student will be taking as part of this spring's norming project. For each objective measured by the test, you are asked to indicate to what extent the student has been exposed to the instructional material related to this objective and to estimate what percentage of the related test items the student will get correct. (Do not look at the student's responses to the test before you fill out this part of the questionnaire.) Your responses to this questionnaire will provide us with valuable information about the Stanford Achievement Test in different educational settings around the country. Consider the questions carefully.

When you have finished filling out the questionnaire, return it to the person who is coordinating the Stanford norming project for your program. The Coordinator will return all the surveys to our office at the same time the Stanford answer documents are returned.

Thank you for your time and effort.

PART I -- GENERAL INFORMATION

Educational Setting

1. **What is the placement level of this student?** (Please mark only one.)

__ 1. Pre-primary (Preschool, Nursery School, Kindergarten)

__ 2. Elementary (Lower School or Primary)

__ 3. Junior High School (Middle School, Intermediate)

__ 4. High School (Upper School, Advanced)

__ 5. Ungraded

2. **During this student's reading instruction, to what degree is s/he integrated with hearing students?**

__ 1. Most or all of the time

__ 2. Sometimes or occasionally

__ 3. None of the time

3. **On a typical day, how many minutes does this student spend in reading instruction?**

__ 1. 25 minutes or less

__ 2. 26-35 minutes

__ 3. 36-45 minutes

__ 4. 46-55 minutes

__ 5. 56 minutes or more

Communication

4. **How do you, the teacher, think the average hearing person with whom this student might come in contact outside of school (i.e., bus driver, clerk in a store, etc.) would classify this student's speech?**

   __ 1. Very Intelligible (very similar to the speech of a hearing person of the same age)

   __ 2. Intelligible (somewhat difficult to understand)

   __ 3. Barely Intelligible (can only understand after repetition and use of other cues)

   __ 4. Not Intelligible

   __ 5. Student Would Not Ordinarily Attempt to Use Speech

5. **How well do you think this student can communicate with the average hearing person, using any method (speech, gestures, etc.)?**

   __ 1. Very well

   __ 2. Adequately

   __ 3. Not very well

6. **When you communicate with this student in the instructional context, do you use the following means?** (Answer YES or NO for each means listed.)

Speech	__ 1. YES	__ 2. NO
Signs	__ 1. YES	__ 2. NO
Fingerspelling	__ 1. YES	__ 2. NO
Cued Speech*	__ 1. YES	__ 2. NO
Gestures/Pantomime	__ 1. YES	__ 2. NO
Writing (excluding blackboard)	__ 1. YES	__ 2. NO
Interpreter	__ 1. YES	__ 2. NO

*Cued speech, a system developed by Dr. Orin Cornett, is a visual representation of spoken language in which lipreading of natural speech is supplemented by visual cues.

7. **When the student communicates with you in the instructional context, does s/he use the following means?** (Answer YES or NO for each means listed.)

Speech	__ 1. YES	__ 2. NO
Signs	__ 1. YES	__ 2. NO
Fingerspelling	__ 1. YES	__ 2. NO
Cued Speech	__ 1. YES	__ 2. NO
Gestures/Pantomime	__ 1. YES	__ 2. NO
Writing (excluding blackboard)	__ 1. YES	__ 2. NO
Interpreter	__ 1. YES	__ 2. NO

Family Background

8. **Indicate the hearing status of this student's parents.**

A. FATHER

__ 1. Normal Hearing

__ 2. Hard of Hearing

__ 3. Deaf

__ 4. Data Not Available

B. MOTHER

__ 1. Normal Hearing

__ 2. Hard of Hearing

__ 3. Deaf

__ 4. Data Not Available

9. **Number of normally hearing siblings:** ____

10. **Number of hearing impaired siblings:** ____

11. **Indicate the language or languages regularly spoken in the student's home.** (Check all that apply.)

__ English __ French __ Spanish __ Chinese

__ Japanese __ Vietnamese __ German __ American Sign Language

__ Other ________________ ___
(please specify)

Teacher Identifying Information

12. **Your sex:** __ 1. Male __ 2. Female

13. **Your hearing status:**

__ 1. Normal Hearing __ 2. Hard of Hearing __ 3. Deaf

14. **Number of years you have taught hearing impaired students:** ______ (years)

15. **Number of years you have ght in total:** ______ (years)

16. **From the continuum below, rate your own ability to express yourself using signs. Place an X on the continuum in the position corresponding to your skill level.**

Do not sign — Can use signs as well as or better than I do spoken English

1 2 3 4 5

17. **From the continuum below, rate your own ability to understand ' gns. Place an X on the continuum in the position corresponding to your skill level.**

Do not understand signs — Can understand signs as well as or better than I do spoken English

1 2 3 4 5

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PART 2 -- Subtest Evaluation

Primary 2 Reading

Note: This section of the questionnaire contains advanced unpublished material for examination purposes. Not to be reproduced in any form. To be published in April, 1983 by the Psychological Corporation.

INSTRUCTIONS: Read the objective. Look through the appropriate test booklet at the items indicated under the objective. An example of one of these items is provided here. Answer the two questions pertaining to this objective by circling the number corresponding to your opinion.

OBJECTIVE

Short Reading Passages — Demonstrate comprehension of explicitly stated meanings and details in short reading passages by completing a sentence presented in a modified cloze format.

ITEMS

Items 1-10

SAMPLE ITEM

Alan's hands were cold, so he put on his

4 shoes ○ belt ○ skates ○ gloves ○

to keep them

5 safe ○ soft ○ warm ○ clean. ○

QUESTIONS

1. To what extent has the student been exposed to instructional material related to this objective?

    1. Not at all
    2. Minimally
    3. Adequately
    4. Heavily

2. What percentage of these items will the student answer correctly?

    1. 0% - 25% (Chance level)
    2. 26% - 50%
    3. 51% - 75%
    4. 76% - 100%

INSTRUCTIONS: Read the objective. Look through the appropriate test booklet at the items indicated under the objective. An example of one of these items is provided here. Answer the two questions pertaining to this objective by circling the number corresponding to your opinion.

OBJECTIVE

Short Reading Passages with Questions — Demonstrate a comprehension of explicitly stated meanings and details in short reading passages by answering questions about the passages.

ITEMS

Items 11-40

SAMPLE ITEM

Rosa earns money by walking her neighbor's dog. She puts the money in her piggy bank. It is almost full. Rosa hopes she will save enough money to buy a bike.

14 Rosa is saving

- ○ time
- ○ stamps
- ○ money
- ○ flowers

QUESTIONS

1. To what extent has the student been exposed to instructional material related to this objective?

   1. Not at all
   2. Minimally
   3. Adequately
   4. Heavily

2. What percentage of these items will the student answer correctly?

   1. 0% - 25% (Chance level)
   2. 26% - 50%
   3. 51% - 75%
   4. 76% - 100%

Appendix E

STUDENT REPORT FROM SCREENING TEST SCORING PROGRAM

JOHNNY

0 0 0 0 0 0 0 0 1 1 0 1 1 2 1 1 1 1 1 2 2 1 2 2 2 2 2
1 5 2 6 4 8 9 3 0 2 7 3 7 0 9 1 4 5 8 1 5 6 6 3 7 2 4
R R R R R W R R R W R W R W W W R W W W R W W W W W R
FORM: R1A RAWSCORE: 13 CAUTION: .23 BORDER REGION: NO
0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2
1 2 3 4 5 6 7 8 9 0 1 2 5 4 6 7 8 3 9 0 1 2 3 4 5 6
R R R R R R R R R R R R R W W R W W R W R R R R W W
FORM: M1A RAWSCORE: 19 CAUTION: .00 BORDER REGION: NO

READING: Assign to Primary 2. MATH: Assign to Primary 3.

NOTE: Since reading and math assignments differ, administer math separate booklet for Concepts of Number and Math Computation.

DANNI

0 0 0 0 0 0 0 0 1 1 0 1 1 2 1 1 1 1 1 2 2 1 2 2 2 2 2
1 5 2 6 4 8 9 3 0 2 7 3 7 0 9 1 4 5 8 1 5 6 6 3 7 2 4
R R R R R R W R R W W W R W W R R W R W W W W W W R R
FORM: R1A RAWSCORE: 14 CAUTION: .29 BORDER REGION: NO
0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2
1 2 3 4 5 6 7 8 9 0 1 2 5 4 6 7 8 3 9 0 1 2 3 4 5 6
R R R R R R R R R R R R R W W R W W R W R R R R W W
FORM: M1A RAWSCORE: 19 CAUTION: .00 BORDER REGION: NO

READING: Assign to Primary 2. MATH: Assign to Primary 3.

NOTE: Since reading and math assignments differ, administer math separate booklet for Concepts of Number and Math Computation.

TYSIE

0 0 0 0 0 0 0 0 1 1 0 1 1 2 1 1 1 1 1 2 2 1 2 2 2 2 2
1 5 2 6 4 8 9 3 0 2 7 3 7 0 9 1 4 5 8 1 5 6 6 3 7 2 4
R R R R R W W R R W W W W W R W R W W W W W W W R W W
FORM: R1A RAWSCORE: 10 CAUTION: .30 BORDER REGION: NO
0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2
1 2 3 4 5 6 7 8 9 0 1 2 5 4 6 7 8 3 9 0 1 2 3 4 5 6
R R R R R R R R R R R R R W W R R W R W R W W W W W
* * * *
B.O.I.S:
FORM: M1A RAWSCORE: 17 CAUTION: .00 BORDER REGION: YES

READING: Assign to Primary 1. MATH: Assign to Primary 2.

NOTE: Since reading and math assignments differ administer math separate booklet for Concepts of Number and Math Computation.

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Appendix F

INDIVIDUAL STUDENT SCORE REPORT

CENTER FOR ASSESSMENT AND DEMOGRAPHIC STUDIES
STANFORD-7 ACHIEVEMENT TEST INDIVIDUAL SCORE REPORT
NORMING PROJECT PRELIMINARY REPORT

EXAMINEE: , COURTN J
TEST LEVEL: II FORM: E
ANSWER DOC: FULL BATTERY ANSWER SHEET

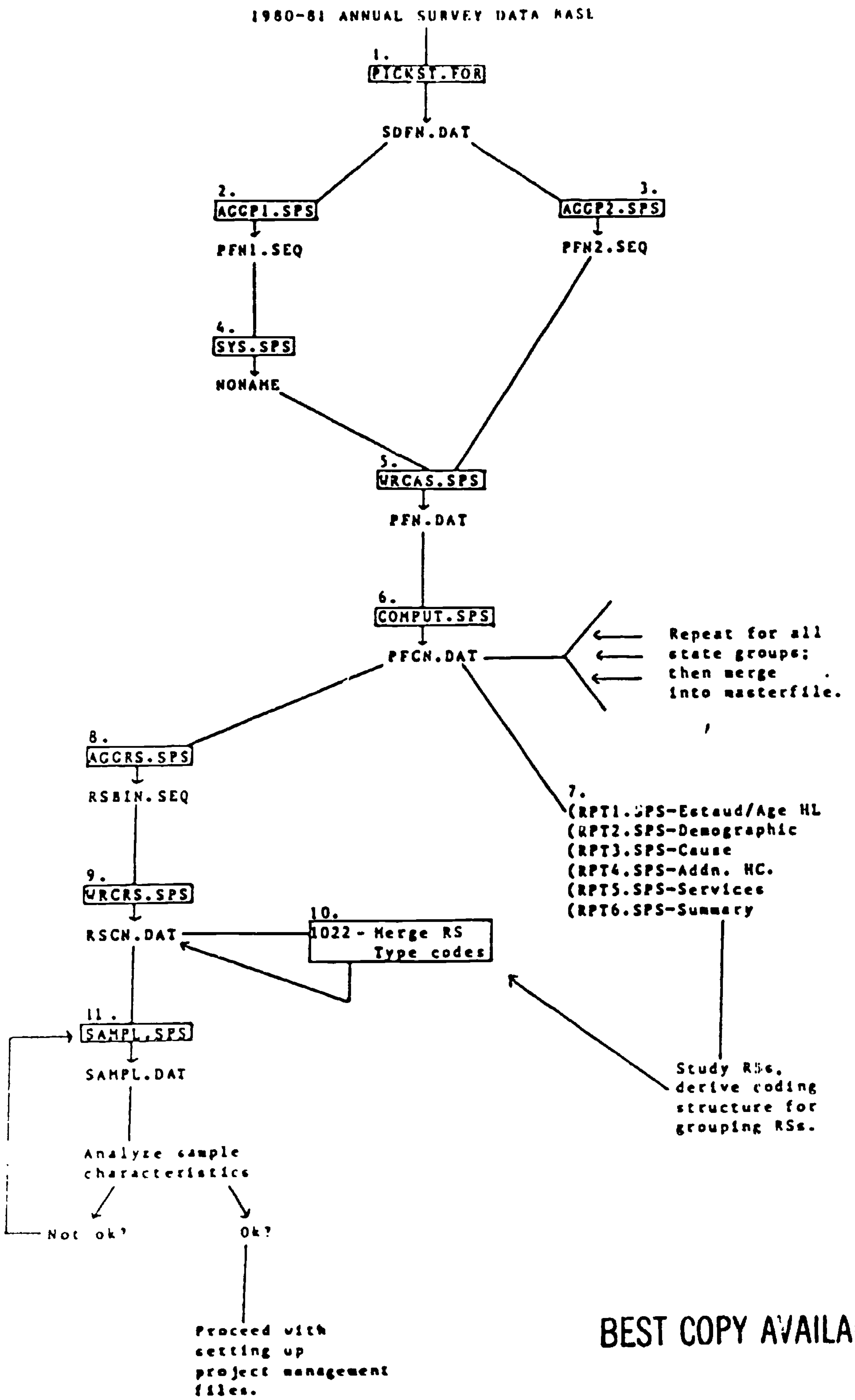
BIRTH DATE: 12-25-67
TEST DATE: 05-17-83
AGE AT TESTING: 15

SUBTEST AREA / ITEM GROUP DESCRIPTION	NO. OF ITEMS	RIGHT	WRONG	BLANK	PERCENT RIGHT	SCALE SCORE	GRADE EQUIV	H.I. RANK
READING COMPREHENSION	60	17	15	28	28	564	2.6	UNKN
TEXTUAL READING	20	9			45			
FUNCTIONAL READING	20	8			40			
RECREATIONAL READING	20	0			N.A.			
LITERAL COMPREHENSION	30	9			30			
INFERENTIAL COMPREHENSION	30	8			26			
SPELLING	40	22	17	1	54	605	3.8	UNKN
HOMOPHONES	8	2			25			
PHONETIC PRINCIPLES	16	11			68			
STRUCTURAL PRINCIPLES	16	9			56			
LANGUAGE	53	29	24	0	54	610	3.7	UNKN
CONVENTIONS	26	15			57			
LANGUAGE SENSITIVITY	14	5			35			
REFERENCE SKILLS	13	9			69			
CONCEPTS OF NUMBER	34	10	19	5	29	566	3.1	UNKN
WHOLE NOS-PLACE VALUE	17	4			23			
RATIONAL NOS.	8	4			50			
OPERTIONS-PROPERTIES	9	2			22			
MATH COMPUTATION	44	27	17	0	61	623	5.1	UNKN
ADDITION-WHOLE NUMBERS	6	5			83			
SUBTRACTION-WHOLE NUS	9	9			100			
MULTIPLICATION-WHOLE NUS	12	5			41			
DIVISION WHOLE NUMBERS	10	4			40			
COMP.W.FRACTIONS-DECIMALS	4	4			100			
ESTIMATION	3	0			0			
MATH APPLICATIONS	40	13	27	0	32	565	3.1	UNKN
PROBLEM SOLVING	22	5			22			
GRAPHS-CHARTS	6	4			66			
GEOMETRY-MEASUREMENT	12	4			33			
SOCIAL SCIENCE	60	18	35	7	30	564	2.1	UNKN
GEOGRAPHY	7	1			14			
HISTORY	6	3			50			
ANTHROPOLOGY	7	1			14			
SOCIOLOGY	7	2			28			
POLITICAL SCIENCE	11	3			27			
ECONOMICS	12	4			33			
INQUIRY SKILLS	10	4			40			
SCIENCE	60	23	26	11	38	583	2.6	UNKN

Appendix G

CHART 1: FLOW CHART, ANNUAL SURVEY DATA BASE
CHART 2: FLOW CHART, PROJECT MANAGEMENT PROCEDURE

CHART 1: FLOW CHART, ANNUAL SURVEY DATA BASE



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Description of Steps in Chart 1

1. PICKST.FOR goes to the 1980-81 Annual Survey Data Base (BD81.SEQ) and picks demographic data for a few states then creates SDFN.DAT. See the codebook of the 1980-81 Annual Survey for the file layout of SDFN.DAT. The reason for working with only one group of states at a time is the limitations of disk space.

2. AGGP1.SPS aggregates all demographic variables on SDFN.DAT except for the age variable and creates a file with one record for each program instead of a record for each student. This file is a binary data file called PFN1.SEQ. Each program record has a valid number of students for each variable and the percents of students for different values of each variable. The aggregation procedure also prints out the number of cases in each record, which, in this case, means number of students. The other variables created by the aggregation procedure are the identification variables which are used to specify aggregation groups, i.e., state, reporting source, and program code number.

3. AGGP2.SPS aggregates the age variable on SDFN.DAT and makes the binary data file PFN2.SEQ. This variable had to be processed separately from the others because of the maximum number of variables allowed in the aggregate procedure.

4. SYS.SPS makes a system file out of PFN1.SEQ called NONAME which is necessary for adding the age variable aggregaton in the next step.

5. WRCAS.SPS does two things: first, it adds the age variable aggregation to NONAME and, second, it rewrites all of the data into ASCII format which becomes PFN.DAT.

6. COMPUT.SPS performs computations on the demographic variables and changes the percents into valid counts for each variable (except for a few which are means) by multiplying the percents for each variable with the valid number and dividing by 100. Instead of having one variable with different values as in SDFN.DAT (i.e., variable SEX with value 0=male and 1=female), now there are two variables (variable MALE with a valid count of students who are male, and variable FEMALE with a valid count of students who are female).

NOTE: Steps 1-6 are repeated for each group of states until all state data files are processed; the aggregated state data files are then merged into one master aggregated data file which is PFCN.DAT.

7. Six different SPSS reports are run on PFCN.DAT to provide a summary of the characteristics each program has. These summaries are used to derive a coding structure for grouping reporting sources which will be used for stratification of the sampling.

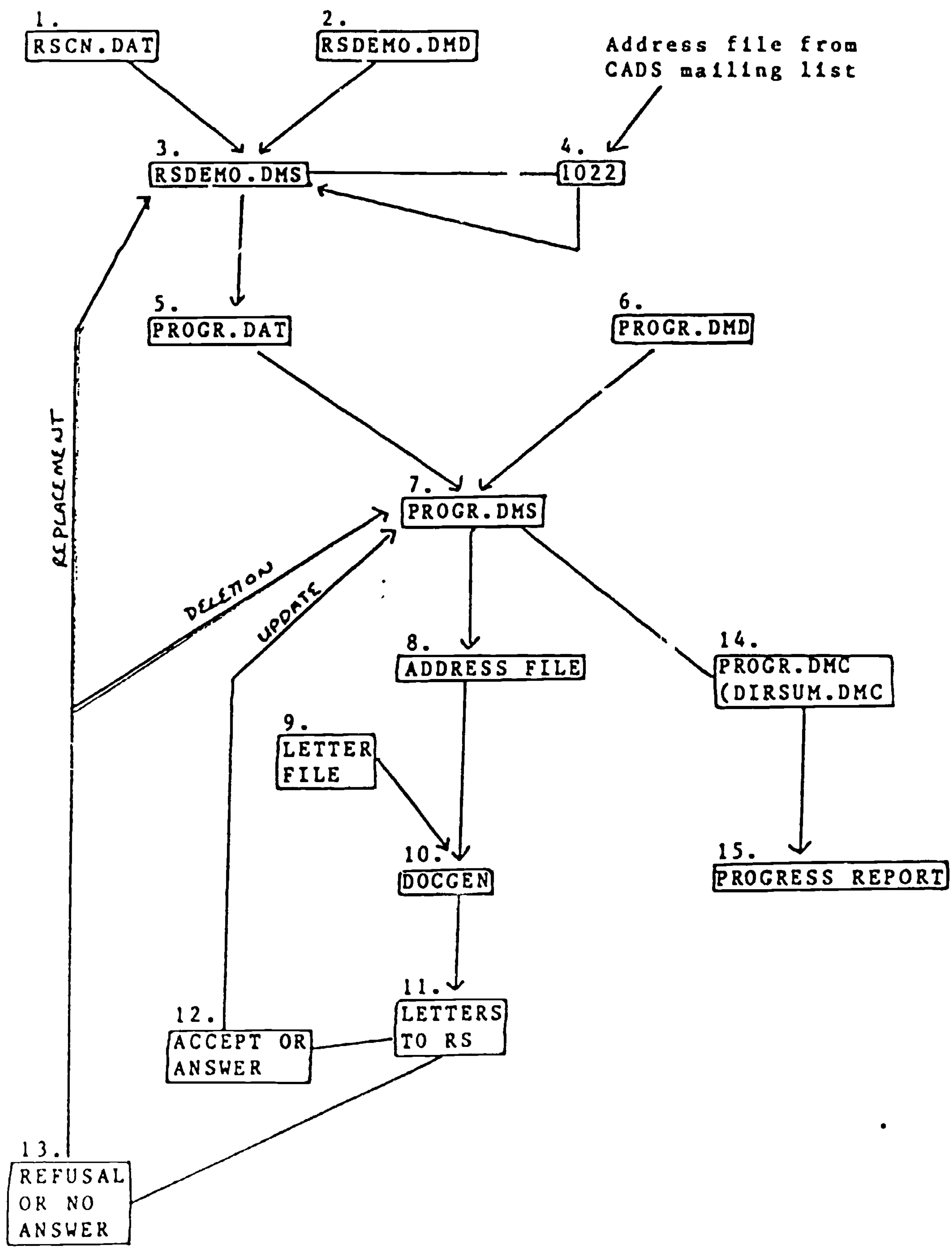
8. AGGRS.SPS, which aggregates the program records into one record for each reporting source, produces RSBIN.SWQ. A reporting source is a group of programs in one region which have one contact person who is responsible for working with the programs. This aggregation produces sums of all the valid counts for each variable generated in the program aggregation and a count of the number o. programs in each record along with the sum of the count of students. The identification variables used to define aggregation groups were state and reporting source code numbers.

9. WRCRS.SPS writes the binary data into ASCII format and makes RSCN.DAT.

10. 1022 is used to merge reporting source type codes generated from Step 7 into RSCN.DAT so that the sampling can be performed.

11. SAMPL.SPS samples the reporting source data from RSCN.DAT using a differing percent for each stratification which is defined by region and reporting source type. There are 12 stratified groups, and the sample percent is determined by the number of students in each group (see Table 1 for further clarification). SAMPL.DAT is the sample itself. The characteristics of each reporting source type sample group are analyzed to determine whether they match the characteristics of the population. If any one of the groups does not match, the sampling is repeated for that group until all the groups are matched. The sample demographic data is then used to set up project management files.

CHART 2: SAT-82 Project Management Procedure



Descriptions of Steps in Chart 2

1. RSCN.DAT is the aggregated demographic data file with one record for each Reporting Source (see Chart 1).

2. RSDEMO.DMD is the description of the variables in RSCN.DAT.

3. RSCN.DAT and RSDEMO.DMD are combined into a 1022 data set called RSDEMO.DMS.

4. Addresses for each Reporting Source are then added to RSDEMO.DMS through the APPEND function in 1022.

5. A variable is set up in RSDEMO.DMS (see layout for this file in Appendix B) called SAMPL. It allows us to pick only the Reporting Sources that were sampled in the sampling procedures out of all the others. PROGR.DAT is the output of this; it contains only the Reporting Sources that were sampled and only the data necessary for record keeping.

6. PROGR.DMD is the description of all the data in PROGR.DAT.

7. PROGR.DAT and PROGR.DMD are combined to make the 1022 data set called PROGR.DMS. This is the file by which the SAT-HI Project will be managed; it will keep records for each of the sample Reporting Sources and enable us to instantly check on the progress of the project.

8. An address file can be made from PROGR.DMS containing the addresses of Reporting Sources that need to be contacted.

9. A DOCGEN letter file is made for each batch of letters that needs to be sent out.

10. The address file and letter file are combined through DOCGEN to make individual letters for each Reporting Source.

11. When a reply is received that is an acceptance or update on some information needed, the information in PROGR.DMS is updated so that it is correct for the responding Reporting Source.

12. If the reply from the Reporting Source is a refusal to participate in the project or if, over a period of time, there is no reply, the Reporting Source is deleted from PROGR.DMS and, if it is not too late, is replaced with a new Reporting Source from RSDEMO.DMS.

(continued)

13. PROGR.DMC and DIRSUM.DMC are two 1022 report files.

14. These two report files are combined to make a report with an individual page that contains information for each Reporting Source and a directory. A summary report with totals for all of the Reporting Sources is also produced. Each time information for a Reporting Source is updated, a new page for that Reporting Source is made. This gives up a quick and easy way to check on each Reporting Source and the progress the project is making.

Appendix H

NORMS TABLES

Gallaudet Research Institute
Center for Assessment and Demographic Studies
Gallaudet College
800 Florida Avenue, N.E.
Washington, D.C. 20002

NORMS TABLES

1982 Stanford Achievement Test, 7th Edition
Form E
For Use with Hearing-Impaired Students

A. Conversion Tables, by Test Level:

Raw Scores to 1. Scaled Scores
Raw Scores to 2. Grade Equivalents

B. Age-Based Percentile Norms

TABLE OF CONTENTS

INTRODUCTION

There are two sets of tables in this packet:

(1) One -- color-coded into the six levels of the Stanford, with two pages at each level -- contains the conversion tables for transforming raw scores on the 1982 Stanford Achievement Test, Form E, for use with hearing-impaired students into two kinds of derived scores.

a. **Scaled scores:** these are scores derived from the norm sample of **hearing** students who took the 1982 Stanford and representing approximately equal units on a continuous scale. It is possible with scaled scores to compare a student's performance in a given subtest (e.g., Reading Comprehension) on one level of the test with that student's performance **in the same subtest area** on another level of the test. Scaled scores are especially suitable for studying change in performance for a given subtest area -- either of an individual student or of a class -- from one administration of the test to the next. They are also appropriate for making comparisons between groups on subtests which measure the same skill. **Scaled scores cannot be compared across different subject areas.**

b. **Grade equivalents:** scores which represent the average performance of **hearing** students tested in a given month of the year with a specific subtest of the Stanford. The Stanford grade equivalent scale ranges from K.0 (beginning kindergarten) to 12.9, with scores above 12.9 designated as PHS (post high school). Grade equivalents are linked to a specific level of the test. They cannot be compared from one level of the test to another; thus, the grade equivalents of two students who took **different** levels of the Stanford **cannot** be compared. The grade equivalents also **cannot** be averaged out to a so-called **"overall"** score.

To Summarize: a grade equivalent of **5.2** in Reading Comprehension on Primary Level 3 of the Stanford means that the student is reading in a similar fashion as would an average hearing student in the **second month of the fifth grade** on material designed generally for 3rd and 4th grades. The student is not necessarily reading materials at the 5th grade level.

(2) The second set of tables in this packet contains the age-based percentile norms. (An explanation of the percentile ranks and some cautions in their interpretation precede the percentile norms.) Percentile scores are derived by

(a) obtaining the proper subtest **scaled score** for the level of the test taken by the student (see 1, a above), and

(b) using the percentile norms table for the age of the student at testing and converting this scaled score to a percentile rank.

For example: a nine-year-old hearing-impaired student has answered 35 items correctly on the Primary 1 Reading Comprehension subtest:

1. using the Primary 1 score conversion table, you learn that a raw score of 35 in Reading Comprehension converts to a scaled score of 533; then,

2. using the green percentile rank tables for nine-year-olds, you are able to convert the 533 scaled score in Reading Comprehension to a percentile rank of 64.

PRIMARY 1

Score Conversion Table
Stanford Achievement Test (7th Edition)
Raw Score (Number Correct) to Scaled Score and Grade Equivalents

NO RIGHT	WORD STUDY SKILLS		WORD READING		READING CMPRHNSN		READING (WRD+COMP)		VOCABULARY		LISTENING CMPRHNSN	
	SS	GE	SS	GE	SS	GE	SS	GE	SS	GE	SS	GE
73							634	5.1				
72							611	3.9				
71							586	3.0				
70							571	2.7				
69							560	2.5				
68							552	2.4				
67							545	2.2				
66							538	2.1				
65							533	2.0				
64							528	2.0				
63							524	2.0				
62							519	1.9				
61							516	1.9				
60							512	1.[illegible]				
59							509	1.8				
58							505	1.8				
57							502	1.7				
56							499	1.7				
55							496	1.7				
54							494	1.7				
53							491	1.6				
52							488	1.6				
51							486	1.6				
50							483	1.5				
49							481	1.5				
48							478	1.5				
47							476	1.5				
46							474	1.5				
45							472	1.4				
44							469	1.4				
43							467	1.4				
42							465	1.4				
41							463	1.3				
40					618	4.2	460	1.3				
39					595	3.3	458	1.3				
38					569	2.7	456	1.3	686	8.5		
37					553	2.4	454	1.3	663	6.7		
36	616	4.1			542	2.2	452	1.2	637	5.0		
35	593	3.3			533	2.0	450	1.2	621	4.1		
34	565	2.6			525	2.0	447	1.2	609	3.6		
33	550	2.2	601	3.6	518	1.9	445	1.2	599	3.1		
32	539	2.0	577	2.9	512	1.8	443	1.1	591	2.8		
31	529	1.9	551	2.4	506	1.8	441	1.1	584	2.6		
30	521	1.9	536	2.1	501	1.7	438	1.1	577	2.3		
29	513	1.8	524	2.0	496	1.7	436	1.1	571	2.1		
28	507	1.7	514	1.8	491	1.6	434	1.0	566	1.9	678	8.6
27	500	1.6	506	1.8	487	1.6	432	1.0	560	1.7	655	6.2
26	495	1.6	499	1.7	482	1.5	429	1.0	555	1.5	629	4.3
25	489	1.5	493	1.6	478	1.5	427	K.9	551	1.4	613	3.4
24	484	1.5	486	1.5	474	1.5	424	K.9	546	1.2	601	9
23	479	1.4	481	1.5	470	1.4	422	K.9	541	1.0	591	2.5
22	474	1.3	475	1.4	466	1.4	419	K.8	537	K.9	583	2.2
21	469	1.3	470	1.4	462	1.3	417	K.8	532	K.7	575	1.9
20	465	1.3	465	1.3	458	1.3	414	K.7	528	K.6	568	1.7
19	460	1.2	460	1.3	454	1.3	411	K.7	524	K.4	562	1.5
18	455	1.1	456	1.2	450	1.2	408	K.7	519	K.3	556	1.2
17	451	1.1	451	1.2	446	1.2	405	K.6	515	K.1	550	1.0
16	446	1.0	446	1.1	442	1.1	402	K.6	511	K.0	544	K.8
15	441	1.0	441	1.1	437	1.1	399	K.5	506	PK	539	K.7
14	436	K.9	436	1.0	433	1.0	396	K.5	502	PK	533	K.4
13	432	K.9	431	K.9	429	1.0	392	K.4	497	PK	528	K.3
12	426	K.8	426	K.9	424	K.9	388	K.4	492	PK	522	K.1
11	421	K.8	421	K.8	419	K.8	384	K.3	487	PK	517	PK
10	416	K.7	416	K.7	414	K.7	380	K.3	482	PK	511	PK
9	410	K.6	410	K.6	408	K.7	375	K.2	476	PK	505	PK
8	403	K.5	404	K.6	402	K.6	370	K.1	471	PK	498	PK
7	396	K.5	397	K.5	396	K.5	365	K.1	464	PK	491	PK
6	389	K.4	390	K.4	389	K.4	358	PK	457	PK	484	PK
5	380	K.3	381	K.2	380	K.3	351	PK	449	PK	475	PK
4	370	K.2	371	K.1	370	K.1	342	PK	439	PK	466	PK
3	356	K.0	359	PK	358	K.0	331	PK	428	PK	454	PK
	341	PK	343	PK	342	PK	316	PK	412	PK	438	PK
1	314	PK	317	PK	316	PK	290	PK	386	PK	411	PK

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PRIMARY 1

Score Conversion Table
Stanford Achievement Test (7th Edition)
Raw Score (Number Correct) to Scaled Score and Grade Equivalents

No. Right	SPELLING SS	SPELLING GE	CONCEPTS OF NUMBER SS	CONCEPTS OF NUMBER GE	MATH COMP/ APPLICATNS* SS	MATH COMP/ APPLICATNS* GE	ENVIRONMNT SS	ENVIRONMNT GE
73								
72								
71								
70								
69								
68								
67								
66								
65								
64								
63								
62								
61								
60								
59								
58								
57								
56								
55								
54								
53								
52								
51								
50								
49								
48								
47								
46								
45					657	6.6		
44					633	5.5		
43					608	4.5		
42					592	3.9		
41					580	3.6		
40					571	3.3		
39					562	3.0		
38					555	2.7		
37					549	2.5		
36					543	2.3		
35					538	2.2		
34			647	6.2	532	2.0		
33			621	5.0	528	1.9		
32			594	4.0	523	1.7		
31			576	3.4	518	1.6		
30	603	3.7	563	3.0	514	1.5		
29	579	3.1	552	2.7	510	1.4		
28	552	2.7	542	2.4	506	1.3		
27	535	2.5	534	2.2	502	1.2	683	9.0
26	523	2.3	526	1.9	498	1.1	658	8.9
25	513	2.2	519	1.8	494	1.0	630	5.0
24	504	2.0	512	1.6	490	1.0	613	4.1
23	496	2.0	506	1.4	486	K.9	599	3.4
22	488	1.9	499	1.3	482	K.9	588	2.9
21	481	1.8	494	1.1	478	K.8	579	2.6
20	475	1.7	488	1.0	474	K.8	570	2.2
19	469	1.7	482	1.0	470	K.8	562	1.9
18	463	1.6	477	K.9	467	K.7	555	1.6
17	457	1.5	471	K.8	463	K.7	548	1.4
16	451	1.4	466	K.8	459	K.6	541	1.1
15	445	1.4	460	K.7	454	K.6	535	K.9
14	439	1.3	454	K.6	450	K.5	528	K.7
13	433	1.2	449	K.6	446	K.5	522	K.5
12	428	1.2	443	K.5	441	K.4	515	K.2
11	421	1.1	437	K.4	436	K.4	508	K.0
10	415	1.0	431	K.4	431	K.3	501	PK
9	409	1.0	424	K.3	426	K.2	494	PK
8	402	K.9	417	K.2	420	K.2	486	PK
7	394	K.8	410	K.1	414	K.1	478	PK
6	386	K.7	402	K.0	407	K.1	469	PK
5	377	K.6	393	PK	399	K.0	459	PK
4	367	K.5	383	PK	390	PK	447	PK
3	354	K.4	370	PK	378	PK	433	PK
2	339	K.2	353	PK	362	PK	415	PK
1	311	PK	326	PK	337	PK	385	PK

*See Separate Subscales for Primary 1 Math Computation and Math Applications **on next page.**

PRIMARY 1 Mathematics Computation and Applications Subtest: Separate Subscales for Math Computation and Math Applications

As indicated by its title, the Primary 1 Mathematics Computation and Applications Subtest combines both math computation and math applications items in the one subtest: 22 items for math computation and 23 items for math applications. For **hearing** students this is understandable, since these students tend to perform similarly on both parts of this subtest. For **hearing-impaired** students, however, whose performance on the two parts of the test often differs, this arrangement is not satisfactory, since the resulting single score does not accurately reflect their skills in these two areas. With this in mind, the Center for Assessment and Demographic Studies has developed tables which estimate separate scaled score norms for the math computation and the math applications parts of this subtest. The scaled scores from each of these tables may be used as separate entries into the age-based hearing-impaired percentile rank tables for math computation and math applications respectively. **THERE ARE NO GRADE EQUIVALENTS AVAILABLE FOR THESE SEPARATE SUBSCALES.**

Directions for Using Subscales:

1. Count the number of items answered correctly by the student on items 1 through 22 of the Primary 1 Mathematics Computation and Applications Subtest. Then enter Table A: Math Computation Subscale, below, and read over to the scaled score.

2. Count the number of items answered correctly by the student on items 23 through 45 of the Primary 1 Mathematics Computation and Applications Subtest. Then enter Table B: Math Applications Subscale, below, and read over to the scaled score.

TABLE A: Math Computation Subscale

Number of Math Computation Items Answered Correctly for Items 1-22	Scaled Score
22	655
21	590
20	569
19	553
18	541
17	530
16	521
15	512
14	504
13	496
12	488
11	480
10	472
9	465
8	457
7	448
6	439
5	429
4	418
3	405
2	388
1	360

TABLE B: Math Applications Subscale

Number of Math Applications Items Answered Correctly for Items 23-45	Scaled Score
23	658
22	609
21	581
20	563
19	550
18	539
17	529
16	519
15	511
14	503
13	495
12	487
11	479
10	471
9	464
8	455
7	447
6	437
5	427
4	415
3	400
2	379
1	338

PRIMARY 2

Score Conversion Table
Stanford Achievement Test (7th Edition)
Raw Score (Number Correct) to Scaled Score and Grade Equivalents

No Right	WORD STUDY SKILLS SS	GE	WORD READING SS	GE	READING CMP HNSN SS	GE	READING (WRD+COMP) SS	GE	VOCABULARY SS	GE	LISTENING CMPRHNSN SS	GE
73							710	12.7				
72							687	9.7				
71							661	7.1				
70							646	6.0				
69							635	5.2				
68							625	4.6				
67							618	4.2				
66							611	3.9				
65							605	3.7				
64							600	3.5				
63							595	3.3				
62							591	3.2				
61							586	3.0				
60							583	3.0				
59							579	2.9				
58							575	2.8				
57							572	2.8				
56							568	2.7				
55							565	2.6				
54							562	2.6				
53							559	2.5				
52							556	2.5				
51							553	2.4				
50							551	2.4				
49							548	2.3				
48	717	PHS					545	2.2				
47	693	12.3					543	2.2				
46	667	9.0					540	2.1				
45	651	7.1					537	2.1				
44	640	6.0					535	2.1				
43	630	5.2					532	2.0				
42	622	4.6					530	2.0				
41	615	4.1					527	2.0				
40	608	3.8			698	11.0	525	2.0				
39	602	3.6			674	8.3	522	1.9				
38	597	3.4			647	6.0	520	1.9				
37	591	3.2			630	4.9	518	1.9				
36	586	3.1			618	4.2	515	1.9				
35	582	3.0			608	3.8	513	1.8	718	11.8		
34	577	2.8			599	3.4	510	1.8	694	9.2		
33	573	2.8	671	8.0	591	3.1	508	1.8	667	7.0		
32	568	2.6	647	5.9	584	3.0	505	1.8	651	5.9		
31	564	2.6	621	4.4	578	2.9	503	1.7	639	5.2		
30	560	2.5	604	3.7	572	2.8	500	1.7	629	4.6	713	PHS
29	556	2.4	592	3.2	566	2.6	498	1.7	621	4.1	689	10.3
28	552	2.3	582	3.0	561	2.5	495	1.7	613	3.8	662	6.9
27	548	2.2	574	2.8	556	2.4	493	1.6	606	3.4	645	5.3
26	544	2.1	566	2.7	551	2.3	490	1.6	600	3.2	632	4.5
25	540	2.1	559	2.5	546	2.3	487	1.6	594	2.9	621	3.8
24	536	2.0	552	2.4	541	2.2	484	1.6	588	2.7	612	3.4
23	532	2.0	546	2.3	537	2.1	482	1.5	583	2.5	604	3.0
22	528	1.9	540	2.1	532	2.0	479	1.5	578	2.3	597	2.8
21	524	1.9	535	2.1	528	2.0	476	1.5	573	2.1	590	2.5
20	520	1.8	529	2.0	523	1.9	473	1.4	568	2.0	584	2.3
19	516	1.8	524	2.0	519	1.9	470	1.4	563	1.8	578	2.0
18	511	1.7	518	1.9	514	1.9	466	1.4	558	1.6	572	1.8
17	507	1.7	513	1.8	510	1.8	463	1.3	553	1.4	566	1.6
16	503	1.7	508	1.8	505	1.8	460	1.3	548	1.2	560	1.4
15	498	1.6	502	1.7	500	1.7	456	1.3	544	1.1	554	1.2
14	493	1.6	497	1.7	495	1.7	452	1.2	539	K.9	548	1.0
13	489	1.5	491	1.6	491	1.6	448	1.2	534	K.8	542	K.6
12	484	1.5	485	1.5	485	1.6	444	1.2	528	K.6	536	K.5
11	478	1.4	479	1.5	480	1.5	440	1.1	523	K.4	530	K.3
10	473	1.3	473	1.4	474	1.5	435	1.0	517	K.2	523	K.1
9	467	1.3	466	1.3	468	1.4	430	1.0	511	K.0	516	PK
8	460	1.2	459	1.3	462	1.3	424	K.9	505	PK	509	PK
7	453	1.1	451	1.2	455	1.3	418	K.8	498	PK	501	PK
6	446	1.0	442	1.1	447	1.2	410	K.7	491	PK	493	PK
5	437	K.9	433	1.0	439	1.1	402	K.6	482	PK	483	PK
4	427	K.8	421	K.8	428	K.9	392	K.4	472	PK	472	PK
3	414	K.7	406	K.6	416	K.8	380	K.3	460	PK	459	PK
2	398	K.5	387	K.3	399	K.5	363	K.0	444	PK	442	PK
1	371	K.2	356	PK	372	K.2	336	PK	418	PK	414	PK

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PRIMARY 2

Score Conversion Table
Stanford Achievement Test (7th Edition)
Raw Score (Number Correct) to Scaled Score and Grade Equivalents

No Right	SPELLING SS	SPELLING GE	CONCEPTS OF NUMBER SS	CONCEPTS OF NUMBER GE	MATH COMPUTATN SS	MATH COMPUTATN GE	MATH APPLICATNS SS	MATH APPLICATNS GE	ENVIRONMNT SS	ENVIRONMNT GE
73										
72										
71										
70										
69										
68										
67										
66										
65										
64										
63										
62										
61										
60										
59										
58										
57										
56										
55										
54										
53										
52										
51										
50										
49										
48										
47										
46										
45										
44										
43										
42										
41										
40										
39										
38					690	8.6				
37					666	7.0				
36					639	5.8	687	8.7		
35					622	5.1	664	7.1		
34			678	7.9	609	4.6	637	5.7		
33			654	6.6	599	4.2	621	4.9		
32			628	5.3	590	3.9	609	4.5		
31			612	4.7	582	3.7	600	4.1		
30	701	9.3	600	4.2	575	3.5	591	3.8		
29	677	7.3	590	3.9	568	3.2	584	3.6		
28	651	5.6	582	3.6	562	3.0	577	3.4		
27	634	4.7	574	3.4	557	2.9	571	3.2	702	11.1
26	621	4.2	568	3.2	551	2.6	565	3.1	677	8.5
25	611	3.9	561	3.0	546	2.5	559	2.9	651	6.3
24	602	3.7	555	2.8	541	2.3	554	2.7	634	5.2
23	595	3.5	550	2.6	536	2.1	549	2.6	621	4.5
22	587	3.3	544	2.5	531	2.0	544	2.3	610	3.9
21	581	3.	539	2.3	526	1.8	539	2.1	601	3.6
20	574	3.0	534	2.2	522	1.7	534	2.0	593	3.1
19	568	2.9	529	2.0	517	1.6	529	1.9	585	2.8
18	563	2.9	524	1.9	512	1.4	525	1.8	578	2.5
17	557	2.8	519	1.8	508	1.3	520	1.6	571	2.2
16	551	2.7	514	1.6	503	1.2	515	1.5	564	2.0
15	546	2.6	509	1.5	498	1.1	510	1.4	557	1.7
14	540	2.5	504	1.4	493	1.0	505	1.2	550	1.5
13	535	2.5	498	1.2	488	1.0	500	1.1	544	1.2
12	529	2.4	493	1.1	483	K.9	495	1.0	537	1.0
11	523	2.3	488	1.0	478	K.8	489	1.0	530	K.8
10	518	2.2	482	1.0	472	K.8	483	K.9	523	K.5
9	511	2.1	476	K.9	466	K.7	477	K.8	516	K.3
8	505	2.1	470	K.8	460	K.6	471	K.8	508	K.0
7	498	2.0	463	K.7	453	K.6	464	K.7	500	PK
6	490	1.9	455	K.6	446	K.5	456	K.6	491	PK
5	482	1.8	447	K.5	437	K.4	447	K.5	481	PK
4	472	1.7	437	K.4	427	K.3	436	K.3	469	PK
3	459	1.5	425	K.3	415	K.1	423	K.2	456	PK
2	44[illegible]	1.4	409	K.1	399	K.0	406	K.0	438	PK
1	41[illegible]	1.1	383	PK	373	PK	378	PK	410	PK

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PRIMARY 3

Score Conversion Table
Stanford Achievement Test (7th Edition)
Raw Score (Number Correct) to Scaled Score and Grade Equivalents

No Right	WORD STUDY SKILLS		READING CMPRHNSN		VOCABULARY		LISTENING CMPRHNSN		SPELLING		LANGUAGE	
	SS	GE	SS	GE	SS	GE	SS	GE	SS	GE	SS	GE
60			760	PHS								
59			736	PHS								
58			710	12.7								
57			695	10.6								
56			683	9.2								
55			674	8.3								
54	740	PHS	666	7.6								
53	717	PHS	659	6.9								
52	691	12.0	653	6.5								
51	676	10.1	647	6.0								
50	664	8.6	642	5.7								
49	655	7.5	637	5.3								
48	648	6.8	632	5.0								
47	641	6.1	628	4.7								
46	635	5.6	624	4.5							772	PHS
45	629	5.1	620	4.3							749	PHS
44	624	4.7	616	4.1							723	PHS
43	620	4.4	612	3.9							708	12.6
42	615	4.1	609	3.8							696	10.8
41	611	3.9	605	3.7							687	9.5
40	607	3.8	602	3.5			753	PHS			679	8.5
39	603	3.6	598	3.4			730	PHS			672	7.7
38	599	3.5	595	3.3	754	PHS	704	PHS			665	6.9
37	595	3.4	592	3.2	730	PHS	688	10.1			659	6.4
36	591	3.2	589	3.1	704	10.2	677	8.5	746	PHS	654	5.9
35	588	3.1	585	3.0	688	8.7	667	7.4	721	11.4	649	5.5
34	584	3.0	582	2.9	677	7.8	659	6.6	694	8.7	644	5.1
33	581	2.9	579	2.9	667	7.0	652	5.9	677	7.3	640	4.9
32	577	2.8	576	2.8	659	6.5	646	5.4	665	6.4	635	4.6
31	574	2.8	573	2.8	651	5.9	640	5.0	654	5.7	631	4.4
30	570	2.7	570	2.7	645	5.5	635	4.7	645	5.2	627	4.2
29	567	2.6	567	2.7	639	5.2	630	4.3	637	4.9	623	4.0
28	563	2.5	564	2.6	633	4.8	625	4.0	630	4.6	619	3.9
27	560	2.5	561	2.5	628	4.5	620	3.8	624	4.3	615	3.8
26	557	2.4	557	2.5	622	4.2	616	3.6	617	4.1	611	3.7
25	553	2.3	554	2.4	617	3.9	611	3.3	612	3.9	607	3.6
24	549	2.2	551	2.3	613	3.8	607	3.1	606	3.8	604	3.6
23	546	2.1	548	2.3	608	3.5	603	3.0	601	3.7	600	3.5
22	542	2.1	545	2.2	603	3.3	599	2.8	596	3.5	596	3.4
21	538	2.0	541	2.2	599	3.1	595	2.7	591	3.4	592	3.3
20	534	2.0	538	2.1	594	2.9	591	2.5	586	3.3	589	3.7
19	531	2.0	535	2.1	590	2.8	587	2.4	581	3.1	585	3.1
18	526	1.9	531	2.0	585	2.6	582	2.2	576	3.0	581	3.0
17	522	1.9	528	2.0	580	2.4	578	2.0	571	3.0	577	3.0
16	518	1.8	524	2.0	576	2.3	574	1.9	566	2.9	573	2.9
15	514	1.8	520	1.9	571	2.1	570	1.7	562	2.8	569	2.9
14	509	1.7	516	1.9	566	1.9	565	1.6	557	2.8	565	2.8
13	504	1.7	512	1.8	561	1.7	561	1.4	552	2.7	561	2.7
12	499	1.6	508	1.8	556	1.5	556	1.2	547	2.6	556	2.7
11	494	1.6	503	1.7	551	1.4	551	1.1	541	2.6	552	2.6
10	489	1.5	498	1.7	545	1.1	546	K.9	536	2.5	547	2.6
9	483	1.4	493	1.6	539	K.9	540	K.7	530	2.4	541	2.5
8	477	1.4	487	1.6	533	K.7	534	K.5	524	2.3	536	2.4
7	470	1.3	481	1.5	526	K.5	528	K.3	517	2.2	530	2.3
6	462	1.2	474	1.5	518	K.2	521	K.1	509	2.1	523	2.2
5	454	1.1	467	1.4	509	PK	512	PK	501	2.0	515	2.1
4	444	1.0	457	1.3	499	PK	503	PK	491	1.9	506	2.0
3	432	K.9	446	1.2	487	PK	491	PK	479	1.8	494	1.8
2	416	K.7	430	1.0	470	PK	474	PK	463	1.6	479	1.6
1	390	K.4	405	K.6	444	PK	448	PK	437	1.3	453	1.2

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PRIMARY 3

Score Conversion Table
Stanford Achievement Test (7th Edition)
Raw Score (Number Correct) to Scaled Score and Grade Equivalents

No Right	CONCEPTS OF NUMBER		MATH COMPUTATN		MATH APPLICATNS		SOCIAL SCIENCE		SCIENCE	
	SS	GE	SS	GE	SS	GE	SS	GE	SS	GE
60										
59										
58										
57										
56										
55										
54										
53										
52										
51										
50										
49										
48										
47										
46										
45										
44							744	PHS	757	PHS
43							721	PHS	734	PHS
42			739	PHS			695	10.1	708	12.4
41			716	10.9			680	8.8	692	10.4
40			690	8.6			668	7.8	680	9.1
39			674	7.5			659	7.1	671	8.3
38			662	6.8	726	12.6	651	6.5	662	7.5
37			652	6.3	703	10.0	644	6.0	655	6.9
36			644	5.9	677	8.0	638	5.6	649	6.4
35			637	5.7	661	6.9	632	5.2	643	5.9
34	739	PHS	631	5.4	650	6.4	627	4.9	637	5.5
33	712	10.5	625	5.2	640	5.9	622	4.6	632	5.1
32	683	3.2	619	5.0	632	5.5	618	4.4	627	4.8
31	664	7.1	614	4.8	625	5.1	613	4.1	623	4.5
30	650	6.4	609	4.6	619	4.9	609	3.9	618	4.2
29	638	5.8	604	4.4	613	4.6	605	3.8	614	4.0
28	629	5.4	600	4.3	607	4.4	601	3.6	609	3.8
27	620	5.0	595	4.1	602	4.2	597	3.5	605	3.6
26	613	4.7	591	4.0	597	4.0	593	3.3	601	3.4
25	606	4.4	587	3.8	593	3.9	589	3.1	597	3.2
24	600	4.2	583	3.7	588	3.7	586	3.0	593	3.1
23	594	4.0	579	3.6	584	3.6	582	2.9	589	2.9
22	588	3.8	575	3.5	579	3.5	578	2.7	585	2.7
21	582	3.6	570	3.3	575	3.4	575	2.6	581	2.6
20	577	3.5	566	3.2	571	3.2	571	2.4	577	2.4
19	572	3.3	562	3.0	566	3.1	567	2.2	573	2.2
18	567	3.1	558	2.9	562	3.0	563	2.1	569	2.1
17	562	3.0	554	2.7	558	2.8	559	1.9	565	1.9
16	557	2.6	550	2.6	553	2.6	555	1.8	561	1.8
15	552	2.7	545	2.4	549	2.5	551	1.6	557	1.6
14	547	2.5	541	2.3	545	2.4	547	1.5	553	1.5
13	542	2.4	536	2.1	540	2.2	543	1.3	548	1.3
12	537	2.2	532	2.0	535	2.0	538	1.1	544	1.1
11	532	2.1	527	1.8	530	1.0	534	1.0	539	1.0
10	526	1.9	521	1.7	525	1.8	529	K.8	534	K.8
9	520	1.8	516	1.5	519	1.6	523	K.6	528	K.6
8	514	1.6	510	1.4	513	1.4	518	K.5	523	K.5
7	507	1.5	503	1.2	507	1.3	511	K.3	516	K.2
6	499	1.3	496	1.1	499	1.1	504	K.0	509	K.0
5	491	1.1	483	1.0	491	1.0	496	PK	501	PK
4	481	1.0	478	K.8	481	K.9	486	PK	492	PK
3	469	K.8	467	K.7	470	K.7	475	PK	480	PK
2	452	K.6	451	K.5	454	K.6	459	PK	464	PK
1	426	K.3	425	K.2	427	K.2	432	PK	438	PK

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Score Conversion Table
Stanford Achievement Test (7th Edition)
Raw Score (Number Correct) to Scaled Score and Grade Equivalents

No. Right	WORD STUDY SKILLS		READING CMPRHNSN		VOCABULARY		LISTENING CMPRHNSN		SPELLING		LANGUAGE	
	SS	GE	SS	GE	SS	GE	SS	GE	SS	GE	SS	GE
60	770	PHS	781	PHS								
59	748	PHS	759	PHS								
58	723	PHS	733	PHS								
57	708	PHS	718	PHS								
56	697	PHS	707	12.3								
55	688	11.6	698	11.0								
54	681	10.7	691	10.1								
53	674	9.9	684	9.3							775	PHS
52	669	9.2	678	8.7							752	PHS
51	664	8.6	673	8.2							726	PHS
50	659	8.0	668	7.7							711	PHS
49	655	7.5	664	7.4							700	11.4
48	651	7.1	660	7.0							691	10.1
47	647	6.7	656	6.7							683	9.0
46	643	6.3	652	6.4							676	8.1
45	640	6.0	648	6.1							670	7.4
44	637	5.8	645	5.9							665	6.9
43	634	5.5	641	5.6							660	6.5
42	630	5.2	638	5.4							656	6.1
41	627	4.9	635	5.2							651	5.7
40	625	4.8	632	5.0			764	PHS	761	PHS	647	5.4
39	622	4.6	629	4.8			741	PHS	738	PHS	643	5.0
38	619	4.3	626	4.6			715	PHS	712	10.4	640	4.9
37	616	4.1	623	4.5			699	11.9	696	8.9	636	4.7
36	614	4.0	620	4.3	762	PHS	687	9.9	684	7.9	633	4.5
35	611	3.9	617	4.1	738	PHS	677	8.5	675	7.1	629	4.3
34	608	3.8	614	4.0	712	11.1	669	7.0	667	6.6	626	4.1
33	606	3.7	611	3.9	697	9.5	662	6.9	659	6.0	623	4.0
32	603	3.6	608	3.8	685	8.4	655	6.2	653	5.7	620	4.0
31	600	3.5	606	3.7	675	7.6	649	5.7	647	5.3	616	3.9
30	598	3.5	603	3.6	667	7.0	644	5.3	642	5.1	613	3.8
29	595	3.4	600	3.5	660	6.5	639	4.9	636	4.8	610	3.7
28	593	3.3	597	3.4	654	6.1	634	4.6	631	4.6	607	3.6
27	590	3.2	594	3.2	647	5.7	630	4.3	627	4.5	604	3.6
26	587	3.1	592	3.2	642	5.3	624	4.0	622	4.3	601	3.5
25	585	3.0	589	3.1	636	5.0	620	3.8	618	4.1	598	3.4
24	582	3.0	586	3.0	631	4.7	616	3.6	613	4.0	595	3.3
23	579	2.9	583	3.0	626	4.4	611	3.3	609	3.9	592	3.3
22	577	2.8	580	2.9	622	4.2	607	3.1	605	3.8	589	3.2
21	574	2.8	577	2.8	617	3.9	603	3.0	601	3.7	586	3.1
20	571	2.7	574	2.8	612	3.7	599	2.8	597	3.5	583	3.1
19	568	2.6	571	2.7	608	3.5	595	2.7	593	3.4	579	3.0
18	565	2.6	567	2.7	603	3.3	590	2.5	588	3.3	576	3.0
17	562	2.5	564	2.6	598	3.1	586	2.3	584	3.2	573	2.9
16	559	2.4	561	2.5	594	2.9	582	2.2	580	3.1	569	2.9
15	555	2.4	557	2.5	589	2.8	577	2.0	576	3.0	565	2.8
14	552	2.3	553	2.4	584	2.6	573	1.8	571	3.0	562	2.8
13	548	2.2	550	2.3	579	2.4	568	1.7	567	2.9	558	2.7
12	544	2.1	546	2.3	574	2.2	563	1.5	562	2.8	554	2.6
11	540	2.1	541	2.2	568	2.0	558	1.3	557	2.8	549	2.6
10	536	2.0	537	2.1	563	1.8	553	1.1	552	2.7	544	2.5
9	531	2.0	532	2.0	557	1.6	547	K.9	547	2.6	539	2.4
8	526	1.9	527	2.0	551	1.4	541	K.7	541	2.6	534	2.4
7	520	1.8	521	1.9	544	1.1	535	K.5	534	2.5	528	2.3
6	513	1.8	514	1.9	536	K.8	527	K.2	527	2.4	521	2.2
5	506	1.7	507	1.8	528	K.6	519	PK	519	2.2	514	2.1
4	497	1.6	498	1.7	518	K.2	509	PK	510	2.1	504	1.9
3	486	1.5	486	1.6	506	PK	496	PK	498	2.0	493	1.8
2	470	1.3	471	1.4	489	PK	480	PK	482	1.8	478	1.6
1	445	1.0	446	1.2	463	PK	453	PK	456	1.5	452	1.2

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Score Conversion Table
Stanford Achievement Test (7th Edition)
Raw Score (Number Correct) to Scaled Score and Grade Equivalents

No. Right	CONCEPTS OF NUMBER SS	CONCEPTS OF NUMBER GE	MATH COMPUTATN SS	MATH COMPUTATN GE	MATH APPLICATNS SS	MATH APPLICATNS GE	SOCIAL SCIENCE SS	SOCIAL SCIENCE GE	SCIENCE SS	SCIENCE GE
60							774	PHS	776	PHS
59							751	PHS	754	PHS
58							726	PHS	729	PHS
57							711	12.0	714	PHS
56							700	10.7	703	11.7
55							691	9.7	694	10.7
54							684	9.1	686	9.8
53							677	8.5	680	9.1
52							672	8.1	674	8.6
51							667	7.7	669	8.1
50							662	7.3	665	7.8
49							657	7.0	660	7.4
48							653	6.7	656	7.0
47							649	6.4	652	6.7
46							646	6.2	649	6.4
45							642	5.9	645	6.1
44			776	PHS			639	5.7	642	5.9
43			752	PHS			636	5.5	639	5.6
42			726	12.1			632	5.2	635	5.3
41			710	10.2			629	5.0	632	5.1
40			699	9.3	760	PHS	626	4.9	629	4.9
39			689	8.5	737	PHS	623	4.7	626	4.7
38			681	7.9	710	10.7	620	4.5	624	4.6
37			674	7.5	694	9.3	618	4.4	621	4.4
36			66[illegible]	7.1	682	8.3	615	4.2	618	4.2
35			661	6.8	672	7.6	612	4.1	615	4.1
34	[illegible]64	PHS	656	6.5	664	7.1	609	3.9	613	4.0
33	739	PHS	65[illegible]	6.3	657	6.7	607	3.9	610	3.8
32	712	10.5	64[illegible]	6.0	650	6.4	604	3.7	607	3.7
31	695	9.0	641	5.8	644	6.1	601	3.6	605	3.6
30	682	8.1	636	5.6	639	5.8	598	3.5	602	3.5
29	671	7.5	632	5.5	634	5.6	596	3.4	599	3.3
28	663	7.0	628	5.3	629	5.3	593	3.3	597	3.2
27	655	6.6	623	5.1	624	5.1	590	3.2	594	3.1
26	648	6.3	619	5.0	620	4.9	588	3.1	591	3.0
25	641	5.9	615	4.8	615	4.7	585	3.0	589	2.9
24	635	5.6	611	4.7	611	4.5	582	2.9	586	2.8
23	630	5.4	607	4.5	607	4.4	579	2.7	583	2.6
22	624	5.1	603	4.4	602	4.2	576	2.6	580	2.5
21	619	4.9	599	4.2	598	4.0	573	2.5	577	2.4
20	614	4.8	595	4.1	594	3.9	570	2.4	574	2.3
19	609	4.6	592	4.0	590	3.8	567	2.2	571	2.1
18	605	4.4	588	3.9	586	3.7	564	2.1	568	2.0
17	600	4.2	583	3.7	582	3.6	561	2.0	565	1.9
16	595	4.0	579	3.5	578	3.5	558	1.9	562	1.8
15	591	3.9	575	3.5	573	3.3	554	1.7	559	1.7
14	586	3.7	571	3.3	569	3.2	551	1.6	555	1.5
13	581	3.6	566	3.2	565	3.1	547	1.5	551	1.4
12	576	3.4	562	3.0	560	2.9	543	1.3	547	1.2
11	571	3.3	557	2.9	555	2.7	539	1.2	543	1.1
10	568	3.1	552	2.7	550	2.5	534	1.0	539	1.0
9	560	2.9	546	2.5	544	2.3	530	K.9	5[illegible]4	K.8
8	554	2.7	540	2.2	539	2.1	524	K.7	529	K.6
7	548	2.6	534	2.0	532	1.9	519	K.5	523	K.5
6	541	2.4	527	1.8	525	1.8	512	K.3	517	K.3
5	533	2.1	519	1.6	517	1.5	505	K.1	510	K.1
4	523	1.9	510	1.4	508	1.3	496	PK	501	PK
3	512	1.6	498	1.1	496	1.1	485	PK	490	PK
2	496	1.2	482	K.9	480	K.9	469	PK	475	PK
1	470	K.8	456	K.6	455	K.6	444	PK	449	PK

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Score Conversion Table
Stanford Achievement Test (7th Edition)
Raw Score (Number Correct) to Scaled Score and Grade Equivalents

No. Right	Word Study Skills SS	Word Study Skills GE	Reading Cmprhnsn SS	Reading Cmprhnsn GE	Vocabulary SS	Vocabulary GE	Listening Cmprhnsn SS	Listening Cmprhnsn GE	Spelling SS	Spelling GE	Language SS	Language GE
60	783	PHS	805	PHS								
59	761	PHS	782	PHS								
58	735	PHS	756	PHS								
57	720	PHS	741	PHS								
56	709	PHS	730	PHS								
55	700	PHS	721	PHS								
54	693	12.3	713	PHS								
53	687	11.5	706	12.1							796	PHS
52	681	10.7	700	11.2							774	PHS
51	676	10.1	695	10.6							748	PHS
50	671	9.5	690	10.0					798	PHS	733	PHS
49	667	9.0	685	9.4					775	PHS	722	PHS
48	662	8.4	681	9.0					749	PHS	713	PHS
47	659	8.0	677	8.6					734	PHS	706	12.3
46	655	7.5	673	8.2					723	11.7	699	11.2
45	651	7.1	669	7.8					714	10.7	693	10.4
44	648	6.8	665	7.5					706	9.8	688	9.7
43	645	6.5	661	7.1					700	9.2	683	9.0
42	642	6.2	658	6.9					694	8.7	679	8.5
41	639	5.9	655	6.6					689	8.3	674	7.9
40	636	5.7	651	6.3			785	PHS	684	7.9	670	7.4
39	633	5.4	648	6.1			761	PHS	679	7.4	666	7.0
38	630	5.2	645	5.9			735	PHS	675	7.1	663	6.7
37	627	4.9	642	5.7			719	PHS	671	6.8	659	6.4
36	624	4.7	639	5.5	782	PHS	706	PHS	667	6.6	656	6.1
35	622	4.6	636	5.2	758	PHS	696	11.4	663	6.3	652	5.8
34	619	4.3	633	5.0	732	PHS	688	10.1	660	6.1	649	5.5
33	616	4.1	630	4.9	716	11.6	680	9.8	656	5.9	646	5.3
32	614	4.0	627	4.7	704	10.2	674	8.1	653	5.7	643	5.0
31	611	3.9	624	4.5	694	9.2	667	7.4	649	5.5	639	4.8
30	608	3.8	621	4.3	686	8.5	662	6.9	646	5.3	636	4.7
29	606	3.7	618	4.2	678	7.9	656	6.3	643	5.1	633	4.5
28	603	3.6	615	4.0	671	7.3	651	5.8	639	4.9	630	4.3
27	601	3.6	612	3.9	665	6.9	646	5.4	636	4.8	627	4.2
26	598	3.5	609	3.8	659	6.5	641	5.0	633	4.7	624	4.1
25	595	3.4	606	3.7	654	6.1	636	4.7	630	4.6	621	4.0
24	593	3.3	603	3.6	648	5.7	631	4.4	627	4.5	618	3.9
23	590	3.2	600	3.5	643	5.4	627	4.2	623	4.3	615	3.8
22	587	3.1	597	3.4	638	5.1	622	3.9	620	4.2	612	3.8
21	584	3.0	593	3.2	633	4.8	618	3.7	617	4.1	609	3.7
20	581	2.9	590	3.1	628	4.5	613	3.4	614	4.0	605	3.6
19	578	2.9	587	3.0	624	4.3	609	3.2	610	3.9	602	3.5
18	575	2.8	584	3.0	619	4.0	604	3.0	607	3.8	599	3.4
17	572	2.7	580	2.9	614	3.8	600	2.9	603	3.7	595	3.3
16	569	2.7	577	2.8	609	3.6	595	2.7	600	3.6	592	3.3
15	566	2.6	573	2.8	604	3.4	591	2.5	596	3.5	588	3.2
14	562	2.5	569	2.7	599	3.1	586	2.3	592	3.4	584	3.1
13	558	2.4	565	2.6	594	2.9	581	2.1	588	3.3	581	3.0
12	555	2.4	561	2.5	588	2.7	576	2.0	584	3.2	576	3.0
11	550	2.2	557	2.5	583	2.5	571	1.8	579	3.1	572	2.9
10	546	2.1	552	2.4	577	2.3	565	1.6	574	3.0	567	2.8
9	541	2.1	547	2.3	571	2.1	559	1.4	569	2.9	563	2.8
8	536	2.0	542	2.2	564	1.8	553	.1	563	2.9	557	2.7
7	530	1.9	536	2.1	557	1.6	546	K.9	557	2.8	551	2.6
6	524	1.9	529	2.0	548	1.2	538	K.6	550	2.7	545	2.5
5	516	1.8	521	1.9	539	K.9	530	K.3	542	2.6	537	2.4
4	507	1.7	512	1.8	528	K.6	520	K.0	533	2.4	528	2.3
3	496	1.6	501	1.7	515	K.1	508	PK	521	2.3	517	2.1
2	481	1.4	486	1.6	497	PK	491	PK	506	2.1	501	1.9
1	455	1.1	460	1.3	469	PK	465	PK	480	1.8	476	1.5

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Score Conversion Table
Stanford Achievement Test (7th Edition)
Raw Score (Number Correct) to Scaled Score and Grade Equivalents

No. Right	CONCEPTS OF NUMBER SS	CONCEPTS OF NUMBER GE	MATH COMPUTATN SS	MATH COMPUTATN GE	MATH APPLICATNS SS	MATH APPLICATNS GE	SOCIAL SCIENCE SS	SOCIAL SCIENCE GE	SCIENCE SS	SCIENCE GE
60							793	PHS	794	PHS
59							770	PHS	771	PHS
58							745	PHS	746	PHS
57							[illegible]	PHS	731	PHS
56							719	PHS	720	PHS
55							710	11.8	711	12.7
54							703	11.0	703	11.7
53							696	10.2	697	11.0
52							691	9.7	691	10.3
51							686	9.3	686	9.8
50							681	8.8	681	9.2
49							677	8.5	[illegible]	8.8
48							673	8.2	[illegible]	[illegible]
47							669	7.9	669	[illegible]
46							665	7.6	665	7.8
45							662	7.3	662	7.5
44			807	PHS			658	7.0	658	7.2
43			783	PHS			655	6.8	655	6.9
42			757	PHS			652	6.6	652	6.7
41			740	PHS			649	6.4	649	6.4
40			728	12.4	795	PHS	646	6.2	646	6.2
39			718	11.1	771	PHS	643	6.0	643	5.9
38			710	10.2	745	PHS	640	5.8	640	5.7
37			702	9.5	730	PHS	637	5.6	637	5.5
36			696	9.0	718	11.6	634	5.4	634	5.3
35			690	8.6	709	10.6	632	5.2	631	5.0
34	791	PHS	684	8.1	701	9.9	629	5.0	628	4.9
33	767	PHS	679	7.8	694	9.3	626	4.9	626	4.7
32	741	PHS	674	7.5	687	8.7	623	4.7	623	4.5
31	725	12.1	669	[illegible]	682	8.3	620	4.5	620	4.4
30	712	10.5	664	6.9	676	7.9	618	4.4	617	4.2
29	703	[illegible]	660	6.7	671	7.6	615	4.2	615	4.1
28	694	9.0	656	6.5	666	7.2	612	[illegible]	612	3.9
27	687	8.5	652	6.3	662	7.0	609	3.9	609	3.8
26	680	8.0	[illegible]	6.1	657	6.7	607	3.9	606	3.6
25	673	7.6	644	5.9	653	6.5	604	3.7	604	3.6
24	667	[illegible]	640	5.8	649	6.3	601	3.6	601	3.4
23	662	7.0	636	5.6	645	6.1	598	3.5	598	3.3
22	656	6.7	632	[illegible]	641	5.9	595	3.4	595	3.1
21	651	6.4	628	5.3	637	5.7	592	3.3	592	3.0
20	646	6.2	624	5.2	633	5.5	589	3.1	[illegible]	2.9
19	641	5.9	620	5.0	629	5.3	586	3.0	586	2.8
18	636	5.7	617	[illegible]	625	5.1	583	2.9	583	2.6
17	631	5.5	613	4.9	621	4.9	579	2.7	579	2.5
16	626	5.2	609	4.6	617	4.8	576	2.6	576	2.4
15	621	5.0	605	4.5	613	4.6	572	2.4	572	2.2
14	616	4.8	600	4.3	609	4.5	568	2.3	569	2.1
13	611	4.6	596	4.1	604	4.3	564	2.1	565	1.9
12	606	4.4	591	4.0	600	4.1	560	2.0	561	1.8
11	600	[illegible]	587	3.8	595	4.0	556	1.8	556	1.6
10	595	4.0	582	3.7	590	3.8	551	1.6	552	1.4
9	589	3.8	576	3.5	585	3.7	546	1.4	547	1.2
8	582	3.6	570	3.3	579	3.5	541	1.2	541	1.0
7	576	3.4	564	3.1	573	3.3	535	1.0	536	K.9
6	568	3.2	557	2.9	566	3.1	528	K.8	529	K.6
5	560	2.9	549	2.6	558	2.8	520	K.6	521	K.4
4	550	2.6	540	2.2	549	2.5	511	K.3	512	K.1
3	538	2.3	528	1.9	538	2.1	500	PK	501	PK
2	522	1.8	512	1.4	522	1.7	484	PK	485	PK
1	496	1.2	486	K.9	496	1.1	459	PK	460	PK

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Score Conversion Table
Stanford Achievement Test (7th Edition)
Raw Score (Number Correct) to Scaled Score and Grade Equivalents

No Right	READING CMPRHNSN SS	READING CMPRHNSN GE	VOCABULAR SS	VOCABULAR GE	LISTENING CMPRHNSN SS	LISTENING CMPRHNSN GE	SPELLING SS	SPELLING GE	LANGUAGE SS	LANGUAGE GE	CONCEPTS OF NUMBER SS	CONCEPTS OF NUMBER GE
60	827	PHS										
59	804	PHS							822	PHS		
58	779	PHS							798	PHS		
57	763	PHS							774	PHS		
56	752	PHS							759	PHS		
55	743	PHS							748	PHS		
54	736	PHS							739	PHS		
53	729	PHS							731	PHS		
52	723	PHS							725	PHS		
51	718	PHS							719	PHS		
50	713	PHS					826	PHS	714	PHS		
49	709	12.6					803	PHS	709	12.7		
48	705	12.0					778	PHS	705	12.1		
47	701	11.4					762	PHS	700	11.4		
46	697	10.9					751	PHS	696	10.8		
45	693	10.4					742	PHS	693	10.4		
44	690	10.0					734	PHS	689	9.8		
43	686	9.5					728	12.2	685	9.2		
42	683	9.2					722	11.5	682	8.9		
41	680	8.9					716	10.9	679	8.5		
40	677	8.6	824	PHS	804	PHS	711	10.3	676	8.1		
39	674	8.3	800	PHS	780	PHS	707	9.9	673	7.8		
38	671	8.0	774	PHS	754	PHS	702	9.4	670	7.4		
37	668	7.7	758	PHS	738	PHS	698	9.0	667	7.1		
36	665	7.5	746	PHS	726	PHS	694	8.7	664	6.8		
35	662	7.2	736	PHS	716	PHS	690	8.4	661	6.6		
34	659	6.9	728	PHS	708	PHS	686	8.0	658	6.3	823	PHS
33	657	6.8	721	12.2	700	12.1	683	7.8	655	6.0	800	PHS
32	654	6.6	714	11.3	694	11.1	679	7.4	652	5.8	774	PHS
31	651	6.3	708	10.7	688	10.1	675	7.1	649	5.5	758	PHS
30	648	6.1	702	10.0	682	9.1	672	6.9	647	5.4	746	PHS
29	645	5.9	697	9.5	677	8.5	669	6.7	644	5.1	736	PHS
28	643	5.7	691	8.9	672	7.9	665	6.4	641	4.9	728	12.5
27	640	5.5	686	8.5	[illegible]	7.4	662	6.2	638	4.8	721	11.6
26	637	5.3	682	8.2	662	6.9	659	6.0	635	4.6	714	10.8
25	634	5.1	677	7.8	657	6.4	655	5.8	633	4.5	708	10.1
24	631	4.9	672	7.4	653	6.0	652	5.6	630	4.3	702	9.6
23	628	4.7	668	7.1	648	5.6	649	5.5	627	4.2	697	9.2
22	626	4.6	663	6.7	644	5.3	645	5.2	624	4.1	691	8.7
21	623	4.5	659	6.5	640	5.0	642	5.1	621	4.0	686	8.4
20	620	4.3	654	6.1	635	4.7	638	4.9	618	3.9	681	8.0
19	616	4.1	650	5.8	631	4.4	635	4.8	615	3.8	676	7.7
18	613	4.0	645	5.5	627	4.2	631	4.6	611	3.7	671	7.5
17	610	3.8	641	5.3	623	3.9	628	4.5	608	3.7	666	7.2
16	607	3.7	636	5.0	618	3.7	624	4.3	605	3.6	662	7.0
15	603	3.6	631	4.7	614	3.5	620	4.2	601	3.5	657	6.7
14	599	3.4	626	4.4	609	3.2	616	4.0	597	3.4	652	6.5
13	596	3.3	621	4.1	604	3.0	612	3.9	594	3.3	647	6.2
12	592	3.2	616	3.9	599	2.8	608	3.8	590	3.2	641	5.9
11	587	3.0	610	3.6	594	2.6	603	3.7	585	3.1	636	5.7
10	583	3.0	604	3.4	589	2.4	598	3.6	581	3.0	630	5.4
9	578	2.9	597	3.1	583	2.2	593	3.4	576	3.0	624	5.1
8	573	2.8	590	2.0	577	2.0	588	3.3	570	2.9	618	4.9
7	567	2.7	583	2.5	570	1.7	582	3.2	564	2.8	611	4.6
6	560	2.5	574	2.2	563	1.5	575	3.0	558	2.7	604	4.4
5	553	2.4	564	1.8	554	1.2	567	2.9	550	2.6	595	4.0
4	544	2.2	553	1.4	544	K.8	558	2.8	541	2.5	585	3.7
3	533	2.0	538	K.9	532	K.4	547	2.6	530	2.3	573	3.3
2	517	1.9	519	K.3	515	PK	531	2.4	514	2.1	557	2.8
1	492	1.6	488	PK	488	PK	505	2.1	488	1.7	530	2.0

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Score Conversion Table
Stanford Achievement Test (7th Edition)
Raw Score (Number Correct) to Scaled Score and Grade Equivalents

No. Right	Math Computatn SS	Math Computatn GE	Math Applicatns SS	Math Applicatns GE	Social Science SS	Social Science GE	Science SS	Science GE
60					812	PHS	816	PHS
59					789	PHS	793	PHS
58					764	PHS	768	PHS
57					749	PHS	763	PHS
56					738	PHS	742	PHS
55					729	PHS	733	PHS
54					721	PHS	726	PHS
53					715	12.5	720	PHS
52					709	11.7	714	PHS
51					704	11.1	709	12.6
50					699	10.5	704	11.8
49					695	10.1	700	11.3
48					691	9.7	696	10.9
47					687	9.4	692	10.4
46					683	9.0	688	10.0
45					679	8.7	685	9.7
44	847	PHS			676	8.4	681	9.2
43	824	PHS			672	8.1	678	8.9
42	798	PHS			669	7.9	675	8.6
41	782	PHS			666	7.6	672	8.4
40	771	PHS	836	PHS	663	7.4	669	8.1
39	761	PHS	813	PHS	660	7.2	666	7.9
38	754	PHS	787	PHS	657	7.0	663	7.6
37	747	PHS	771	PHS	654	6.7	661	7.4
36	740	PHS	760	PHS	651	6.5	658	7.2
35	735	PHS	750	PHS	648	6.3	655	6.9
34	729	12.5	742	PHS	646	6.2	653	6.8
33	724	11.9	735	PHS	643	6.0	650	6.5
32	720	11.4	729	12.9	640	5.8	647	6.3
31	715	10.8	723	12.2	637	5.6	645	6.1
30	711	10.3	718	11.6	634	5.4	642	5.9
29	707	9.8	713	11.0	632	5.2	639	5.6
28	702	9.5	708	10.5	629	5.0	637	5.5
27	698	9.2	703	10.0	626	4.9	634	5.3
26	694	8.9	699	9.7	623	4.7	631	5.0
25	690	8.6	695	9.4	620	4.5	628	4.9
24	687	8.3	690	8.9	618	4.4	626	4.7
23	683	8.0	686	8.6	615	4.2	623	4.5
22	679	7.8	682	8.3	612	4.1	620	4.4
21	675	7.5	678	8.0	609	3.9	617	4.2
20	671	7.3	674	7.8	606	3.8	614	4.0
19	667	7.1	670	7.5	603	3.7	611	3.9
18	663	6.9	666	7.2	599	3.5	608	3.7
17	659	6.7	662	7.0	596	3.4	605	3.6
16	654	6.4	658	6.8	593	3.3	602	3.5
15	650	6.2	654	6.6	589	3.1	598	3.3
14	645	6.0	650	6.4	586	3.0	595	3.1
13	641	5.8	645	6.1	582	2.9	591	3.0
12	636	5.6	641	5.9	578	2.7	587	2.8
11	631	5.4	636	5.7	573	2.5	583	2.6
10	626	5.3	631	5.4	569	2.3	578	2.4
9	620	5.0	626	5.2	564	2.1	573	2.2
8	614	4.8	620	4.9	559	1.9	566	2.0
7	606	4.6	614	4.7	553	1.7	562	1.8
6	600	4.3	607	4.4	546	1.4	556	1.6
5	592	4.0	599	4.1	539	1.2	548	1.3
4	582	3.7	589	3.8	530	K.9	539	1.0
3	570	3.3	578	3.5	519	K.5	528	K.6
2	554	2.7	562	3.0	503	K.0	513	K.1
1	528	1.9	536	2.0	478	PK	488	PK

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PERCENTILE RANKS:
An Age-Based Comparison to Hearing-Impaired Students
in the Norm Sample
1982 Stanford Achievement Test, Special Procedures

Interpreting Percentile Ranks for Hearing-Impaired Students Administered the 1982 Stanford Achievement Test

Before using the age-based percentile ranks contained later in this brochure, the teacher or test administrator should review the following paragraphs regarding percentile ranks.

Percentile ranks for hearing-impaired students are computed within the various age groups of hearing-impaired students. For example, a percentile of 50 in Reading Comprehension for a ten-year-old means that the student's Reading Comprehension achievement is at or better than the Reading Comprehension achievement level of 50 percent of all ten-year-old hearing-impaired students in the 1983 norming sample. **The percentiles are computed across all levels of the test**, i.e., each age group contains students who took different levels of the test. In designing the sample, a large amount of effort went into assuring that the resulting norms would represent the entire population of hearing-impaired students at given ages and would be accurate to within three percentage points. Thus, when you see a 50 printed as a ten-year-old student's percentile rank, you can be assured that, if the test had been given to all ten-year-old hearing-impaired students in the country, the student's true percentile rank would fall between 47 and 53.

There are three important pieces of information that you need to be aware of before you study the percentile ranks of your students: 1) not all subtest areas are contained in all six battery level booklets, and this greatly influences the percentile values; 2) some subtests were defined as "optional" subtests, and the norms may not represent all students at a given age; and 3) special norms have been computed for Mathematics Computation and Applications at the Primary 1 level.

These facts are discussed more fully below.

Special Note #1: Norms for subtests not appearing at all levels.

The following subtests are administered **at all six levels** of the Stanford:

(1)

Reading Comprehension	Math Computation
Spelling	Math Applications
Concepts of Number	

The following subtests are administered **only at the levels indicated**:

(2)

P1 and P2 Only	P3 thru Advanced
Word Reading	Language
Environment	Social Science
Reading (Combined Word Reading and Reading Comprehension)	

(These lists do not include subtests which were not normed for hearing-impaired students at all, i.e., Vocabulary, Word Study Skills, and Listening Comprehension.)

Percentile ranks for subtest areas in the second category above should be interpreted carefully. These subtests are not offered at all levels. Since students in the norming sample were assigned to test levels on the basis of a screening test, it is inevitable that the norming groups for these tests did not contain all students at a given age. This may result in discrepant percentiles. For example, a possible result would be a nine-year-old student scoring in the 44th percentile for Reading Comprehension and 60th percentile for Word Reading. Since Reading Comprehension is tested at all levels of the Stanford, the 44th percentile is an accurate placement for that student among **all** nine-year-olds. However, only students who were assigned by the screening test to the Primary 1 and Primary 2 levels of the test were included in the norming sample for the Word Reading norms. Thus, we expect a higher percentile rank, because the population is limited to students assigned to the lower two levels of the test.

Special Note #2: "Required" vs "Optional" subtests.

In the norming project, not all subtests were required because curriculum differences may have rendered some of the tests inappropriate for certain groups of students. (Again, remember that Listening Comprehension, Word Study Skills, and Vocabulary were not normed.) The following subtests were **required**:

- Word Reading
- Reading Comprehension
- Concepts of Number
- Math Computation
- Spelling
- Language

The following subtests were declared **optional**:

- Environment
- Math Applications
- Science
- Social Science

Interpreting norms from these optional subtests should also be done with some caution. For the **required** subtests, a percentile of 50 means that the student performed equal to or better than 50 percent of **all** students at that age level. For the **optional** subtests, the interpretation is slightly different. A percentile of 50 for these subtests means that the student performed equal to or better than 50 percent of all **students who attended programs that chose to administer this subtest**. You can assume that this subsample has meaning in its own right, since the decision to administer a subtest has some relationship to a program's curriculum. Thus, if you consider the subtest appropriate for your students, the norms you will obtain will compare your students' performance to students from other programs that have also determined the subtest to be appropriate.

As you can see, there are only a few subtests for which the norms can be interpreted without qualification. These include: Reading Comprehension, Spelling, Concepts of Numbers, and Mathematics Computation. Administration of these subtests was required of the norming sample, and these subtests are included at all levels of the test. For these subtests only, percentiles may be interpreted without considering the level of the test taken.

Special Note #3: Special Scores for Mathematics at Primary 1.

At the Primary 1 level, Mathematics Computation and Applications are combined into one subtest. This is a reasonable practice for **hearing** students whose performance on the separate sections of the test typically does not differ. However, hearing-impaired students often show large differences between their computation and applications performance at that level. It was determined that using the single scaled score provided by the publisher at Primary 1 for computing the norms for both Math Computation and Applications was not appropriate, since this value often underestimates a student's computational ability and overestimates a student's math applications ability.

We have devised a way to estimate separate scaled scores for Computation and Applications, based on statistical information about these scales provided to us by the test publisher and on a separate analysis of the student's performance on the respective Computation and Applications items contained in the Primary 1 test. Thus, you will be able to obtain separate scaled scores and separate percentile ranks for the Math Computation and Math Applications parts of the Primary 1 level test, even though in the test booklet the two parts are printed as **one** subtest.

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STANFORD ACHIEVEMENT TEST: Norms for Hearing-Impaired Students AGE = 8

PCTILE	Normed for all levels: READING CMPRHNSN P1-AD	SPELLING P1-AD	CONCEPTS OF NUMBER P1-AD	MATH CMPUTATN P1-AD	MATH APPLICATNS P1-AD	Normed for indicated levels only: WORD READING P1,P2	LANGUAGE P3-AD	SOCIAL SCIENCE P3-AD	SCIENCE P3-AD	PCTILE
99	648-827	688-826	636-823	656-847	609-826	598-671	INCOMPLETE DATA	INCOMPLETE DATA	INCOMPLETE DATA	99
98	638-647	676-687	629-635	655	603-608	593-597				98
97	628-637	669-675	621-628	654	594-602	582-592				97
96	622-627	660-668	613-620	653	582-593	579-581				96
95	615-621	654-659	601-612	652	575-581	576-578				95
94	610-614	644-653	595-600	650-651	565-574	573-575				94
93	604-609	632-643	593-594	643-649	563-564	568-572				93
92	598-603	623-631	589-592	640-642	556-562	563-567				92
91	591-597	619-622	583-588	630-639	550-555	557-562				91
90	585-590	614-618	576-582	622-629	544-549	551-556				90
89	581-584	608-613	572-575	617-621	542-543	549-550				89
88	579-580	603-607	567-571	610-616	540-541	548				88
87	573-578	---	563-566	609	539	54 -547				87
86	567-572	596-602	562	608	538	545				86
85	565-566	595	556-561	602-607	537	544				85
84	559-564	594	553-555	597-601	536	543				84
83	556-558	590-593	551-552	591-596	535	541-542				83
82	555	583-589	549-550	589-590	531-534	539-540				82
81	553-554	581-582	547-548	588	529-530	537-538				81
80	552	---	544-546	587	528	536				80
79	551	---	543	585-586	527	---				79
78	545-550	578-580	542	584	526	534-535				78
77	543-544	576-577	541	582-583	523-525	532-533				77
76	541-542	573-575	540	580-581	520-522	529-531				76
75	540	569-572	535-539	574-579	519	528				75
74	538-539	568	534	570-573	---	526-527				74
73	537	567	533	569	518	524-525				73
72	536	562-566	---	---	---	523				72
71	533-535	557-561	529-532	---	517	---				71
70	---	555-556	527-528	---	516	522				70
69	532	552-554	526	---	---	521				69
68	527-531	---	---	---	512-515	520				68
67	524-526	---	525	567-568	511	519				67
66	522-523	550-551	---	561-566	---	518				66
65	520-521	548-549	519-524	558-560	---	514-517				65
64	519	539-547	518	554-557	---	---				64
63	517-518	535-538	516-517	553	509-510	---				63
62	514-516	534	515	---	504-508	---				62
61	512-513	532-533	514	552	503	---				61
60	510-511	531	512-513	---	---	511-513				60
59	507-509	527-530	511	---	502	508-510				59
58	506	523-526	509-510	549-551	---	507				58
57	---	522	505-508	542-548	---	---				57
56	503-505	521	503-504	540-541	501	506				56
55	501-502	520	501-502	539	---	505				55
54	---	518-519	499-500	538	---	504				54
53	499-500	515-517	496-498	537	495-500	503				53
52	496-498	513-514	494-495	535-536	494	502				52
51	---	512	493	534	492-493	499-501				51
50	---	---	492	533	491	498				50
49	494-495	509-511	491	532	489-490	496-497	INCOMPLETE DATA	INCOMPLETE DATA	INCOMPLETE DATA	49
48	492-493	506-508	490	531	488	494-495				48
47	490-491	503-505	488-489	528-530	486-487	493				47
46	489	502	487	526-527	485	---				46
45	488	500-501	486	523-525	483-484	492				45
44	487	499	485	521-522	481-482	---				44
43	486	497-498	484	520	480	489-491				43
42	---	494-496	483	519	479	486-488				42
41	482-485	489-493	482	518	478	---				41
40	478-481	487-488	481	517	477	---				40
39	475-477	485-486	480	512-516	476	---				39
38	472-474	483-484	478-479	511	475	---				38
37	470-471	481-482	477	510	474	482-485				37
36	468-469	480	---	509	473	480-481				36
35	467	478-479	---	504-508	472	478-479				35
34	466	477	---	---	471	476-477				34
33	465	475-476	---	---	470	475				33
32	464	474	473-476	498-503	468-469	474				32
31	---	472-473	471-472	495-497	467	---				31
30	463	468-471	---	493-494	465-466	470-473				30
29	462	466-467	---	492	464	469				29
28	461	463-465	---	490-491	463	468				28
27	459-460	462	---	488-489	461-462	466-467				27
26	457-458	461	---	485-487	460	465				26
25	455-456	460	---	482-484	458-459	464				25
24	454	458-459	---	479-481	457	462-463				24
23	453	457	466-470	476-478	456	461				23
22	452	455-456	465	472-475	454-455	454-460				22
21	451	454	463-464	470-471	453	451-453				21
20	450	452-453	462	467-469	452	450				20
19	449	449-451	460-461	465-466	450-451	449				19
18	448	445-448	459	463-464	449	448				18
17	447	---	458	462	448	446-447				17
16	445-446	444	457	460-461	446-447	444-445				16
15	444	---	456	458-459	444-445	442-443				15
14	442-443	439-443	454-455	455-457	442-443	440-441				14
13	440-441	437-438	452-453	449-454	440-441	438-439				13
12	439	434-436	451	446-448	438-439	436-437				12
11	437-438	432-433	449-450	443-445	436-437	434-435				11
10	435-436	430-431	446-448	441-442	434-435	431-433				10
9	434	429	444-445	438-440	432-433	429-430				9
8	432-433	426-428	437-443	434-437	430-431	427-428				8
7	431	423-425	431-436	431-433	428-429	425-426				7
6	430	419-422	428-430	427-430	424-427	423-424				6
5	427-429	414-418	424-427	423-426	419-423	421-422				5
4	423-426	409-413	421-423	419-422	415-418	417-420				4
3	418-422	405-408	418-420	410-418	406-414	410-4.6				3
2	406-417	397-404	412-417	400-409	374-405	405-409				2
1	316-405	311-396	326-411	335-399	338-373	317-404				1

221 BEST COPY AVAILABLE

PCTILE	READING CMPRHNSN P1-AD	SPELLING P1-AD	CONCEPTS OF NUMBER P1-AD	MATH CMPUTATN P1-AD	MATH APPLICATNS P1-AD	WORD READING P1,P2	LANGUAGE P3-AD	SOCIAL SCIENCE P3-AD	SCIENCE P3-AD	
	Normed for all levels					Normed for indicated levels only				
99	665-827	718-826	661-823	684-847	640-836	593-671	INCOMPLETE DATA	INCOMPLETE DATA	INCOMPLETE DATA	99
98	646-664	697-717	650-660	667-683	633-639	586-592				98
97	638-645	687-696	638-649	662-666	613-632	581-585				97
96	632-637	674-686	634-637	656-661	608-612	578-580				96
95	621-631	666-673	627-633	655	597-607	577				95
94	618-620	657-665	620-626	654	592-596	576				94
93	612-617	653-656	614-619	---	583-591	575				93
92	606-611	650-652	613	653	580-582	573-574				92
91	604-605	645-649	606-612	---	578-579	570-572				91
90	600-603	638-644	601-605	652	574-577	567-569				90
89	598-599	637	599-600	650-651	566-573	563-568				89
88	593-595	634-636	597-598	643-649	564-565	559-562				88
87	589-592	631-633	595-596	640-642	560-563	555-558				87
86	586-588	628-630	592-594	637-639	559	552-554				86
85	582-585	621-625	591	632-636	555-558	---				85
84	579-581	618-620	583-590	---	550-554	---				84
83	574-578	613-617	580-582	628-631	---	---				83
82	572-573	612	578-579	623-627	---	551				82
81	570-571	608-611	576-577	619-622	---	549-550				81
80	567-569	605-607	575	616-618	547-549	548				80
79	565-566	603-604	573-574	614-615	545-546	546-547				79
78	563-564	---	572	610-613	541-544	543-545				78
77	561-562	602	570-571	608-609	538-540	540-542				77
76	559-560	---	568-569	604-607	536-537	539				76
75	557-558	600-601	566-567	600-603	533-535	537-538				75
74	556	597-599	563-565	599	530-532	536				74
73	555	594-596	562	597-598	529	---				73
72	554	589-593	560-561	591-596	528	---				72
71	551-553	587-588	556-559	590	527	---				71
70	---	---	555	---	---	---				70
69	546-550	582-586	552-554	589	526	535				69
68	542-545	581	551	---	523-525	532-534				68
67	541	579-580	548-550	588	520-522	529-531				67
66	539-540	578	544-547	---	519	525-528				66
65	536-538	577	542-543	586-587	518	524				65
64	532-535	574-576	541	583-585	517	523				64
63	528-531	569-573	54[illegible]	581-582	---	522				63
62	527	565-568	538-[illegible]	580	516	520-521				62
61	526	563-564	534-537	574-579	515	519				61
60	525	558-562	---	572-573	514	518				60
59	523-524	555-557	533	570-571	511-513	515-517				59
58	519-522	553-554	---	569	---	514				58
57	518	552	529-532	---	---	---				57
56	514-517	---	528	---	507-510	---				56
55	512-513	---	526-527	---	504-506	---				55
54	511	547-551	---	---	503	513				54
53	509-510	542-546	525	---	502	510-512				53
52	506-508	540-541	522-524	568	---	508-509				52
51	---	538-539	519-521	567	501	507				51
50	502-505	535-537	518	563-566	---	506				50
49	501	534	517	557-562	497-500	504-505	INCOMPLETE DATA	INCOMPLETE DATA	INCOMPLETE DATA	49
48	---	532-533	516	556	495-496	503				48
47	497-500	531	515	554-555	494	501-502				47
46	496	526-530	512-514	553	493	499-500				46
45	---	523-525	511	---	492	---				45
44	493-495	521-522	510	---	491	498				44
43	491-492	520	508-509	552	490	---				43
42	---	519	506-507	---	487-489	---				42
41	490	514-518	505	---	486	494-497				41
40	489	513	---	551	484-485	492-493				40
39	488	512	499-504	---	483	489-491				39
38	487	---	---	546-550	482	487-488				38
37	486	505-511	---	541-545	479-481	486				37
36	482-485	503-504	494-498	540	---	---				36
35	481	500-502	488-493	538-539	---	---				35
34	---	498-499	487	537	---	---				34
33	478-480	497	485-486	532-536	478	---				33
32	477	492-496	483-484	530-531	---	---				32
31	475-476	490-491	482	528-529	---	482-485				31
30	474	488-489	481	526-527	---	481				30
29	472-473	486-487	480	524-525	471-477	480				29
28	471	484-485	479	521-523	470	---				28
27	470	482-483	477-478	520	469	475-479				27
26	469	480-481	---	519	468	474				26
25	468	477-479	---	518	467	472-473				25
24	465-467	475-476	---	512-517	466	471				24
23	463-464	474	---	511	465	469-470				23
22	462	472-473	471-476	510	463-464	468				22
21	461	471	470	509	462	466-467				21
20	459-460	459-470	469	502-508	461	463-465				20
19	458	467-468	468	499-501	459-460	461-462				19
18	457	465-466	467	495-498	458	460				18
17	455-456	463-464	465-466	491-494	456-457	---				17
16	454	460-462	463-464	485-490	455	459				16
15	452-453	457-459	460-462	482-484	[illegible]-454	455-458				15
14	450-451	454-456	457-459	477-481	45[illegible]	453-454				14
13	448-449	452-453	455-456	472-476	450-451	451-452				13
12	447	449-451	453-454	468-471	449	450				12
11	444-446	447-448	451-452	464-467	448	448-449				11
10	441-443	442-446	450	457-463	445-447	446-447				10
9	437-440	438-441	447-449	452-456	443-444	444-445				9
8	435-436	436-437	445-446	447-451	440-442	442-443				8
7	432-434	434-435	442-444	444-446	438-439	439-441				7
6	430-431	432-433	440-441	441-443	437	437-438				6
5	422-429	429-431	438-439	435-440	---	434-436				5
4	417-421	425-428	436-437	429-434	424-436	431-433				4
3	410-416	419-424	434-435	419-428	418-423	426-430				3
2	366-409	410-418	432-433	394-418	401-417	418-425				2
1	316-365	311-409	326-431	335-393	338-400	317-417				1

AGE 10

STANFORD ACHIEVEMENT TEST: Norms for Hearing-Impaired Students AGE = 10

PCTILE	READING CMPRHNSN P1-AD	SPELLING P1-AD	CONCEPTS OF NUMBER P1-AD	MATH CMPUTATN P1-AD	MATH APPLICATNS P1-AD	WORD READING P1,P2	LANGUAGE P3-AD	SOCIAL SCIENCE P3-AD	SCIENCE P3-AD	
	--Normed for all levels--					--Normed for indicated levels only--				
99	[illegible]1-827	723-826	683-823	718-847	650-836	601-671	INCOMPLETE DATA	INCOMPLETE DATA	INCOMPLETE DATA	99
98	[illegible]0-690	718-722	673-682	711-717	645-649	597-600				98
97	663-669	701-717	664-672	690-710	640-644	593-596				97
96	654-662	695-700	653-663	687-689	633-639	586-592				96
95	641-653	691-694	644-652	681-686	627-632	581-585				95
94	635-640	685-690	639-643	675-680	620-626	579-580				94
93	632-634	677-684	634-638	672-674	618-619	577-578				93
92	629-631	676	630-633	670-671	614-617	576				92
91	624-628	674-675	629	668-669	607-613	573-575				91
90	619-623	667-673	62[illegible]-628	666-667	602-606	568-572				90
89	615-618	665-666	621-626	662-665	600-601	565-567				89
88	611-614	659-664	617-620	---	594-599	563-564				88
87	609-610	654-658	613-616	661	588-593	561-562				87
86	605-608	---	611-612	656-660	583-587	559-560				86
85	602-604	652-653	607-610	655	581-582	557-558				85
84	598-601	651	606	654	579-580	555-556				84
83	595-597	650	---	653	---	553-554				83
82	591-594	644-649	605	---	577-578	552				82
81	588-590	643	601-604	652	574-576	---				81
80	586-587	637-642	599-600	649-651	571-573	---				80
79	585	634-636	597-598	646-648	570	---				79
78	583-584	631-633	595-596	644-645	566-569	551				78
77	581-582	628-630	---	642-643	583-565	550				77
76	579-580	624-627	592-594	640-641	---	549				76
75	578	620-623	589-591	638-639	561-562	547-548				75
74	573-577	617-619	583-588	637	559-560	545-546				74
73	571-572	613-616	582	636	556-558	541-544				73
72	568-570	612	578-581	631-635	552-555	539-540				72
71	567	609-611	577	629-630	550-551	537-538				71
70	566	604-608	576	626-628	549	536				70
69	565	603	575	625	548	---				69
68	---	---	572-574	623-624	547	---				68
67	563-564	602	---	622	546	---				67
66	561-562	---	---	619-621	545	---				66
65	559-560	601	568-571	617-618	542-544	534-535				65
64	557-558	599-600	567	616	540-541	532-533				64
63	556	596-598	---	614-615	---	530-531				63
62	554-555	595	563-566	609-613	538-539	529				62
61	552-553	591-594	561-562	605-608	537	527-528				61
60	550-551	587-590	---	604	536	526				60
59	549	---	557-560	600-603	535	525				59
58	546-548	585-586	556	598-599	---	524				58
57	545	580-584	552-555	595-597	533-534	523				57
56	544	579	551	593-594	531-532	522				56
55	541-543	577-578	550	591-592	530	521				55
54	539-540	574-576	548-549	590	529	520				54
53	537-538	571-573	546-547	---	---	---				53
52	536	569-570	544-545	589	528	519				52
51	533-535	565-568	542-543	---	---	516-518				51
50	531-532	559-564	---	588	527	514-515				50
49	525-530	554-558	541	---	526	---	INCOMPLETE DATA	INCOMPLETE DATA	INCOMPLETE DATA	49
48	524	552-553	538-540	583-587	---	---				48
47	521-523	---	537	580-582	520-525	---				47
46	519-520	---	535-536	577-579	519	510-513				46
45	518	---	534	574-576	517-518	507-509				45
44	515-517	549-551	533	571-573	515-516	506				44
43	513-514	547-548	---	570	511-514	505				43
42	512	542-546	529-532	569	510	504				42
41	510-511	538-541	527-528	---	---	503				41
40	506-509	535-537	526	---	509	---				40
39	---	534	525	---	508	501-502				39
38	503-505	532-533	522-524	568	505-507	499-500				38
37	501-502	531	519-521	563-567	503-504	---				37
36	500	529-530	518	560-562	---	498				36
35	498-499	527-528	516-517	558-559	502	---				35
34	496-497	524-526	515	556-557	501	497				34
33	---	522-523	514	554-555	495-500	493-496				33
32	493-495	521	512-513	553	494	490-492				32
31	490-492	519-520	---	---	493	488-489				31
30	489	515-518	511	552	492	486-487				30
29	487-488	513-514	510	---	490-491	---				29
28	---	512	507-509	551	489	---				28
27	486	---	505-506	544-550	488	481-485				27
26	---	506-511	504	540-543	487	---				26
25	482-485	504-505	499-503	538-539	486	480				25
24	481	501-503	---	536-537	485	---				24
23	478-480	498-500	493-498	533-535	482-484	478-479				23
22	475-477	493-497	491-492	530-532	479-481	475-477				22
21	471-474	489-492	489-490	529	---	---				21
20	469-470	485-488	487-488	526	478	474				20
19	465-468	482-484	484-486	525-527	---	471-473				19
18	463-464	480-481	482-483	519-524	471-477	469-470				18
17	462	478-479	481	514-518	469-470	468				17
16	460-461	476-477	480	512-513	467-468	466-467				16
15	458-459	474-475	478-479	511	466	464-465				15
14	457	470-473	477	---	463-465	462-463				14
13	455-456	466-469	471-476	503-510	461-462	460-461				13
12	453-454	461-465	468-470	498-502	458-460	459				12
11	452	456-460	465-467	495-497	455-457	457-458				11
10	451	453-455	462-464	494	451-454	456				10
9	447-450	448-452	459-461	486-493	447-450	454-455				9
8	445-446	444-447	457-458	479-485	444-446	451-453				8
7	443-444	441-443	454-456	471-478	441-443	447-450				7
6	438-442	437-440	450-453	458-470	438-440	443-446				6
5	435-437	429-436	445-449	452-457	437	439-442				5
4	432-434	424-428	441-444	446-451	424-436	431-438				4
3	427-431	421-423	430-440	432-445	414-423	427-430				3
	414-426	418-420	419-429	408-431	396-413	419-426				2
	316-413	311-417	326-418	335-407	338-395	317-418				

AGE
11

	Normed for all levels					Normed for indicated levels only				
PCTILE	READING CMPRHNSN P1-A0	SPELLING P1-A0	CONCEPTS OF NUMBER P1-A0	MATH CMPUTATN P1-A0	MATH APPLICATNS P1-A0	WORD READING P1,P2	LANGUAGE P3-A0	SOCIAL SCIENCE P3-A0	SCIENCE P3-A0	
99	678-827	737-826	681-823	723-847	660-836	600-671	I	I	I	99
98	660-677	722-736	672-680	714-722	651-659	597-599	N	N	N	98
97	653-659	713-721	660-671	707-713	639-650	594-596	C	C	C	97
96	648-652	704-712	656-659	699-706	634-638	590-593	O	O	O	96
95	642-647	694-703	651-655	693-698	630-633	585-589	M	M	M	95
94	638-641	693	643-650	690-692	625-629	581-584	P D	P D	P D	94
93	635-637	691-692	640-642	689	623-624	578-580	L A	L A	L A	93
92	632-634	684-690	637-639	685-688	620-622	577	E T	E T	E T	92
91	630-631	681-683	634-636	677-684	618-619	576	T A	T A	T A	91
90	626-629	677-680	631-633	674-676	615-617	575	E	E	E	90
89	624-625	---	630	673	614	571-574				89
88	620-623	676	625-629	---	610-613	566-570				88
87	619	---	623-624	672	602-609	564-565				87
86	615-618	669-675	622	667-671	601	563				86
85	612-614	665-668	621	---	600	561-562				85
84	609-611	664	620	663-666	598-599	559-560				84
83	605-608	657-663	619	662	594-597	557-558				83
82	603-604	654-656	615-618	658-661	592-593	555-556				82
81	601-602	653	613-614	656-657	589-591	553-554				81
80	598-600	650-652	612	---	586-588	552				80
79	597	648-649	609-611	654-655	582-585	---				79
78	595-596	645-647	608	653	580-581	550-551				78
77	593-594	643-644	606-607	652	578-579	549				77
76	590-592	641-642	---	---	576-577	548				76
75	588-589	638-640	604-605	649-651	573-575	546-547				75
74	587	637	601-603	645-648	571-572	544-545				74
73	585-586	636	599-600	643-644	569-570	541-543				73
72	583-584	635	597-598	642	566-568	540				72
71	580-582	632-634	595-596	641	---	539				71
70	579	630-631	---	640	564-565	538				70
69	578	629	593-594	637-639	563	537				69
68	577	624-628	591-592	---	562	536				68
67	575-576	623	589-590	636	560-561	---				67
66	573-574	621-622	588	632-635	559	---				66
65	571-572	618-620	587	---	558	535				65
64	570	614-617	585-586	631	556-557	534				64
63	567-569	612-613	582-584	629-630	554-555	532-533				63
62	566	---	---	626-628	---	530-531				62
61	565	610-611	580-581	625	551-553	528-529				61
60	561-564	603-609	577-579	623-624	550	526-527				60
59	559-560	---	576	---	548-549	525				59
58	557-558	---	575	620-622	546-547	524				58
57	555-556	602	572-574	618-619	545	523				57
56	551-554	---	571	617	---	522				56
55	550	599-601	569-570	615-616	543-544	---				55
54	547-549	595-598	567-568	613-614	540-542	521				54
53	546	593-594	---	611-612	539	520				53
52	541-545	591-592	---	610	---	519				52
51	539-540	587-590	564-566	608-609	535-538	---				51
50	537-538	---	562-563	607	529-534	517-518				50
49	---	---	561	604-606	528	515-516	I	I	I	49
48	536	581-586	557-560	603	527	514	N	N	N	48
47	533-535	---	556	600-602	526	---	C	C	C	47
46	531-532	---	555	598-599	524-525	---	O	O	O	46
45	528-530	579-580	552-554	597	522-523	---	M	M	M	45
44	526-527	577-578	551	594-596	520-521	512-513	P D	P D	P D	44
43	525	575-576	---	593	519	511	L A	L A	L A	43
42	524	573-574	549-550	590-592	---	509-510	E T	E T	E T	42
41	522-523	568-572	547-548	---	518	508	T A	T A	T A	41
40	520-521	---	545-546	589	515-517	507	E	E	E	40
39	518-519	563-567	543-544	588	511-514	506				39
38	514-517	---	542	584-587	---	505				38
37	512-513	557-562	539-541	583	---	504				37
36	510-511	553-556	538	581-582	---	503				36
35	508-509	552	535-537	578-580	509-510	502				35
34	506-507	---	534	575-577	506-508	501				34
33	505	550-551	533	573-574	504-505	499-500				33
32	503-504	545-549	530-532	571-572	503	---				32
31	501-502	540-544	526-529	569-570	502	498				31
30	500	536-539	525	---	---	---				30
29	497-499	534-535	---	---	501	497				29
28	496	532-533	524	568	500	494-496				28
27	492-495	530-531	519-523	563-567	495-499	493				27
26	490-491	523-529	514-518	556-562	493-494	---				26
25	489	522	512-513	553-555	491-492	492				25
24	488	521	510-511	---	488-490	---				24
23	486-487	520	506-509	---	487	486-491				23
22	482-485	519	505	---	486	---				22
21	---	518	---	551-552	484-485	---				21
20	481	513-517	499-504	546-550	481-483	---				20
19	477-480	---	---	541-545	478-480	484-485				19
18	474-476	512	494-498	540	476-477	482-483				18
17	473	506-511	---	538-539	474-475	479-491				17
16	471-472	503-505	490-493	537	472-473	477-478				16
15	469-470	498-502	486-489	535-536	470-471	475-476				15
14	466-468	492-497	482-485	530-534	468-469	474				14
13	465	484-491	480-481	528-529	467	---				13
12	463-464	479-483	477-479	527	465-466	469-473				12
11	461-462	475-478	471-476	521-526	463-464	467-468				11
10	459-460	473-474	---	512-520	461-462	461-466				10
9	457-458	468-472	---	510-511	458-460	457-460				9
8	454-456	465-467	466-470	504-509	456-457	454-456				8
7	451-453	461-464	464-465	497-503	455	451-453				7
6	449-450	457-460	459-463	479-496	---	449-450				6
5	447-448	453-456	456-458	474-478	---	448				5
4	443-446	449-452	451-455	464-473	442-454	446-447				4
3	437-442	444-448	444-450	452-463	432-441	442-445				3
2	431-436	437-443	435-443	436-451	421-431	432-441				2
1	316-430	311-436	326-434	335-435	338-420	317-431				1

BEST COPY AVAILABLE

AGE 12

STANFORD ACHIEVEMENT TEST: Norms for Hearing-Impaired Students AGE = 12

PCTILE	Normed for all levels: READING CMPRHNSN P1-AD	SPELLING P1-AD	CONCEPTS OF NUMBE P1-AD	MATH CMPUTATN P1-AD	MATH APPLICATNS P1-AD	Normed for indicated levels only: WORD READING P1,P2	LANGUAGE P3-AD	SOCIAL SCIENCE P3-AD	SCIENCE P3-AD	
99	674-827	743-826	695-823	740-847	675-836	611-671	690-822	I	I	99
98	663-673	735-742	687-694	729-739	666-674	603-610	682-689	N	N	98
97	655-662	719-734	681-686	724-728	657-665	598-602	676-681	C	C	97
96	647-654	713-718	672-680	717-723	653-656	593-597	669-674	O	O	96
95	644-646	702-712	667-671	711-716	648-652	585-592	665-668	M	M	95
94	641-643	699-701	661-666	705-710	642-647	581-584	661-664	P D	P D	94
93	637-640	693-698	656-660	699-704	635-641	578-580	---	L A	L A	93
92	635-636	689-692	651-655	---	626-634	577	660	E T	E T	92
91	632-634	684-688	649-650	692-698	621-625	576	659	T A	T A	91
90	627-631	677-683	647-648	690-691	620	---	655-658	E	E	90
89	624-626	676	641-646	---	---	575	653-654			89
88	621-623	674-675	638-640	689	618-619	---	652			88
87	619-620	673	636-637	687-688	613-617	572-574	650-651			87
86	616-618	667-672	634-635	685-686	609-612	569-571	649			86
85	---	666	631-633	681-684	604-608	566-568	648			85
84	612-615	665	630	680	602-603	564-565	646-647			84
83	---	---	629	678-679	601	562-563	644-645			83
82	609-611	664	627-628	675-677	600	560-561	643			82
81	---	661-663	624-626	674	597-599	558-559	641-642			81
80	606-608	656-660	622-623	673	595-596	557	640			80
79	604-605	654-655	620-621	672	593-594	555-556	639			79
78	602-603	---	619	667-671	591-592	553-554	---			78
77	600-601	---	617-618	---	589-590	552	636-638			77
76	598-599	653	614-616	663-666	588	---	635			76
75	---	651-652	---	662	587	551	633-634			75
74	595-597	650	613	661	586	550	632			74
73	594	647-649	---	---	585	549	631			73
72	592-593	---	608-612	660	583-584	548	---			72
71	589-591	645-646	606-607	656-659	582	547	---			71
70	587-588	643-644	605	---	579-581	545-546	629-630			70
69	585-586	638-642	602-604	655	578	544	628			69
68	582-584	637	600-601	---	574-577	542-543	627			68
67	580-581	634-636	598-599	---	571-573	540-541	---			67
66	579	632-633	597	652-654	---	539	626			66
65	---	630-631	595-596	651	570	---	625			65
64	577-578	629	594	649-650	---	538	623-624			64
63	574-576	627-628	591-593	646-648	568-569	537	---			63
62	572-573	624-626	---	645	566-567	536	---			62
61	569-571	623	588-590	643-644	---	---	---			61
60	567-568	620-622	587	640-642	565	---	622			60
59	566	618-619	586	637-639	---	---	---			59
58	564-565	615-617	582-585	---	564	---	---			58
57	560-563	613-614	---	---	561-563	---	620-621			57
56	557-559	611-612	581	634-636	560	534-535	---			56
55	556	610	580	631-633	559	532-533	619			55
54	555	606-609	578-579	630	554-558	530-531	---			54
53	---	603-605	577	629	---	529	---			53
52	552-554	---	---	625-628	552-553	528	---			52
51	551	---	576	624	550-551	527	618			51
50	549-550	602	575	623	---	526	616-617			50
49	546-548	---	572-574	621-622	548-549	525	615	I	I	49
48	---	601	569-571	618-620	546-547	524	---	N	N	48
47	545	599-600	568	617	545	523	614	C	C	47
46	542-544	596-598	567	615-616	543-544	522	613	O	O	46
45	540-541	595	564-566	614	540-542	---	612	M	M	45
44	539	590-594	562-563	611-613	539	521	611	P D	P D	44
43	536-538	587-589	---	609-610	535-538	520	---	L A	L A	43
42	533-535	---	560-561	605-608	534	519	---	E T	E T	42
41	532	583-586	557-559	604	533	518	---	T A	T A	41
40	531	581-582	555-556	600-603	529-532	517	---	E	E	40
39	529-530	579-580	---	---	528	515-516	610			39
38	527-528	577-578	553-554	597-599	527	514	609			38
37	525-526	576	552	593-596	526	---	608			37
36	522-524	572-575	550-551	591-592	525	---	607			36
35	520-521	567-571	547-549	590	523-524	---	---			35
34	519	563-566	545-546	---	519-522	512-513	606			34
33	---	560-562	542-544	589	518	510-511	605			33
32	518	553-559	---	588	517	508-509	604			32
31	514-517	552	541	586-587	516	507	603			31
30	512-513	---	538-540	583-585	515	506	602			30
29	509-511	---	534-537	576-582	513-514	505	601			29
28	506-508	549-551	---	573-575	511-512	504	---			28
27	504-505	546-548	---	571-572	---	503	600			27
26	501-503	542-545	529-533	569-570	---	501-502	599			26
25	499-500	539-541	526-528	---	---	499-500	598			25
24	496-498	536-538	525	568	507-510	497-498	596-597			24
23	---	534-535	524	567	503-506	493-496	592-595			23
22	492-495	532-533	520-523	563-566	501-502	---	---			22
21	490-491	530-531	519	560-562	495-500	492	591			21
20	489	524-529	516-518	556-559	494	487-491	590			20
19	487-488	522-523	513-515	553-555	493	486	589			19
18	486	520-521	511-512	---	491-492	---	588			18
17	482-485	519	510	552	490	483-485	586-587			17
16	481	513-518	508-509	548-551	486-489	481-482	585			16
15	477-480	512	505-507	541-547	482-485	480	584			15
14	475-476	505-511	499-504	539-540	479-481	477-479	583			14
13	473-474	497-504	---	537-538	478	475-476	581-582			13
12	472	494-496	---	535-536	476-477	471-474	579-580			12
11	470-471	489-493	494-498	531-534	470-475	469-470	577-578			11
10	---	485-488	491-493	528-530	468-469	467-468	576			10
9	469	482-484	486-490	524-527	466-467	464-466	573-575			9
8	464-468	479-481	481-485	513-523	462-465	461-463	572			8
7	458-463	474-478	473-480	504-512	457-461	460	571			7
6	456-457	469-473	467-472	500-503	455-456	---	---			6
5	450-455	464-468	463-466	495-499	453-454	454-459	570			5
4	447-449	457-463	458-462	487-494	444-452	449-453	565-569			4
3	443-446	449-456	451-457	468-486	437-443	442-448	562-564			3
2	436-442	441-448	441-450	435-467	428-436	434-441	556-561			2
1	316-435	311-440	326-440	335-434	338-427	317-433	453-555			1

AGE

13

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STANFORD ACHIEVEMENT TEST: Norms for Hearing-Impaired Students AGE = 13

PCTILE	READING CMPRHNSN P1-AD	SPELLING P1-AD	CONCEPTS OF NUMBER P1-AD	MATH CMPUTATN P1-AD	MATH APPLICATNS P1-AD	WORD READING P1,P2	LANGUAGE P3-AD	SOCIAL SCIENCE P3-AD	SCIENCE P3-AD	
	Normed for all levels					Normed for indicated levels only				
99	695-827	743-826	727-823	756-847	709-836	605-671	702-822	I	I	99
98	677-694	737-742	711-726	740-755	679-708	602-604	688-701	N	N	98
97	670-676	732-736	698-710	734-739	671-678	596-601	683-687	C	C	97
96	663-669	721-731	694-697	728-733	665-670	590-595	678-682	O	O	96
95	659-662	718-720	687-693	727	662-664	585-589	670-677	M	M	95
94	656-658	716-717	682-686	723-726	660-661	581-584	669	P D	P D	94
93	654-655	712-715	679-681	718-722	656-659	578-580	667-668	L A	L A	93
92	649-653	---	675-678	716-717	650-655	577	665-666	E T	E T	92
91	648	702-711	672-674	711-715	646-649	576	664	T A	T A	91
90	645-647	---	669-671	709-710	643-645	---	662-663	E	E	90
89	643-644	6'6-701	667-668	708	641-642	575	661			89
88	642	694-695	664-666	702-707	638-640	574	660			88
87	640-641	693	661-663	700-701	636-637	571-573	658-659			87
86	637-639	691-692	658-660	699	632-635	569-570	656-657			86
85	635-636	685-690	656-657	---	628-631	567-568	655			85
84	632-634	684	654-655	695-698	626-627	565-566	652-654			84
83	628-631	678-683	651-653	690-694	624-625	564	---			83
82	---	677	650	---	621-623	562-563	649-651			82
81	624-627	---	648-649	---	620	561	648			81
80	621 623	676	645-647	689	616-619	559-560	646-647			80
79	619-620	---	641-644	688	615	558	644-645			79
78	616-618	674-675	640	687	612-614	557	---			78
77	614-615	670-673	639	684-686	609-611	555-556	---			77
76	612-613	666-669	636-638	681-683	605-608	554	643			76
75	611	665	633-635	680	601-604	552-553	642			75
74	609-610	664	631-632	676-679	599-600	---	640-641			74
73	---	663	630	674-675	597-598	---	---			73
72	605-608	659-662	---	673	595-596	---	---			72
71	602-604	656-658	624-629	672	593-594	---	---			71
70	601	654-655	623	669-671	592	---	636-639			70
69	600	---	622	667-668	591	---	---			69
68	598-599	---	620-621	666	588-590	---	---			68
67	596-597	653	619	664-665	587	551	635			67
66	595	651-652	618	662-663	584-586	550	---			66
65	592-594	650	617	---	581-583	549	634			65
64	---	647-649	614-616	661	579-580	548	633			64
63	589-591	645-646	---	657-660	---	547	632			63
62	588	644	612-613	656	578	546	631			62
61	586-587	643	609-611	655	577	545	---			61
60	585	641-642	608	---	574-576	543-544	629-630			60
59	583-584	637-640	607	652-654	572-573	542	627-628			59
58	582	---	606	---	571	541	---			58
57	581	636	---	651	570	540	---			57
56	579-580	633-635	603-605	---	568-569	539	626			56
55	577-578	632	600-602	646-650	566-567	538	625			55
54	575-576	629-631	599	645	---	537	623-624			54
53	573-574	626-628	597-598	643-644	565	536	---			53
52	572	624-625	596	642	564	---	---			52
51	---	621-623	595	641	563	---	622			51
50	570-571	---	594	640	562	534-535	---			50
49	567-569	617-620	591-593	637-639	561	533	621	I	I	49
48	566	613-616	589-590	636	---	531-532	619-620	N	N	48
47	563-565	612	587-588	634-635	560	530	---	C	C	47
46	561-562	611	586	632-633	559	528-529	---	O	O	46
45	560	610	584-585	631	557-558	527	616-618	M	M	45
44	559	606-609	582-583	629-630	556	526	---	P D	P D	44
43	558	603-605	580-581	627-628	554-555	524-525	615	L A	L A	43
42	556-557	---	577-579	626	---	523	614	E T	E T	42
41	555	---	---	625	552-553	---	---	T A	T A	41
40	552-554	602	576	623-624	550-551	522	613	E	E	40
39	550-551	---	574-575	621-622	548-549	521	612			39
38	549	601	572-573	619-620	545-547	520	611			38
37	546-548	599-600	---	617-618	---	519	---			37
36	---	595-598	570-571	615-616	543-544	518	---			36
35	542-545	594	568-569	613-614	541-542	517	---			35
34	540-541	591-593	567	610-612	540	515-516	610			34
33	539	587-590	564-566	608-609	---	514	607-609			33
32	537-538	---	561-563	606-607	538-539	---	---			32
31	536	586	557-560	604-605	536-537	513	606			31
30	---	581-585	556	600-603	535	510-512	605			30
29	530-535	580	553-555	---	530-534	508-509	---			29
28	527-529	578-579	551-552	598-599	529	506-507	604			28
27	525-526	575-577	548-550	597	526-528	505	603			27
26	521-524	570-574	544-547	594-596	524-525	504	---			26
25	519-520	567-569	542-543	593	521-523	503	602			25
24	517-518	557-566	---	591-592	520	502	---			24
23	513-516	554-556	536-541	589-590	519	499-501	600-601			23
22	509-512	552-553	534-535	583-588	518	---	---			22
21	506-508	---	---	580-582	515-517	498	---			21
20	504-505	---	531-533	577-579	513-514	---	---			20
19	501-503	542-551	527-530	573-576	511-512	493-497	597-599			19
18	499-500	536-541	526	570-572	---	---	596			18
17	492-498	532-535	525	569	508-510	492	---			17
16	490-491	529-531	524	568	504-507	488-491	595			16
15	488-489	523-528	520-523	561-567	502-503	486-487	592-594			15
14	486-487	522	517-519	555-560	497-501	485	590-591			14
13	482-485	520-521	513-516	553-554	494-496	475-484	588-589			13
12	478-481	519	510-512	552	491-493	474	586-587			12
11	475-477	513-518	506-509	546-551	488-490	---	585			11
10	473-474	511-512	504-505	541-545	480-487	469-473	584			10
9	470-472	503-510	499-503	--	479	465-468	581-583			9
8	468-469	495-502	494-498	528-540	478	459-464	580			8
7	465-467	489-494	486-493	522-527	471-477	455-458	576-579			7
6	462-464	48_-488	479-485	517-521	465-470	450-454	574-575			6
5	458-461	477-481	477-478	501-516	459-464	441-449	569-573			5
4	452-457	470-476	467-476	490-500	453-458	438-440	561-568			4
3	447-451	458-469	452-466	469-489	442-452	435-437	555-560			3
2	440-446	444-457	440-451	435-468	432-441	432-434	549-554			2
1	316-439	311-443	326-439	335-434	338-431	317-431	453-548			1

226

STANFORD ACHIEVEMENT TEST: Norms for Hearing-Impaired Students AGE = 14

PCTILE	READING CMPRHNSN P1-AD	SPELLING P1-AD	CONCEPTS OF NUMBER P1-AD	MATH CMPUTATN P1-AD	MATH APPLICATNS P1-AD	WORD READING P1,P2	LANGUAGE P3-AD	SOCIAL SCIENCE P3-AD	SCIENCE P3-AD	
	Normed for all levels					Normed for indicated levels only				
99	710-827	757-826	743-823	762-847	717-836	604-671	713-822	I	I	99
98	703-709	750-756	730-742	753-761	709-716	599-603	706-712	N	N	98
97	689-702	743-749	721-729	745-752	700-708	591-598	699-705	C	C	97
96	68[illegible]-688	736-742	713-720	740-744	694-699	587-590	694-698	O	O	96
95	674-681	728-735	703-712	---	689-693	583-586	689-693	M	M	95
94	[illegible]-673	722-727	697-702	729-739	682-688	580-582	682-688	P D	P D	94
93	666-669	720-721	695-696	728	681	577-579	679-681	L A	L A	93
92	664-665	718-719	689-694	726-727	679-680	576	675-678	E T	E T	92
91	660-663	712-717	687-688	725	677-678	575	671-674	T A	T A	91
90	658-659	---	682-686	721-724	670-676	---	667-670	E	E	90
89	654-657	---	681	717-720	667-669	572-574	---			89
88	648-653	707-711	675-680	716	665-666	570-571	665-666			88
87	646-647	702-706	672-674	712-715	659-664	567-569	663-664			87
86	644-645	696-701	670-671	711	655-658	566	661-662			86
85	642-643	695	668-669	710	650-654	564-565	660			85
84	641	693-694	667	708-709	---	562-563	658-659			84
83	637-640	691-692	665-666	706-707	---	561	657			83
82	634-636	685-690	663-664	701-705	644-649	559-560	656			82
81	632-633	684	661-662	699-700	641-643	557-558	654-655			81
80	631	680-683	659-660	---	636-640	555-556	652-653			80
79	628-630	677-679	656-658	696-698	633-635	552-554	649-651			79
78	626-627	---	---	691-695	632	---	648			78
77	624-625	---	653-655	690	629-631	---	---			77
76	---	676	651-652	---	627-628	---	647			76
75	621-623	---	---	---	625-626	---	645-646			75
74	619-620	675	649-650	689	623-624	551	644			74
73	617-618	674	648	688	622	549-550	---			73
72	615-616	672-673	646-647	---	621	548	642-643			72
71	612-614	667-671	642-645	686-687	620	547	641			71
70	611	665-666	640-641	684-685	616-619	546	640			70
69	609-610	---	639	683	612-615	545	---			69
68	607-608	664	636-638	681-682	610-611	544	---			68
67	605-606	663	634-635	680	607-609	---	638-639			67
66	604	---	631-633	677-679	605-606	543	636-637			66
65	603	659-662	630	674-676	602-604	542	---			65
64	602	657-658	---	---	601	541	---			64
63	601	654-656	627-629	673	599-600	540	635			63
62	598-600	---	624-626	672	598	539	634			62
61	---	---	622-623	---	595-597	---	633			61
60	595-597	653	621	669-671	590-594	538	631-632			60
59	593-594	---	620	667-668	---	537	---			59
58	592	651-652	619	---	588-589	536	---			58
57	591	649-650	617-618	664-666	586-587	---	630			57
56	588-590	645-648	615-616	663	584-585	---	628-629			56
55	586-587	644	614	662	583	---	627			55
54	585	640-643	613	661	579-582	---	---			54
53	583-584	637-639	611-612	---	578	534-535	626			53
52	582	---	609-610	660	577	533	625			52
51	581	635-636	608	656-659	576	532	624			51
50	579-580	634	606-607	---	572-575	531	623			50
49	578	---	---	655	571	530	---	I	I	49
48	577	---	604-605	653-654	570	528-529	622	N	N	48
47	575-576	630-633	601-603	652	---	527	---	C	C	47
46	573-574	629	599-600	---	566-569	526	620-621	O	O	46
45	572	628	597-598	650-651	---	525	---	M	M	45
44	---	624-627	595-596	648-649	565	524	619	P D	P D	44
43	570-571	623	---	646-647	564	523	618	L A	L A	43
42	567-569	622	593-594	645	563	522	617	E T	E T	42
41	565-566	621	591-592	642-644	562	521	616	T A	T A	41
40	563-564	617-620	589-590	641	560-561	---	615	E	E	40
39	561-562	613-616	587-588	637-640	559	520	---			39
38	558-560	611-612	584-586	---	558	519	614			38
37	557	610	582-583	632-636	556-557	515-518	613			37
36	555-556	609	---	630-631	555	514	612			36
35	554	606-608	---	629	553-554	---	611			35
34	551-553	604-605	580-581	627-628	550-552	---	---			34
33	---	603	578-579	626	549	513	---			33
32	546-550	602	577	625	547-548	511-512	609-610			32
31	545	600-601	574-576	622-624	546	510	607-608			31
30	543-544	596-599	572-573	619-621	545	508-509	---			30
29	541-542	594-595	571	618	544	---	606			29
28	538-540	591-593	569-570	615-617	542-543	507	---			28
27	536-537	584-590	567-568	614	540-541	506	604-605			27
26	533-535	580-583	564-566	612-613	---	505	---			26
25	532	578-579	562-563	610-611	537-539	504	603			25
24	528-531	575-577	561	608-609	535-536	502-503	602			24
23	526-527	572-574	557-560	604-607	534	499-501	---			23
22	522-525	568-571	555-556	600-603	533	---	600-601			22
21	519-521	563-567	553-554	599	531-532	498	599			21
20	---	556-562	551-552	597-598	530	---	---			20
19	513-518	552-555	547-550	594-596	528-529	497	596-598			19
18	511-512	---	545-546	591-593	527	495-496	---			18
17	506-510	550-551	543-544	589-590	524-526	492-494	593-595			17
16	502-505	544-549	542	583-588	520-523	487-491	592			16
15	499-501	535-543	537-541	578-582	519	486	591			15
14	493-498	533-534	533-536	575-577	518	482-485	590			14
13	490-492	531-532	530-532	572-574	---	480-481	587-589			13
12	487-489	530	526-529	569-571	513-517	479	585-586			12
11	486	522-529	524-525	568	507-512	475-478	584			11
10	480-485	513-521	520-523	565-567	500-506	473-474	---			10
9	478-479	512	514-519	559-564	494-499	471-472	580-583			9
8	474-477	506-511	512-513	554-558	490-493	469-470	577-579			8
7	472-473	500-505	507-511	552-553	485-489	467-468	574-576			7
6	468-471	494-499	499-506	539-551	482-484	462-466	566-573			6
5	461-467	487-493	492-498	529-538	478-481	455-461	563-565			5
4	456-46[illegible]	482-486	485-491	521-528	468-477	452-454	560-562			4
3	451-455	473-481	476-484	510-520	458-467	449-451	559			3
2	444-450	460-472	466-475	487-509	450-457	442-448	548-558			2
1	316-443	311-459	326-465	335-486	338-449	317-441	453-547			1

STANFORD ACHIEVEMENT T'ST: Norms for Hearing-Impaired Students AGE = 15

PCTILE	READING CMPRHNSN P1-AD	SPELLING P1-AD	CONCEPTS OF NUMBER P1-AD	MATH CMPUTATN P1-AD	MATH APPLICATNS P1-AD	WORD READING P1,P2	LANGUAGE P3-AD	SOCIAL SCIENCE P3-AD	SCIENCE P3-AD	PCTILE
	Normed for all levels					Normed for indicated levels only				
99	717-827	771-826	756-823	775-847	731-838	I	708-822	699-812	698-816	99
98	707-716	762-770	744-755	761-774	721-730	N	703-707	695-698	695-697	98
97	698-706	754-761	729-743	756-760	711-720	C	697-702	692-694	692-694	97
96	691-695	748-753	720-728	754-755	704-710	O	693-696	686-691	687-691	96
95	684-690	743-747	713-719	747-753	698-703	M	689-692	681-685	680-686	95
94	678-683	731-742	708-712	741-746	696-697	P D	686-688	677-680	678-679	94
93	674-677	722-730	702-705	737-740	695	L A	683-685	674-676	676-677	93
92	671-673	720-721	697-701	729-736	688-694	E T	681-682	669-673	674-675	92
91	666-670	718-719	696	727-728	682-687	T A	680	666-668	672-673	91
90	664-665	717	695	725-726	681	E	678-679	664-665	670-671	90
89	660-663	712-716	692-694	722-724	679-680		676-677	663	668-669	89
88	659	---	688-691	720-721	678		673-675	---	666-667	88
87	658	709-711	687	719	674-677		---	659-662	663-665	87
86	656-657	707-708	685-686	716-718	671-673		670-672	656-658	662	86
85	652-655	703-706	683-684	713-715	---		667-669	655	661	85
84	649-651	702	681-682	711-712	667-670		666	652-654	---	84
83	648	701	680	710	661-666		665	649-651	659-660	83
82	645-647	698-700	676-679	709	659-660		664	647-648	658	82
81	644	695-697	673-675	---	658		660-663	646	657	81
80	642-643	694	670-672	708	656-657		659	644-645	656	80
79	640-641	693	668-669	703-707	654-655		657-658	643	---	79
78	639	692	667	701-702	651-653		655-656	642	655	78
77	637-638	691	665-666	700	650		---	640-641	654	77
76	636	690	663-664	699	648-649		652-654	---	653	76
75	632-635	684-689	661-662	---	645-647		---	---	---	75
74	---	---	658-660	696-698	641-644		649-651	639	652	74
73	629-631	683	657	695	638-640		648	637-638	651	73
72	627-628	678-682	656	690-694	636-637		647	---	649-650	72
71	626	677-678	652-655	---	634-635		---	634-636	648	71
70	624-625	---	---	---	633		645-646	---	647	70
69	623	676	651	669	632		644	633	---	69
68	621-622	---	648-650	668	629-631		643	632	645-646	68
67	619-620	---	647	666-667	627-628		642	631	644	67
66	618	674-675	642-646	664-665	626-628		641	630	642-643	66
65	616-617	673	640-641	---	623-624		---	---	641	65
64	613-615	672	639	661-663	620-622		640	628-629	639-640	64
63	612	669-671	638	---	619		639	627	638	63
62	610-611	667-668	636-637	680	616-618		636-638	625-626	637	62
61	609	666	---	679	614-615		635	624	635-636	61
60	608	665	633-635	677-678	610-613		634	623	633-634	60
59	605-607	664	631-632	675-676	607-609		632-633	622	630-632	59
58	604	662-663	---	674	605-606		631	620-621	629	58
57	602-603	659-661	---	---	602-604		---	---	627-628	57
56	599-601	657-658	630	673	601		629-630	619	---	56
55	598	655-656	628-629	---	600		---	---	626	55
54	---	654	625-627	672	598-599		628	617-618	625	54
53	595-597	---	624	671	---		627	616	624	53
52	594	653	623	669-670	596-597		---	615	---	52
51	592-593	652	622	668	594-595		---	614	---	51
50	590-591	650-651	620-621	667	591-593		626	613	622-623	50
49	588-589	648-649	619	---	589-590	I	625	611-612	621	49
48	588-587	645-647	618	664-666	588	N	623-624	610	619-620	48
47	585	644	614-617	663	587	C	---	609	618	47
46	584	643	---	662	586	O	---	608	617	46
45	582-583	638-642	612-613	661	584-585	M	622	607	615-616	45
44	581	637	609-611	660	581-583	P D	---	605-606	---	44
43	579-580	636	606-608	656-659	579-580	L A	620-621	---	---	43
42	578	635	---	---	---	E T	---	602-604	614	42
41	574-577	634	604-605	655	578	T A	619	600-601	---	41
40	573	631-633	601-603	652-654	577	E	---	599	611-613	40
39	571-572	630	598-600	---	575-576		618	597-598	609-610	39
38	570	628-629	596-597	650-651	573-574		616-617	---	606-608	38
37	567-569	624-627	595	646-649	---		---	595-596	604-605	37
36	---	621-623	---	645	572		614-615	594	602-603	36
35	565-566	618-620	591-594	644	570-571		612-613	593	601	35
34	563-564	617	---	643	568-569		611	592	599-600	34
33	560-562	614-616	587-590	641-642	564-565		---	591	597-598	33
32	558-559	612-613	583-586	---	562-563		609-610	590	---	32
31	557	611	582	638-640	560-561		607-608	589	596	31
30	555-556	---	---	637	559		---	588	595	30
29	553-554	606-610	579-581	635-636	556-558		606	587	594	29
28	551-552	605	577-578	632-634	554-555		605	586	593	28
27	548-550	603-604	574-576	---	551-553		---	582-585	592	27
26	546-547	---	571-573	629-631	550		603-604	---	589-591	26
25	---	602	567-570	625-628	549		602	581	588	25
24	541-545	---	565-566	623-624	547-548		601	580	587	24
23	539-540	600-601	562-564	619-622	545-546		---	579	585-586	23
22	537-538	595-599	---	---	542-544		600	578	584	22
21	535-536	592-594	559-561	618	540-541		599	577	582-583	21
20	532-534	588-591	557-558	615-617	535-539		---	575-576	581	20
19	528-531	581-587	556	613-614	531-534		596-598	573-574	---	19
18	525-527	579-580	555	610-612	528-530		---	570-572	---	18
17	522-524	577-578	553-554	608-609	526-527		592-595	567-569	577-580	17
16	517-521	573-576	551-552	604-607	524-525		591	---	575-576	16
15	511-516	561-572	548-550	600-603	522-523		590	566	573-574	15
14	509-510	552-560	545-547	593-599	520-521		589	565	571-572	14
13	501-508	546-551	542-544	589-592	517-519		586-588	563-564	569-570	13
12	496-500	536-545	541	581-588	512-516		585	561-562	567-568	12
11	---	531-535	534-540	575-580	511		584	559-560	565-566	11
10	491-495	525-530	531-533	569-574	509-510		581-583	556-558	564	10
9	488-490	521-524	527-530	567-568	505-508		580	554-555	563	9
8	486-487	516-520	519-526	559-566	496-504		577-579	552-553	---	8
7	480-485	512-515	511-518	553-558	492-495		575-576	549-551	562	7
6	472-479	503-511	505-510	541-552	488-491		572-574	546-548	560-561	6
5	462-471	499-502	494-504	535-540	480-487		568-571	543-545	558-559	5
4	458-461	482-498	478-493	528-534	469-479		564-567	540-542	554-557	4
3	449-457	467-481	468-477	511-527	456-468		559-563	531-539	546-553	3
2	441-448	449-466	481-467	499-510	444-455		553-558	489-530	540-545	2
1	318-440	311-448	328-480	335-498	338-443		453-552	432-488	438-539	1

BEST COPY AVAILABLE

STANFORD ACHIEVEMENT TEST· Norms for Hearing-Impaired Students AGE = 16

PCTILE	READING CMPRHNSN P1-AD	SPELLING P1-AD	CONCEPTS OF NUMBER P1-AD	MATH CMPUTATN P1-AD	MATH APPLICATNS P1-AD	WORD READING P1,P2	LANGUAGE P3-AD	SOCIAL SCIENCE P3-AD	SCIENCE P3-AD	
	Normed for all levels					Normed for indicated levels only				
99	725-827	767-826	745-823	785-847	743-836	I	723-822	723-812	719-816	99
98	709-724	755-766	734-744	778-784	724-742	N	712-722	712-722	709-718	98
97	700-708	746-754	727-733	764-777	713-723	C	706-711	699-711	705-708	97
96	691-699	740-745	721-726	756-763	705-712	O	697-705	691-698	694-704	96
95	686-690	734-739	715-720	751-755	703-704	M	689-696	687-690	691-693	95
94	679-685	729-733	713-714	740-750	702	P D	687-688	685-686	685-690	94
93	675-678	724-728	708-712	---	697-701	L A	684-686	681-684	681-684	93
92	[illegible]-674	720-723	704-707	733-739	690-696	E T	681-683	676-680	678-680	92
91	669-67[illegible]	718-719	701-703	729-732	688-689	T A	679-680	672-675	675-677	91
90	664-668	716-717	698-700	728	686-687	E	676-678	667-671	674	90
89	660-663	712-715	697	725-727	683-685		672-675	664-666	669-673	89
88	658-659	---	696	723-725	681-682		669-671	662-663	668	88
87	654-657	708-711	693-695	720-722	6[illegible]-680		667-668	659-661	666-667	87
86	651-653	707	691-692	718-719	6[illegible]9		665-666	657-658	6[illegible]-665	86
85	648-650	702-706	688-690	717	676-677		664	655-656	[illegible]3	85
84	---	701	687	716	673-675		---	654	662	84
83	---	698-700	683-686	713-715	671-672		661-663	652-653	661	83
82	644-647	696-697	681-682	711-712	669-670		660	649-651	660	82
81	643	695	---	---	666-668		658-659	647-648	657-659	81
80	641-642	694	676-680	710	665		657	645-646	655-656	80
79	640	693	673-675	709	662-664		655-656	644	654	79
78	---	---	672	708	---		---	643	653	78
77	637-639	692	670-671	706-707	658-661		652-654	---	---	77
76	636	691	668-669	702-705	654-657		---	---	---	76
75	634-635	690	667	701	653		649-651	641-642	651-652	75
74	632-633	686-689	665-666	700	649-652		---	640	650	74
73	630-631	684-685	662-664	699	646-648		648	639	649	73
72	629	---	661	698	645		---	---	648	72
71	628	681-683	659-660	697	---		647	638	647	71
70	625-627	678-680	658	696	643-644		---	637	---	70
69	624	677	657	695	641-642		646	---	646	69
68	623	---	656	694	640		644-645	---	645	68
67	622	---	---	691-693	638-639		---	---	---	67
66	620-621	676	655	690	637		643	633-636	644	66
65	618-619	---	653-654	---	633-636		641-642	632	642-643	65
64	616-617	---	651-652	---	632		640	631	641	64
63	614-615	675	---	---	631		---	---	640	63
62	612-613	674	648-650	689	628-630		639	630	639	62
61	---	673	647	688	626-627		638	---	638	61
60	609-611	672	643-646	686-687	625		636-637	629	---	60
59	---	668-671	641-642	684-685	622-624		---	628	636-637	59
58	607-608	666-667	639-640	683	620-621		635	627	635	58
57	605-606	665	637-638	681-682	616-619		634	625-626	634	57
56	604	---	636	680	615		633	624	632-633	56
55	602-603	664	---	678-679	614		632	623	---	55
54	600-601	663	632-635	677	612-613		---	622	---	54
53	598-599	659-662	631	675-676	609-611		631	620-621	630-631	53
52	597	656-658	---	674	607-608		---	---	629	52
51	595-596	654-655	630	---	605-606		---	619	628	51
50	594	---	---	673	603-604		630	618	626-627	50
49	592-593	---	629	672	600-602	I	628-629	616-617	---	49
48	---	653	625-628	671	598-599	N	627	615	625	48
47	590-591	652	624	669-670	596-597	C	---	614	623-624	47
46	587-589	650-651	623	667-668	593-595	O	626	612-613	622	46
45	585-586	647-649	621-622	---	591-592	M	625	610-611	621	45
44	---	645-646	620	665-666	588-590	P D	623-624	609	618-620	44
43	583-584	644	619	664	586-587	L A	---	---	617	43
42	580-582	---	615-618	662-663	584-585	E T	---	608	616	42
41	578-579	641-643	614	661	583	T A	622	---	615	41
40	575-577	639-640	609-613	660	579-582	E	---	607	614	40
39	574	637-638	607-608	656-659	578		621	605-606	---	39
38	572-573	636	606	---	---		620	---	612-613	38
37	571	633-635	603-605	655	573-577		---	---	610-611	37
36	569-570	631-632	600-602	652-654	570-572		619	603-604	609	36
35	566-568	629-630	598-599	---	567-569		---	601-602	608	35
34	564-565	628	596-597	651	566		---	600	606-607	34
33	56[illegible]-563	624-627	595	647-650	563-565		616-618	---	605	33
32	559-560	623	594	645-646	561-562		615	599	604	32
31	557-558	621-622	591-593	644	559-560		614	598	602-603	31
30	555-556	620	588-590	642-643	557-558		613	597	601	30
29	552-554	619	587	641	555-556		612	---	---	29
28	550-551	616-618	584-586	638-640	---		611	---	600	28
27	549	612-615	582-583	635-637	554		---	595-596	598-599	27
26	546-548	611	577-581	632-634	552-553		609-610	594	597	26
25	---	610	---	631	550-551		607-608	592-593	596	25
24	541-545	606-609	575-576	629-630	548-549		606	591	594-595	24
23	539-540	603-605	572-574	626-628	545-547		---	590	593	23
22	537-538	601-602	569-571	623-625	541-544		605	589	---	22
21	5[illegible]-536	596-600	567-568	621-622	539-540		604	--	590-592	21
20	53[illegible]-53[illegible]	594-595	565-566	618-620	---		603	---	588-589	20
19	529-53[illegible]	587-593	562-564	615-617	535-538		601-602	586-588	587	19
18	5[illegible]8	585-586	558-561	612-614	532-534		---	---	586	18
17	522-527	580-584	556-557	608-611	530-531		600	---	582-585	17
16	519-521	578-579	552-555	604-607	520-529		599	582-585	581	16
15	514-518	573-577	548-551	594-603	---		597-598	580-581	579-580	15
14	508-513	563-572	546-547	591-593	518-519		596	578-579	576-578	14
13	501-507	554-562	542-545	585-590	513-517		---	577	574-575	13
12	4[illegible]6-5[illegible]	552-553	539-541	576-584	509-512		595	575-576	572-573	12
11	4[illegible]-4[illegible]	549-551	533-538	570-575	501-508		591-594	574	570-571	11
10	487-48[illegible]	536-548	526-532	565-569	496-500		589-590	571-573	568-569	10
9	48[illegible]-486	530-535	523-525	555-564	492-495		587-588	569-570	566-567	9
8	473-48[illegible]	52[illegible]-529	518-522	552-554	487-491		585-586	564-568	563-565	8
7	467-472	514-520	512-517	546-551	484-486		581-584	562-563	561-562	7
6	463-466	5[illegible]-513	499-511	541-545	478-483		576-580	559-561	559-560	6
5	458-462	43[illegible]-501	496-498	530-540	470-477		570-575	555-558	557-558	5
4	455-457	482-491	476-495	519-529	462-469		564-569	---	553-556	4
3	45[illegible]-454	473-481	467-475	504-518	455-461		556-563	549-554	550-552	3
2	437-44[illegible]	461-472	457-466	464-503	439-454		551-555	539-546	538-549	2
1	116-436	3[illegible]-460	326-456	335-463	338-438		453-550	432-538	438-537	1

AGE 17

STANFORD ACHIEVEMENT TEST: Norms for Hearing-Impaired Students — AGE = 17

PCTILE	Reading Cmprhnsn P1-AD	Spelling P1-AD	Concepts of Number P1-AD	Math Cmputatn P1-AD	Math Applicatns P1-AD	Word Reading P1,P2	Language P3-AD	Social Science P3-AD	Science P3-AD	PCTILE
	Normed for all levels					Normed for indicated levels only				
99	737-827	772-826	757-823	775-847	751-836	I	718-822	720-812	713-816	99
98	705-736	762-771	745-756	764-774	734-750	N	714-717	710-719	703-712	98
97	693-704	757-761	733-744	757-763	724-733	C	699-713	700-709	696-702	97
96	685-692	751-756	726-732	753-756	720-723	O	693-698	697-699	695	96
95	680-684	746-750	721-725	750-752	712-719	M	689-692	693-696	689-694	95
94	677-679	743-745	714-720	744-749	704-711	P D	---	688-692	687-688	94
93	673-676	738-742	713	740-743	702-703	L A	682-688	680-687	685-686	93
92	668-672	736-737	709-712	---	695-701	E T	678-681	675-679	680-684	92
91	665-667	732-735	705-708	733-739	690-694	T A	676-677	672-674	677-679	91
90	660-664	723-731	703-704	729-732	685-689	E	673-675	666-671	673-676	90
89	659	722	700-702	---	682-684		---	664-665	670-672	89
88	657-658	720-721	697-699	727-728	680-681		670-672	663	669	88
87	654-656	718-719	696	725-726	678-679		667-669	662	668	87
86	653	716-717	690-695	723-724	675-677		---	660-661	667	86
85	649-652	715	688-689	720-722	673-674		665-666	---	666	85
84	648	712-714	685-687	718-719	671-672		664	657-659	665	84
83	646-647	---	682-684	717	669-670		662-663	656	663-664	83
82	645	708-711	681	714-716	666-668		661	654-655	---	82
81	644	705-707	---	711-713	664-665		658-660	---	661-662	81
80	643	702-704	679-680	---	662-663		657	649-653	659-660	80
79	641-642	701	675-678	709-710	659-661		656	648	657-658	79
78	637-640	---	673-674	708	658		654-655	647	655-656	78
77	636	696-700	672	706-707	656-657		653	646	---	77
76	635	695	670-671	703-705	654-655		652	645	654	76
75	632-634	694	667-669	701-702	651-653		649-651	644	653	75
74	---	693	---	700	650		648	643	---	74
73	631	692	666	699	645-649		647	641-642	651-652	73
72	629-630	691	665	---	644		---	640	649-650	72
71	628	---	662-664	696-698	642-643		645-646	638-639	648	71
70	626-627	687-690	661	695	641		644	637	647	70
69	625	685-686	659-660	693-694	638-640		---	---	646	69
68	624	684	657-658	690-692	637		642-643	635-636	644-645	68
67	---	---	656	---	635-636		641	633-634	642-643	67
66	622-623	682-683	---	---	634		---	632	640-641	66
65	619-621	678-681	653-655	---	632-633		640	---	639	65
64	617-618	677	652	689	629-631		639	631	638	64
63	613-616	---	651	687-688	627-628		637-638	630	637	63
62	612	676	---	686	625-626		636	629	---	62
61	611	---	649-650	684-685	624		---	---	636	61
60	609-610	675	647-648	---	621-623		635	628	635	60
59	---	---	642-646	682-683	620		634	---	633-634	59
58	606-608	674	641	681	618-619		633	626-627	632	58
57	605	673	640	680	613-617		632	625	---	57
56	604	672	639	679	612		---	624	630-631	56
55	603	671	636-638	678	611		631	---	629	55
54	601-602	667-670	635	676-677	610		630	623	---	54
53	598-600	666	632-634	675	607-609		628-629	---	628	53
52	596-597	665	630-631	---	605-606		627	621-622	626-627	52
51	595	---	---	674	602		---	620	625	51
50	592-594	664	626-629	673	601		---	619	624	50
49	591	662-663	625	672	---	I	626	---	---	49
48	590	659-661	623-624	---	598-600	N	625	618	622-623	48
47	588-589	658	622	671	597	C	624	617	621	47
46	585	657	621	668-670	595-596	O	623	616	---	46
45	583-584	655-656	619-620	668	590-594	M	---	615	619-620	45
44	581-582	654	---	667	---	P D	622	614	618	44
43	580	---	617-618	---	588-589	L A	---	613	---	43
42	579	653	614-616	---	587	E T	620-621	---	---	42
41	578	649-652	---	664-666	586	T A	619	---	---	41
40	576-577	647-648	---	662-663	---	E	---	612	615-617	40
39	572-575	644-646	612-613	661	584-585		---	611	614	39
38	570-571	643	609-611	---	583		616-618	610	---	38
37	567-569	639-642	608	660	580-582		---	609	611-613	37
36	---	637-638	606-607	657-659	578-579		---	608	610	36
35	565-566	635-636	605	656	573-577		615	606-607	609	35
34	563-564	634	---	652-655	571-572		614	605	608	34
33	560-562	---	600-604	651	569-570		613	601-604	607	33
32	558-559	632-633	598-599	650	567-568		---	600	605-606	32
31	557	629-631	596-597	646-649	565-566		611-612	---	604	31
30	556	624-628	595	645	562-564		---	599	603	30
29	555	623	591-594	643-644	---		---	598	602	29
28	551-554	621-622	---	641-642	561		609-610	597	601	28
27	549-550	620	586-590	637-640	559-560		607-608	---	599-600	27
26	546-548	615-619	583-585	633-636	556-558		---	595-596	597-598	26
25	543-545	612-614	582	632	554-555		606	593-594	---	25
24	540-542	610-611	577-581	---	550-553		605	---	596	24
23	538-539	603-609	575-576	629-631	548-549		---	592	595	23
22	536-537	---	572-574	626-628	545-547		603-604	591	594	22
21	532-535	---	570-571	625	---		602	---	593	21
20	528-531	602	568-569	623-624	542-544		601	589-590	591-592	20
19	525-527	598-601	565-567	619-622	540-541		---	---	590	19
18	522-524	594-597	562-564	615-618	538-539		600	---	589	18
17	519-521	585-593	557-561	610-614	535-537		599	586-588	588	17
16	515-518	580-584	553-556	609	530-534		598	---	586-587	16
15	509-514	578-579	547-552	604-608	528-529		597	583-585	584-585	15
14	506-508	575-577	545-546	600-603	525-527		596	580-582	581-583	14
13	501-505	572-574	542-544	593-599	522-524		595	578-579	579-580	13
12	496-500	563-571	540-541	589-592	520-521		591-594	576-577	577-578	12
11	---	552-562	534-539	583-588	515-519		588-590	574-575	576	11
10	490-495	---	531-533	577-582	511-514		585-587	572-573	574-575	10
9	488-489	545-551	525-530	571-576	509-510		584	569-571	572-573	9
8	482-487	534-544	518-524	569-570	502-508		578-583	566-568	569-571	8
7	478-481	522-533	508-517	560-568	494-501		577	565	---	7
6	470-477	513-521	499-507	548-559	487-493		574-576	562-564	568	6
5	466-469	499-512	494-498	537-547	478-486		570-573	558-561	562-567	5
4	460-465	482-498	482-493	528-536	466-477		568-569	553-557	558-561	4
3	456-459	464-481	474-481	511-527	454-465		565-567	547-552	554-557	3
2	444-455	444-463	457-473	481-510	434-453		552-564	539-546	537-553	2
1	316-443	311-443	326-456	335-480	338-433		453-551	432-538	438-536	1

BEST COPY AVAILABLE

STANFORD ACHIEVEMENT TEST; Norms for Hearing-Impaired Students AGE = 18

PCTILE	READING CMPRHNSN P1-AD	SPELLING P1-AD	CONCEPTS OF NUMBER P1-AD	MATH CMPUTATN P1-AD	MATH APPLICATNS P1-AD	WORD READING P1,P2	LANGUAGE P3-AD	SOCIAL SCIENCE P3-AD	SCIENCE P3-AD	
	Normed for all levels					Normed for indicated levels only				
99	704-827	776-826	744-823	769-847	730-836	604-671	708-822	705-812	703-816	99
98	693-703	762-775	727-743	757-768	716-729	603	696-707	695-704	695-702	98
97	686-692	753-761	718-726	751-756	709-715	602	689-695	692-694	688-694	97
96	680-685	748-752	713-715	742-750	703-708	599-601	684-688	688-691	684-687	96
95	674-679	744-747	705-712	740-741	698-702	594-598	680-683	685-687	680-683	95
94	668-673	739-743	701-704	---	695-697	590-593	677-679	679-684	677-679	94
93	664-667	736-738	698-700	730-739	689-694	585-589	673-676	678	674-676	93
92	661-663	734-735	697	729	684-688	582-584	670-672	674-677	672-673	92
91	658-660	730-733	693-696	727-728	681-683	581	667-669	671-673	669-671	91
90	654-657	724-729	690-692	725-726	679-680	580	---	669-670	668	90
89	652-653	722-723	687-689	720-724	677-678	578-579	664-666	666-668	667	89
88	649-651	720-721	685-686	719	673-676	577	661-663	664-665	666	88
87	648	719	683-684	717-718	669-672	---	---	663	663-665	87
86	645-647	717-718	681-682	715-716	666-668	576	657-660	659-662	---	86
85	644	715-716	---	711-714	662-665	575	656	657-658	661-662	85
84	641-643	712-714	678-680	---	---	---	655	655-656	659-660	84
83	640	711	675-677	710	658-661	573-574	652-654	654	657-658	83
82	638-639	707-710	673-674	709	655-657	572	---	651-653	656	82
81	636-637	702-706	671-672	708	651-654	570-571	650-651	650	655	81
80	634-635	701	669-670	705-707	650	568-569	648-649	649	654	80
79	632-633	698-700	667-668	702-704	648-649	566-567	647	647-648	653	79
78	630-631	697	666	701	645-647	565	---	645-646	650-652	78
77	628-629	696	663-665	699-700	641-644	563-564	645-646	643-644	649	77
76	626-627	695	662	---	---	562	644	640-642	647-648	76
75	624-625	694	660-661	698	640	560-561	---	---	---	75
74	622-623	693	658-659	697	638-639	559	643	---	646	74
73	619-621	692	657	695-696	635-637	557-558	642	638-639	645	73
72	617-618	---	656	694	634	555-556	641	637	644	72
71	616	691	---	691-693	631-633	553-554	640	636	---	71
70	614-615	690	655	690	629-630	552	---	634-635	642-643	70
69	612-613	685-689	652-654	---	627-628	---	638-639	632-633	641	69
68	609-611	684	651	---	625-626	---	636-637	631	640	68
67	---	---	648-650	---	621-624	---	---	630	639	67
66	606-608	680-683	647	689	619-620	550-551	635	629	637-638	66
65	605	678-679	644-646	688	616-618	549	634	628	636	65
64	604	677	641-643	687	614-615	548	633	627	635	64
63	603	---	640	684-686	611-613	547	632	625-626	633-634	63
62	602	---	639	---	609-610	546	631	624	632	62
61	600-601	676	---	681-683	606-608	544-545	---	623	---	61
60	598-599	---	636-638	---	603-605	543	630	---	631	60
59	597	675	---	680	602	542	628-629	---	629-630	59
58	595-596	674	634-635	679	601	541	627	621-622	---	58
57	---	673	631-633	677-678	599-600	540	---	620	---	57
56	594	672	630	676	598	539	---	619	627-628	56
55	592-593	667-671	---	675	597	538	625-626	618	626	55
54	---	666	629	674	595-596	537	624	617	625	54
53	590-591	665	625-628	673	593-594	---	623	616	624	53
52	589	---	624	---	592	536	---	---	---	52
51	587-588	664	622-623	672	590-591	---	622	614-615	622-623	51
50	585-586	663	621	671	588-589	---	---	613	620-621	50
49	---	660-662	619-620	669-670	586-587	---	621	---	618-619	49
48	582-584	657-659	---	667-668	584-585	---	620	611-612	---	48
47	581	654-656	615-618	---	583	535	619	609-610	616-617	47
46	579-580	---	614	---	579-582	532-534	---	---	615	46
45	578	---	---	666	---	530-531	---	608	614	45
44	576-577	653	611-613	664-665	577-578	528-529	616-618	---	613	44
43	575	---	608-610	663	574-576	527	615	607	612	43
42	573-574	651-652	606-607	662	572-573	526	---	606	610-611	42
41	572	650	605	661	571	524-525	614	605	609	41
40	570-571	647-649	601-604	---	570	---	613	---	608	40
39	---	645-646	598-600	658-660	566-569	523	---	604	607	39
38	567-569	644	596-597	656-657	565	522	611-612	602-603	605-606	38
37	---	640-643	595	---	562-564	---	---	601	---	37
36	565-566	637-639	---	655	561	521	610	599-600	---	36
35	563-564	---	591-594	652-654	559-560	520	609	598	603-604	35
34	561-562	634-636	---	651	557-558	519	607-608	---	601-602	34
33	559-560	632-633	588-590	---	556	---	---	597	---	33
32	558	630-631	586-587	648-650	554-555	516-518	606	---	600	32
31	556-557	628-629	---	646-647	552-553	514-515	---	594-596	597-599	31
30	554-555	624-627	582-585	644-645	550-551	---	---	593	596	30
29	551-553	623	581	642-643	549	---	604-605	---	---	29
28	549-550	621-622	578-580	641	547-548	---	603	---	594-595	28
27	546-548	617-620	576-577	639-640	545-546	513	---	---	593	27
26	543-545	613-616	575	637-638	543-544	508-512	602	589-592	592	26
25	541-542	612	572-574	633-636	541-542	507	601	---	589-591	25
24	540	610-611	570-571	632	539-540	506	600	586-588	588	24
23	538-539	604-609	567-569	627-631	---	505	---	---	586-587	23
22	536-537	603	564-566	625-626	535-538	504	599	582-585	585	22
21	532-535	---	562-563	623-624	533-534	503	597-598	581	584	21
20	528-531	602	559-561	619-622	530-532	499-502	596	580	581-583	20
19	524-527	596-601	556-558	615-618	527-529	498	595	579	580	19
18	521-523	593-595	554-555	612-614	525-526	494-497	592-594	577-578	579	18
17	519-520	587-592	550-553	609-611	523-524	493	591	576	578	17
16	517-518	580-586	547-549	604-608	520-522	492	590	573-575	577	16
15	512-516	579	544-546	600-603	518-519	490-491	589	571-572	575-576	15
14	506-511	578	542-543	593-599	515-517	487-489	588	---	574	14
13	501-505	577	540-541	590-592	512-514	486	587	567-570	572-573	13
12	---	568-576	535-539	583-589	510-511	---	585-586	566	571	12
11	496-500	554-567	533-534	577-582	505-509	---	584	565	569-570	11
10	492-495	552-553	526-532	572-576	502-504	482-485	---	564	567-568	10
9	489-491	549-551	524-525	569-571	500-501	480-481	581-583	561-563	565-566	9
8	486-488	535-548	515-523	567-568	495-499	475-479	580	559-560	564	8
7	481-485	532-534	509-514	558-566	491-494	474	576-579	557-558	562-563	7
6	474-480	521-531	505-508	553-557	484-490	469-473	573-575	553-556	560-561	6
5	471-473	506-520	498-504	546-552	479-483	466-468	571-572	549-552	558-559	5
4	465-470	497-505	489-497	541-545	472-478	462-465	567-570	546-548	553-557	4
3	460-464	482-496	479-488	529-540	462-471	458-461	564-566	536-545	550-552	3
2	451-459	466-481	464-478	508-528	441-461	447-457	558-563	524-535	546-549	2
1	316-450	311-465	326-463	335-507	338-440	317-446	453-557	432-523	438-545	1

231

AGE 19 AND OVER

PCTILE	Normed for all levels: READING CMPRHNSN P1-AD	SPELLING P1-AD	CONCEPTS OF NUMBER P1-AD	MATH CMPUTATN P1-AD	MATH APPLICATNS P1-AD	Normed for indicated levels only: WORD READING P1,P2	LANGUAGE P3-AD	SOCIAL SCIENCE P3-AD	SCIENCE P3-AD	
99	693-827	758-826	735-823	768-847	I	I	694-822	I	I	99
98	679-692	751-757	727-734	758-767	N	N	682-693	N	N	98
97	670-678	746-750	722-726	754-757	C	C	678-681	C	C	97
96	666-669	743-745	716-721	752-753	O	O	676-677	O	O	96
95	662-665	738-742	713-715	741-751	M	M	673-675	M	M	95
94	661	735-737	706-712	740	P O	P D	671-672	P D	P D	94
93	658-660	731-734	703-705	734-739	L A	L A	670	L A	L A	93
92	657	722-730	699-702	731-733	E T	E T	669	E T	E T	92
91	654-656	721	697-698	729-730	T A	T A	668	T A	T A	91
90	652-653	720	696	728	E	E	---	E	E	90
89	648-651	718-719	690-695	727			666-667			89
88	646-647	717	688-689	726			664-665			88
87	644-645	715-716	686-687	725			662-663			87
86	642-643	712-714	683-685	721-724			660-661			86
85	640-641	---	682	719-720			657-659			85
84	635-639	711	681	718			656			84
83	634	709-710	679-680	717			654-655			83
82	631-633	707-708	676-678	716			652-653			82
81	629-630	706	674-675	713-715			651			81
80	628	699-705	672-673	711-712			649-650			80
79	624-627	697-698	670-671	710			647-648			79
78	623	695-696	667-669	709			644-646			78
77	622	694	665-666	708			---			77
76	620-621	693	663-664	705-707			643			76
75	619	691-692	661-662	702-704			642			75
74	618	690	659-660	700-701			641			74
73	617	685-689	657-658	699			640			73
72	615-616	684	---	---			639			72
71	613-614	---	656	---			638			71
70	610-612	682-683	---	697-698			636-637			70
69	609	679-681	651-655	696			---			69
68	607-608	677-678	649-650	694-695			---			68
67	605-606	---	647-648	691-693			634-635			67
66	603-604	676	646	690			633			66
65	602	---	643-645	689			632			65
64	601	675	641-642	688			---			64
63	600	674	640	687			631			63
62	599	673	639	684-686			---			62
61	598	670-672	636-638	683			630			61
60	597	667-669	---	681-682			627-629			60
59	595-596	666	634-635	---			---			59
58	593-594	665	632-633	680			---			58
57	592	664	631	---			626			57
56	591	662-663	629-630	679			625			56
55	589-590	657-661	628	677-678			624			55
54	585-588	654-656	626-627	674-676			623			54
53	584	---	623-625	---			622			53
52	582-583	---	620-622	673			---			52
51	580-581	---	619	672			621			51
50	578-579	653	617-618	---			---			50
49	577	652	615-616	670-671	I	I	620	I	I	49
48	575-576	649-651	614	669	N	N	---	N	N	48
47	573-574	647-648	612-613	666	C	C	---	C	C	47
46	570-572	646	608-611	667	O	O	619	O	O	46
45	567-569	645	606-607	---	M	M	617-618	M	M	45
44	---	643-644	604-605	664-666	P D	P D	616	P D	P D	44
43	565-566	637-642	601-603	661-663	L A	L A	---	L A	L A	43
42	563-564	---	599-600	---	E T	E T	615	E T	E T	42
41	562	635-636	597-598	---	Y A	T A	614	T A	T A	41
40	561	633-634	595-596	---	E	E	---	E	E	40
39	559-560	630-632	---	660			613			39
38	557-558	628-629	592-594	656-659			---			38
37	555-556	624-627	591	655			---			37
36	554	622-623	590	652-654			611-612			36
35	551-553	621	---	651			---			35
34	---	618-620	584-589	649-650			---			34
33	547-550	613-617	580-583	646-648			---			33
32	546	610-612	576-579	645			609-610			32
31	---	607-609	575	642-644			608			31
30	540-545	606	572-574	640-641			607			30
29	538-539	603-605	570-571	635-639			606			29
28	536-537	---	568-569	632-634			604-605			28
27	532-535	602	565-567	630-631			---			27
26	---	597-601	562-564	628-629			603			26
25	---	589-596	561	626-627			---			25
24	528-531	587-588	558-560	622-625			---			24
23	527	---	556-557	617-621			600-602			23
22	526	581-586	553-555	615-616			599			22
21	525	580	552	609-614			596-598			21
20	521-524	577-579	551	605-608			---			20
19	519-520	575-576	545-550	600-604			---			19
18	---	571-574	542-544	595-599			592-595			18
17	513-518	563-570	539-541	593-594			591			17
16	509-512	556-562	534-538	592			590			16
15	501-508	552-555	530-533	589-591			589			15
14	496-500	---	524-529	583-588			587-588			14
13	490-495	537-551	520-523	580-582			585-586			13
12	487-489	533-536	516-519	569-579			584			12
11	482-486	531-532	513-515	567-568			---			11
10	481	526-530	510-512	558-566			581-583			10
9	478-480	513-525	506-509	553-557			578-580			9
8	473-477	496-512	503-505	551-552			575-577			8
7	470-472	491-495	498-502	541-550			572-574			7
6	466-469	484-490	491-497	532-540			570-571			6
5	460-465	479-483	481-490	512-531			567-569			5
4	454-459	463-478	472-480	506-511			564-566			4
3	445-453	456-462	460-471	497-505			561-563			3
2	439-444	431-455	452-459	466-496			557-560			2
1	316-438	311-430	326-451	335-465			453-556			1

Appendix I

INFORMATIONAL BROCHURE

Special Pull-out Section

The 1982 Seventh Edition Stanford Achievement Test for Use with Hearing-Impaired Students

Overview

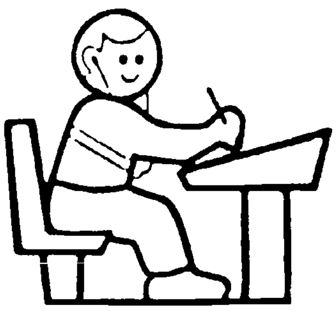
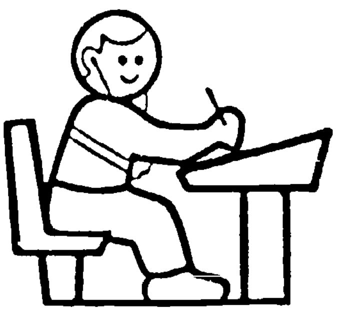
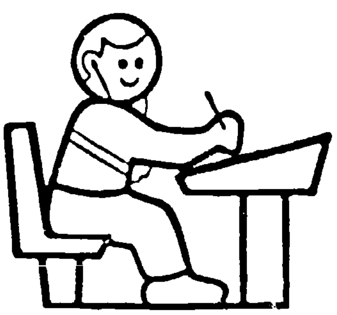
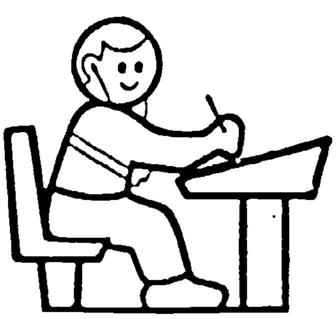
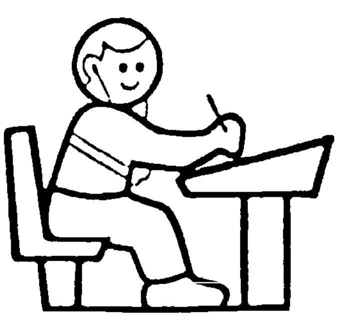
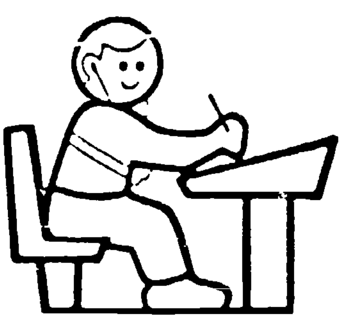
A new edition of the Stanford Achievement Test is replacing the 1974 Special Edition of the Stanford for hearing-impaired students (SAT-HI). The new Stanford is the Seventh Edition of the SAT, published by the Psychological Corporation in 1982. Hearing-impaired students will take the same test as do hearing students, but the screening, testing administration procedures, scoring and norms are based on the needs of hearing-impaired students.

A detailed booklet describing the test and its use—"Administering the 1982 Stanford Achievement Test, Seventh Edition, to Hearing-Impaired Students" —is now available from CADS.

The 1982 Stanford Achievement Test

The 1982 Stanford Achievement Test measures a student's level of academic achievement in a wide range of content areas. It is published at six difficulty levels, with the Reading Comprehension, Spelling, and Mathematics subtests appearing at all levels. Each level covers curriculum material specifically related to different grade levels in educational programs across the United States. This test is generally not appropriate for students under eight years of age.

A school need not administer all of the subtests to its hearing-impaired students. Some subtests—such as Word Study Skills, Listening Comprehension, and Vocabulary—do not appear to be suitable for most hearing-impaired students. It is essential for school staff to review the test materials

ahead of time in order to determine which subtests are appropriate for their students. For those children—usually younger or multiply handicapped—who need some preliminary drill in understanding the test format and procedures, practice tests are available at levels Primary 1, 2, and 3 of the Stanford. (These are the same practice tests used with the 1974 SAT-HI.) At test levels Primary 1 and 2, students mark their answers directly in the test booklets. At the upper four levels of the test, students mark their answers on separate answer sheets. The test booklets at these four levels are reusable.

To date, the norms for hearing-impaired students have been developed only for Form E of the test. Plans for norming the alternate Form F of the test are now under way. Norms for Form F may be available in the 1984-85 school year.

The 1983 Stanford Norming Project

The 1982 Stanford Achievement Test was normed in the spring of 1983 on approximately 8,500 hearing-impaired students from 41 states and over 600 schools; the project was largely supported by a grant from the U.S. Department of Education, Special Education Programs. The programs which took part in the norming project were selected randomly from programs participating in the Annual Survey of Hearing-Impaired Children and Youth, also conducted by CADS. The sample of students chosen for the norming project represents closely the population of hearing-impaired students receiving special educational services throughout the United States.

Test Level Assignment

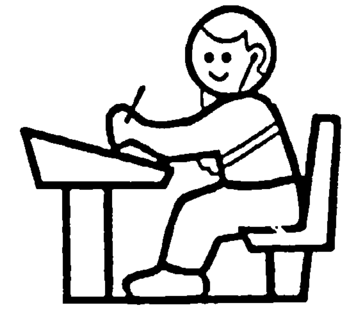
Although each level of the test covers curriculum material related to different grade levels in schools, many hearing-impaired students are either in ungraded classrooms or are not performing at the same level in reading as they are in mathematics. Because of this, assigning the proper level of the 1982 Stanford is extremely important and should generally be done on the basis of two brief screening tests, one in reading, the other in mathematics. (This is a different and more individualized procedure than the single screening test in reading employed with the 1974 SAT-HI.) The *lower level* screening tests are administered to students achieving at the *fourth grade or below* in reading/math; the *upper level* screening tests are given to students achieving at the *fifth grade or above* in reading/math.

On the basis of these two screening tests the student is assigned the proper level of the Stanford (1) for reading and reading-related subtests, including (in most cases) Mathematics Applications, and (2) for Concepts of Number and Mathematics Computation. The raw scores on the screening tests and the patterns of individual item responses will guide the teacher or test administrator in assigning the proper battery test levels for individual students. Special instruction materials with scoring examples have been prepared to help teachers assign test levels. These instructions will be sent with all screening test orders.

Most hearing-impaired students will be assigned to a math test level different from their reading test level. For example, a student may be assigned the Reading Comprehension and other reading-related subtests from the *Primary 2 full-battery* test booklet and the Concepts of Number and Mathematics Computation subtests from the *Intermediate 1 Mathematics Separate* test booklet. In the 1983 norming project described above, over 60% of the 8,500 hearing-impaired students in the sample were assigned a Concepts of Number and Mathematics Computation test level different from their reading test level.

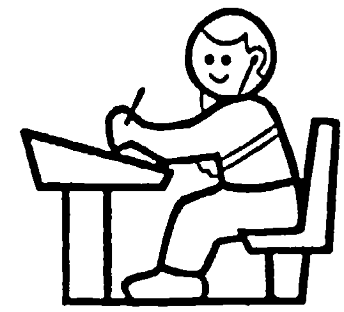
Types of Scores

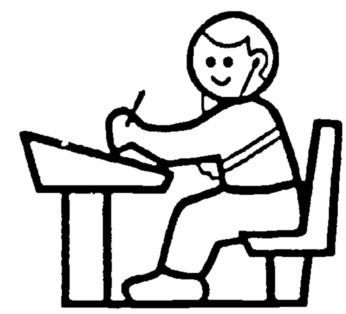
The Stanford is a norm-referenced test. That means that the scores derived from hearing-impaired students' responses to the test will emphasize a comparison of their individual performances with the performance of a representative norming population of students. The Psychological Corporation has standardized this test with a large national sample of hearing students. It is, therefore, possible for a school to administer the Stanford to its hearing-impaired students and to compare their performances with the *hearing* students who took the same level of the test. The norming project of the Center for Assessment and Demographic Studies extends the work of the Psychological Corporation by allowing comparisons with *hearing-impaired* students as well.



The following scores can be derived from the new Stanford:

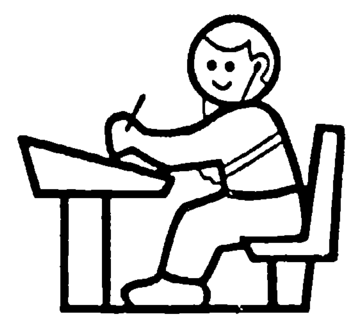
- **Raw Scores:** the number of correct answers for each subtest.
- **Scaled Scores:** scores derived from the raw scores and representing equal units on a continuous scale; these scaled scores are comparable across levels of the test within the same content area and are especially valuable for charting individual student growth from year to year.
- **Percentiles for Hearing-Impaired Students:** scores derived from the distributions of scaled scores within age groups for given content areas; these percentiles represent the percentage of hearing-impaired students of the same age who scored equal to or less than that score.
- **Grade Equivalents:** scores that represent the average performance of hearing students tested in a given month of the year with a specific subtest; e.g., obtaining a 6.2 grade equivalent on the Primary 2 Reading Comprehension subtest means that the student performed on that subtest in a fashion similar to what would be expected from an average hearing sixth-grader taking the same subtest. Grade equivalents are *not* comparable across levels of the test and should be used with great caution.



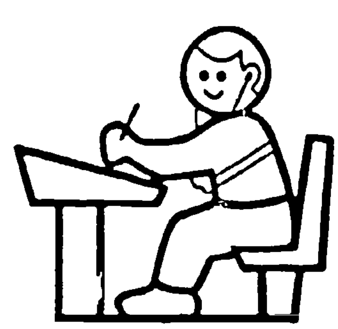


Scoring

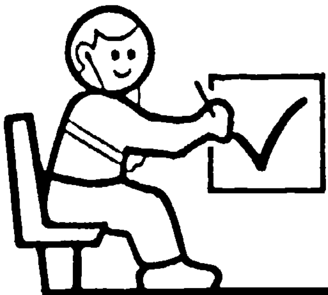
The tests may be scored either by hand at the school or sent to the scoring center in Iowa for machine-scoring. (Schools should obtain information on these machine-scoring services from CADS before sending their tests to Iowa.) As with the 1974 SAT-HI, the percentile comparisons with hearing-impaired students of the same age in the norming sample, will *not* be available from the scoring center in Iowa. Percentiles must either be computed by the school using the norm charts or, for those schools using the machine-scoring services in Iowa, obtained from CADS.



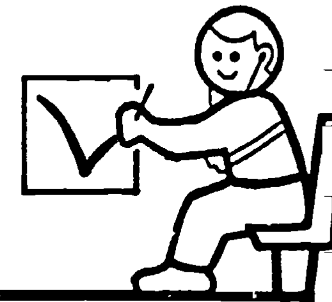
The Center for Assessment and Demographic Studies is also able to provide special, more detailed reports on each student's performance. These reports contain not only all the scores detailed above, but also have a breakdown of correct/wrong/blank responses for the *subgroups* within each subtest. A sample of these reports appears in the booklet, "Administering the 1982 Stanford Achievement Test, Seventh Edition, to Hearing-Impaired Students," available from CADS.



If a school wishes to obtain individualized reports, a magnetic tape with the school's test results must first be obtained from the Iowa scoring center. The school must then forward this tape to CADS for production of the student reports. This service will be available from CADS after January 1, 1984.



CHECKLIST FOR ADMINISTERING THE 1982 STANFORD ACHIEVEMENT TEST TO HEARING-IMPAIRED STUDENTS



1. Preliminary:

- ☐ Obtain informational brochure and order blank/price list from CADS to determine suitability of the test for your students.

2. Screening and Ordering:

- ☐ Determine number of students performing at fourth grade level or below in reading/math. Order LOWER LEVEL SCREENING TESTS in reading and math for these students from CADS.
- ☐ Determine number of students performing at fifth grade level or above in reading/math. Order UPPER LEVEL SCREENING TESTS in reading and math for these students from CADS.
- ☐ Administer screening tests.
- ☐ Score screening tests and determine numbers of full-battery level tests and Math Separates needed.
- ☐ Order full-battery tests, Math Separates, and related materials from CADS.

3. Testing:

- ☐ Administer practice tests, if appropriate.
- ☐ Administer full-battery tests (for reading and reading-related subtests) and Math Separates (for Concepts of Number and Math Computation subtests).

4. Scoring:

- ☐ Hand-score at school
  OR
- ☐ Send tests to Iowa for machine-scoring. (Contact CADS first.)
- ☐ OPTIONAL: Send magnetic tape obtained from Iowa to CADS for special individual student reports.

5. Using Test Results:

- ☐ Assess individual student growth in each area by examining scaled scores.
- ☐ Use norms and resulting percentiles to compare students' performance to national sample of hearing-impaired students.
- ☐ Examine patterns of student responses by using results of special CADS scoring procedures (optional). Use data in designing the IEP.

FOR FURTHER INFORMATION, contact:

Center for Assessment and Demographic Studies
Gallaudet Research Institute
800 Florida Avenue, N.E.
Washington, D.C. 20002

Phone: (202) 651-5300, voice
(202) 651-5302, TDD

Appendix J

STUDENT-PROBLEM CHART AND RELATED ANALYSES USING PRIMARY 3 READING COMPREHENSION FROM CURRICULUM COVERAGE STUDY

STUDENT-PROBLEM (S-P) CHART ANALYSIS OF P3R - CURRUCULUM STUDY SAMPLE: RESID.-SOUTH

ITEM DOMAIN = RD-TEXT ; NUMBER OF STUDENTS = 61; NUMBER OF PROBLEMS = 20

STUDENT NUMBER	TEST (RAW)	SCORE (%)	MODIFIED CAUTION IND	SGN	PROBLEM NUMBER: 18 20 17 1 19 39 2 3 4 53 40 52 24 4 25 53 43 41 21 56	
					ANSWER KEY: C D D A B B D D A D C B A B C A D D D A	
8076	18	90	.01	A	+ + + + + + + + + + + + + + + + + 1S+ 4	(4.3)
8013	18	90	.01	A	+ + + + + + + + + + + + + + + + + 1S+ 2	(5.0)
1038	17	85	.12	A	+ + + + + + + + + + 4 + + + + + 3S1 + +	(4.5)
1017	16	80	.28	B	+ + + + 1 + + + + + + + + + 1 +S3 + 2 +	(4.3)
4078	15	75	.26	B	+ + 2 + + + + + 4 + + + + + +S+ + 1 2 2	(3.3)
1156	14	70	.11	A	+ + + + + + + + 2 + 4 + + +S4 + 3 2 2 +	(4.1)
471	14	70	.12	A	+ + + + + + 3 + + + 1 + + +S+ 2 + 1 2 2	(3.8)
6076	14	70	.05	A	+ + + + + + + + + + 2 + + +S1 0 + 1 2 0	(3.5)
6071	14	70	.11	A	+ + + + + + + 2 + + + + 3 +S+ 2 2 1 + 2	(3.7)
601	14	70	.07	A	+ + + + + + + + + 0 + + + 0S+ 0 1 + 2 0	(4.5)
5053	14	70	.18	A	+ + + + + + 2 + 2 + + + + +S1 2 2 + 2 +	(4.3)
7056	14	70	.15	A	+ + + + + + + 2 + + + + 3 3S+ 3 3 + 2 +	(3.9)
6012	14	70	.08	A	+ + + + + + + + + + + 4 4 +S4 + 2 + 2 3	(3.8)
					P	
1472	13	65	.19	A	+ + + + + + + 3 + 1 4 + 3S+ 4 + 2 + 2 +	(3.9)
					P	
7018	13	65	.15	A	+ + + + + + + + 2 2 + + 3S4 + 2 2 + 2 +	(3.4)
					P	
1102	13	65	.12	A	+ + + + + + + 2 4 + 2 + +S+ + + 3 2 3 2	(3.2)
					P	
6017	13	65	.19	A	+ + + + + 4 + + + + 1 1 3S+ + + 1 + 2 2	(3.2)
6037	13	65	.17	A	+ + + + + + 3 + + 2 1 + 3S+ + + 2 1 3 +	(3.8)
1151	13	65	.10	A	+ + + + + + + + 2 + 4 + +S3 2 + 2 2 2 +	(3.8)
708	13	65	.10	A	+ + + + + + + + 2 + + + 3S3 4 + 2 2 + 2	(3.8)
					P	
4056	13	65	.07	A	+ + + + + + + + + 1 + + 3S1 + 2 + 1 2 4	(3.1)

- CONTINUED -

STUDENT-PROBLEM (S-P) CHART ANALYSIS OF P3R - CURRUCULUM STUDY SAMPLE: RESID.-SOUTH

ITEM DOMAIN = RD-TEXT ; NUMBER OF STUDENTS = 61; NUMBER OF PROBLEMS = 20

PROBLEM NUMBER

STUDENT NUMBER	TEST SCORE (RAW)	TEST SCORE (%)	MODIFIED CAUTION IND/SGN		Responses	Notes
					1 2 1 _ 1 3 _ _ _ 5 4 5 2 5 4 5 4 4 2 5	
					8 0 7 1 9 9 2 3 4 3 0 2 2 4 2 5 3 1 1 6	
					ANSWER KEY	
					C D D A B B D D A D C B A B C A D D D A	
92	13	65	.21	B	+ + + + + 1 + 2 + + + + 2S+ + 2 2 2 2 +	(3.1)
					P	
6029	13	65	.07	A	+ + + + + + + + + + + 1 4S1 2 + + 1 2 3	(3.7)
					P	
4051	12	60	.32	B	+ + 3 + + + + 2 4 + + +S0 1 4 2 1 + + +	(3.1)
8036	12	60	.32	B	+ + 3 + + + 2 + 2 + + 1S2 + + 2 3 + 2 +	(3.5)
8085	12	60	.16	A	+ + + + + + 3 + + 0 + 0S3 0 + 0 + + 2 0	(3.2)
					P	
1105	12	60	.08	A	+ + + + + + + 2 + + 4 1S+ + 1 + 2 3 2 2	(3.3)
					P P	
2002	12	60	.02	A	+ + + + + + + + + + + 1S2 + 4 3 2 1 2 2	(2.7)
1289	12	60	.09	A	+ + + + + + + + 4 + 2 +S3 1 2 + 3 + 2 2	(3.1)
1431	12	60	.20	A	+ + + + 1 + + + + + 2 4S3 + 4 + 3 1 + 3	(2.8)
					P	
7028	12	60	.09	A	+ + + + + + + 2 2 + + +S3 + 4 + 3 1 2 2	(4.5)
239	12	60	.12	A	+ + + + + + 2 + + 0 + 0S+ 0 + 0 + 1 2 0	(2.7)
					P	
7001	11	55	.00	A	+ + + + + + + + + + 4S+ 3 1 1 2 3 1 2 3	(3.1)
607	11	55	.09	A	+ + + + + + + 2 + 0 +S1 + 0 4 0 2 + 3 0	(3.4)
8015	11	55	.13	A	+ + + + + + + + 2 0 1S0 + 0 1 0 + 3 + 0	(3.7)
					P	
70	11	55	.00	A	+ + + + + + + + + + 4S4 + 0 4 0 3 3 2 0	(3.2)
479	10	50	.17	C	+ + + + + + 3 2 4 0S+ 0 + 0 + 0 2 2 + 0	(2.8)
6023	10	50	.09	C	+ + + + + + 2 2 + 0S+ + + 0 4 0 2 2 2 0	(2.9)
					P	
6035	10	50	.21	D	+ + + + + + 2 + 3 0S4 0 2 0 2 0 + + + 0	(3.1)
3084	10	50	.33	D	+ + + + 1 + 2 2 3 +S1 3 2 + 2 + + 1 + 2	(2.8)
1358	9	45	.09	C	+ + + + + + + 2 4S0 + 0 4 0 1 0 + 1 2 0	(3.1)
5009	9	45	.08	C	+ + + + + 0 + + +S0 0 0 + 0 0 0 0 0 3 0	(2.5)

- CONTINUED -

STUDENT-PROBLEM (S-P) CHART ANALYSIS OF P3R - CURRUCULUM STUDY SAMPLE: RESID.-SOUTH

ITEM DOMAIN = RD-TEXT ; NUMBER OF STUDENTS = 61; NUMBER OF PROBLEMS = 20

```
                                                    PROBLEM NUMBER
                         MODIFIED
STUDENT TEST SCORE  CAUTION   1 2 1   1 3       5 4 5 2 5 4 5 4 4 2 5
NUMBER  (RAW)( % )  IND/SGN   8 0 7 1 9 9 2 3 4 3 0 2 2 4 2 5 3 1 1 6
-----------------------------------------------------------------------

                                          ANSWER KEY
                              C D D A B B D D A D C B A B C A D D D A
                              ---------------------------------------
  1095      9   45   .18  C   + + + + + 1 2 + +S1 1 1 2 4 + 2 + 3 2 3    (2.6)

  7047      9   45   .11  C   + + + + + + 2 + 2S0 + 0 3 0 1 0 3 1 + 0    (2.7)

  7014      9   45   .19  C   + + + + + 4 2 + 4S0 + 0 + 0 0 0 0 2 + 0    (2.7)

  8040      9   45   .07  C   + + + + + + + 2 2S0 1 0 + 0 + 0 3 3 3 0    (2.5)

  4008      9   45   .06  C   + + + + + + 2 2 +S+ 1 + 3 3 1 2 2 1 2 2    (2.7)

  1104      8   40   .11  C   + + + + + 1 + 2S+ 0 1 0 3 0 + 0 0 1 2 0    (2.6)
                                        P
  1182      8   40   .06  C   + + + + + 0 + +S+ 0 0 0 3 0 0 0 0 0 2 0    (2.5)

  8055      8   40   .05  C   + + + + + + + 2S4 0 1 0 3 0 + 0 2 3 2 0    (2.8)

  6113      8   40   .16  C   + + + 4 + + + 1S+ 0 2 0 4 0 1 0 + 1 2 0    (2.6)

  1046      8   40   .03  C   + + + + + + + 2S2 0 + 0 3 0 0 0 0 2 2 0    (2.6)

  6034      8   40   .23  D   + + + 2 + + 1 2S4 1 2 + + 4 1 4 + 1 2 2    (2.7)

  1379      7   35   .19  C   + + + 3 + 0 1S+ + 0 0 0 + 0 0 0 0 0 2 0    (2.4)

  1162      6   30   .42  D   + 3 + + 1 0S3 2 4 1 2 1 + + 1 3 3 3 2 +    (2.3)
                                    P P
  3028      6   30   .42  D   4 + + 3 + 3S1 1 4 + 1 1 4 3 1 + 3 + 3 2    (1.9)

  1006      6   30   .09  C   + + + + + 0S3 2 2 0 0 0 + 0 0 0 0 0 2 0    (2.2)

  8121      5   25   .10  C   + + + + 1S0 2 + 4 0 0 0 3 0 0 0 0 0 2 0    (2.2)
                                P P
  6019      5   25   .00  C   + + + + +S0 2 2 4 0 0 0 4 0 0 0 0 0 2 0    (2.0)
                              P
  6115      4   20   .06  C   + 3 + 2S+ + 1 2 3 0 2 0 3 0 1 0 3 1 2 0    (3.7)

  3022      3   15   .41  D   1 3 +S2 1 + 1 2 4 0 2 0 2 0 1 0 2 2 + 0    (1.7)

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STUDENT-PROBLEM (S-P) CHART ANALYSIS OF P3R - CURRUCULUM STUDY SAMPLE: RESID.-SOUTH

ITEM DOMAIN = RD-TEXT ; NUMBER OF STUDENTS = 61; NUMBER OF PROBLEMS = 20

PROBLEM NUMBER	1	2	1		1	3				5	4	5	2	5	4	5	4	4	2	5
	8	0	7	1	9	9	2	3	4	3	0	2	2	4	2	5	3	1	1	6
ANSWER KEY	C	D	D	A	B	B	D	D	A	D	C	B	A	B	C	A	D	D	D	A
PROBLEM TOTAL	5	5	5	5	5	4	3	3	3	3	2	2	2	2	2	2	1	1	1	1
	9	8	8	5	5	8	8	5	2	0	7	7	6	3	2	0	6	5	4	3
PERCENT CORRECT	9	9	9	9	9	7	6	5	5	4	4	4	4	3	3	3	2	2	2	2
	7	5	5	0	0	9	2	7	2	9	4	4	3	8	6	3	6	5	3	1
MODIFIED CAUTION INDEX	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	0	0	6	1	3	1	2	2	2	1	2	0	3	1	2	1	3	2	3	2
	7	2	6	0	3	9	0	3	6	2	1	9	2	1	1	4	2	9	6	3
MODIFIED CAUTION SIGNAL	Y	Y	Z	Y	Z	Y	Y	Z	Z	W	X	W	X	W	X	W	X	X	X	X

⁻⁰MAIN = RD-TEXT ; NUMBER OF STUDENTS = 61; NUMBER OF PROBLEMS = 20

******* S T U D E N T S U M M A R Y *******

AVERAGE RAW SCORE	=	11.00
STANDARD DEVIATION OF RAW SCORE	=	3.31
AVERAGE PERCENT OF ITEMS CORRECT	=	55.00 %
AVERAGE MODIFIED CAUTION INDEX	=	0.14
STANDARD DEVIATION OF MODIFIED CAUTION INDEX	=	0.10

******* P R O B L E M S U M M A R Y *******

AVERAGE ITEM DIFFICULTY	=	55.00 %
STANDARD DEVIATION OF ITEM DIFFICULTY	=	0.27
AVERAGE MODIFIED CAUTION INDEX	=	0.22
STANDARD DEVIATION OF MODIFIED CAUTION INDEX	=	0.14

******* T E S T S U M M A R Y *******

AVERAGE OVERALL STUDENT PERFORMANCE ON TEST	=	55.00 %
RELIABILITY COEFFICIENT (CRONBACH'S ALPHA)	=	0.71
DISPARITY COEFFICIENT	=	0.46

Appendix K

REGIONAL DECILE TABLES FOR NORTHEASTERN HEARING-IMPAIRED STUDENTS

1Stanford Norms for Northeast AGE = 8

DECILE	READING CMPRHNSN P1-AD	SPELLING P1-AD	LANGUAGE P3-AD	CONCEPTS OF NUMBER P1-AD	MATH CMPUTATN P1-AD	MATH APPLICATNS P1-AD	
1	316-432	311-420	453-578	326-444	335-431	338-433	1
2	433-442	421-436	579-600	445-457	432-446	434-446	2
3	443-451	437-455	601-611	458-467	447-463	447-463	3
4	452-470	456-480	612-620	468-475	464-488	464-481	4
5	471-500	481-507	621-632	476-484	489-514	482-493	5
6	501-517	508-548	633	485-513	515-536	494-502	6
7	518-538	549-572	634-643	514-529	537-557	503-515	7
8	539-566	573-598	644-658	530-545	558-590	516-536	8
9	567-604	599-651	659-661	546-573	591-610	537-564	9
10	605-827	652-826	662-822	574-823	611-847	565-836	10

1Stanford Norms for Northeast AGE = 9

DECILE	READING CMPRHNSN P1-AD	SPELLING P1-AD	LANGUAGE P3-AD	CONCEPTS OF NUMBER P1-AD	MATH CMPUTATN P1-AD	MATH APPLICATNS P1-AD	
1	316-446	311-453	453-577	326-443	335-452	338-440	1
2	447-460	454-473	578-603	444-469	453-498	441-462	2
3	461-477	474-488	604-619	470-481	499-522	463-476	3
4	478-489	489-515	620-626	482-503	523-548	477-492	4
5	490-505	516-535	627-631	504-512	549-565	493-507	5
6	506-528	536-555	632-634	513-526	566-580	508-516	6
7	529-544	556-583	635-638	527-548	581-598	517-525	7
8	545-559	584-601	639-652	549-577	599-632	526-548	8
9	560-601	602-642	653-675	578-602	633-652	549-595	9
10	602-827	643-826	676-822	603-823	653-847	596-836	10

1Stanford Norms for Northeast AGE = 10

DECILE	READING CMPRHNSN P1-AD	SPELLING P1-AD	LANGUAGE P3-AD	CONCEPTS OF NUMBER P1-AD	MATH CMPUTATN P1-AD	MATH APPLICATNS P1-AD	
1	316-448	311-442	453-569	326-453	335-484	338-440	1
2	449-454	443-468	570-583	454-478	485-512	441-465	2
3	455-473	469-493	584-599	479-502	513-539	466-490	3
4	474-496	494-513	600-609	503-524	540-568	491-507	4
5	497-517	514-547	610-613	525-541	569-584	508-523	5
6	518-556	548-587	614-617	542-552	585-621	524-539	6
7	557-575	588-606	618-621	553-570	622-645	540-557	7
8	576-591	607-640	622-629	571-604	646-660	558-575	8
9	592-628	641-675	630-665	605-630	661-673	576-618	9
10	629-827	676-826	666-822	631-823	674-847	619-836	10

1Stanford Norms for Northeast AGE = 11

DECILE	READING CMPRHNSN P1-AD	SPELLING P1-AD	LANGUAGE P3-AD	CONCEPTS OF NUMBER P1-AD	MATH CMPUTATN P1-AD	MATH APPLICATNS P1-AD	
1	316-463	311-470	453-579	326-472	335-509	338-458	1
2	464-485	471-518	580-593	473-501	510-551	459-471	2
3	486-505	519-540	594-607	502-526	552-577	472-497	3
4	506-521	541-561	608-613	527-551	578-593	498-518	4
5	522-536	562-586	614-625	552-568	594-608	519-532	5
6	537-561	587-602	626-632	569-585	609-627	533-547	6

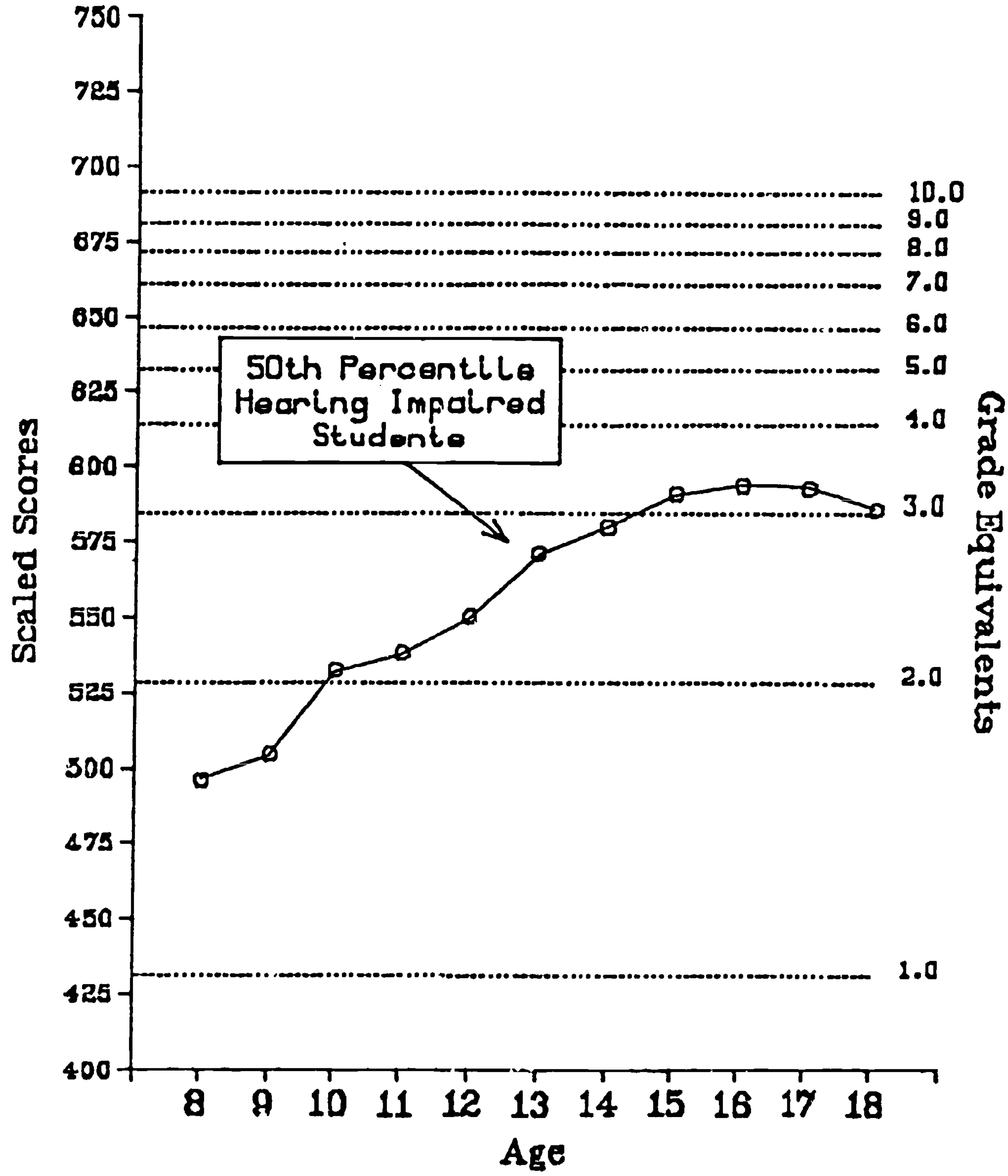
Appendix L

GRAPH REPRESENTING SCALED SCORE, GRADE EQUIVALENT AND HEARING-IMPAIRED PERCENTILE DISTRIBUTIONS FOR READING COMPREHENSION

Achievement Patterns

Stanford Achievement Test, 7th Edition

READING COMPREHENSION



Appendix M

PERSPECTIVES ARTICLE, "INTERPRETING THE NEW STANFORD ACHIEVEMENT TEST FOR HEARING-IMPAIRED STUDENTS"

BEST COPY AVAILABLE

Research Reports

Interpreting the New Stanford Achievement Test for Hearing-Impaired Students

By Thomas E. Allen

This column reviews research data and developments in the field of education of the deaf. Researchers interested in contributing articles or readers interested in suggesting topics are encouraged to contact Judy Harkins, Research Division, House 3, Gallaudet College, Washington, DC 20002

In the spring of 1983, more than 8,300 hearing-impaired students across the United States took the new 7th edition of the Stanford Achievement Test (SAT). Their test scores became the basis for norms for hearing-impaired students on the new edition. The norms are useful in comparing the achievement of one student with the achievement of other hearing-impaired students of the same age. Interpreting the norms correctly depends upon a full understanding of the characteristics of the norming sample.

Who Was Studied

The students in the norming study were from a sample of special education programs, selected at random from those participating in the Gallaudet Research Institute's *Annual Survey of Hearing-Impaired Children and Youth.* The population of hearing-impaired students (over 55,000) represented by the *Annual Survey* data base consists of those who receive some kind of special education or support service. Hearing-impaired students who do not receive special services are not well represented by the *Annual Survey* and are also not well represented in the norming project.

The sampling procedures were designed to give a good representation of the geographic regions of the United States and of the types of programs hearing-impaired students attend. Hearing-impaired students in the study were between the ages of 8 and 19. Most multihandicapped students, especially those with severe cognitive disabilities, were not included in the norming. (Special screening procedures have been developed which help to identify students for whom the SAT is not appropriate.)

Subtest Materials Used

All students in the sample took the *Reading Comprehension, Spelling, Concepts of Number,* and *Mathematics Computation* subtests. Those subtests are included in all six levels of the Stanford Battery. Other subtests, such as *Vocabulary, Word Study Skills,* and *Listening Comprehension* were not normed, because previous experience with the SAT had shown that achievement of hearing-impaired students is not measured well by these subtests.

The *Environment, Mathematics Applications, Science,* and *Social Science* subtests were optional for participants. Therefore, the norms on these subtests are based on only part of the norming sample.

Interpreting the Norms

The norms are expressed in terms of percentile ranks. A percentile rank is a score ranging

The special procedures for administering this SAT and the new norms on hearing-impaired students were supported by Gallaudet College and by the U.S. Department of Education, Office of Special Education Programs, under grant number [illegible]004.

Thomas E. Allen is a Research Scientist, Center for Assessment and Demographic Studies, Gallaudet Research Institute, Washington, D.C

in value from 1 to 99. It expresses the percentage of students who are equal to or below the score shown by an individual student.

In the norming project, the student's age at the time of testing was the norming variable. Thus, for example, a percentile of 50 in reading comprehension for a ten-year-old means that the student's reading comprehension achievement, as measured by the scaled scores, was equal to or better than the reading comprehension of 50 percent of all ten-year-old hearing-impaired students tested as part of the project.

Unlike hearing students, who are assigned a level of the test on the basis of age or grade in school, hearing-impaired students are assigned a test level on the basis of a screening test. It is inevitable that within each age group, hearing-impaired students will take a variety of test levels. In order to ensure that a percentile rank places a student among all students of the same age, the subject matter must have been measured at all levels of the test. When the subject matter has not been measured at all levels of the test, the percentile ranks have to be interpreted with caution. (The table describes which subtests have or have not been normed at all test levels.)

Sometimes, as a result of this problem, the students' scores may present some confusing discrepancies. For example, a 13-year-old student may achieve at the 92 percentile rank on the *Word Reading* subtest and the 35 percentile rank on the *Reading Comprehension* subtest. Which percentile is more valid? Since the *Reading Comprehension* subtest was tested at all levels of the SAT, the 35th percentile is an accurate placement of this student among all 13-year-olds. On the other hand, *Word Reading* is tested only at the Primary 1 and 2 levels. Therefore, the 92 represents this student's standing only among those 13-year-old students who were assigned to Primary 1 or 2. Educators should not conclude that this student reads words better than 92 percent of all hearing-impaired 13-year-olds.

The Primary 1 level *Mathematics* subtest presents particular problems. At this level on the SAT, *Mathematics Computation* and *Mathematics Applications* are combined in one subtest. This is a reasonable practice for hearing students, whose performance on the separate sections of the test does not often differ. However, hearing-impaired students are likely to show large differences between computation and application performance at this level. Using the single scaled score provided by the test publisher was not appropriate, since this value often underestimates a student's computation ability and overestimates a student's ability in math applications. To get around this problem, separate scaled scores were estimated for the different sections of the test by using statistical information about these scales (provided by the

Guide to Interpreting Percentiles on Subtests of the Stanford Achievement Test, 7th Edition

Subtest	Test Levels	Comments on Interpreting Percentiles
Reading Comprehension *Spelling* *Concepts of Numbers* *Mathematics Computation**	All six levels of battery	Percentiles on these subtests are the most reliable because data are available on students of all ages at each level of the battery.
Word Reading *Math Applications** *Science* *Social Science* *Language*	Primary 1 & 2 only All six levels of battery Primary 3 through advanced Primary 3 through advanced Primary 3 through advanced	These subtests were optional; not all educational programs in the sample administered them. *Interpret percentiles with caution.*
**Mathematics Computation/Applications* (combined)	Primary 1 only	On this subtest, special scaled scores were developed for hearing-impaired students.
Vocabulary *Word Study Skills* *Listening Comprehension*		Norms are not available for these subtests, which are generally inappropriate for hearing-impaired students.

st publisher) and by separately ssessing the students' performance on the computation and apication items in the Primary 1 st. As a result, by taking one subtest, the student will show two scaled scores and two percentile nks. Unlike the reading discrency noted in the previous example, this difference can be intereted as a difference in skill level tween computation and applications achievement.

Resources

The special procedures designed for administering the new SAT are available from the Gallaudet Research Institute. The norms and complete battery of test materials are also available at cost.

If you are interested in having a workshop at your school or program, or if you have questions about the use of the SAT, please write c/o Stanford Achievement Test, Gallaudet Research Institute, 800 Florida Ave., N.E., Washington, DC 20002. Our phone number is (202) 651-5300.