ABSTRACT
        Normative data were obtained on the performance of
first-year graduate students on the Aptitude Test and Advanced Tests
of the Graduate Record Examinations. The population consisted of
students enrolled as full-time graduate students for the first time
in the fall of 1964 in a college or university belonging to the
Council of Graduate Schools (CGS). Subpopulations within each
institution were composed of students enrolled in graduate study in
18 major fields--biology, business, chemistry, economics, education,
engineering, French, geology, government, history, literature,
mathematics, philosophy, physical education, physics, psychology,
sociology, and Spanish. Majors in these fields took both the Aptitude
Test and the appropriate Advanced Test. Norms are provided for the
Verbal and Quantitative sections of the Aptitude Test by major field
of study and for performance on the 15 Advanced Tests. Accuracy of
the data is discussed and the appendices contain the names of the
institutions participating, the plan of data collection, weights used
in preparing the frequency distributions, and specific fields
classified under particular fields for sampling purposes. (BOF)

GRe

The Performance of
First-Year Graduate Students
on the
Graduate Record Examinations

Gary L. Marco

July 1968
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GRE

THE PERFORMANCE OF FIRST-YEAR GRADUATE STUDENTS

ON THE GRADUATE RECORD EXAMINATIONS

Gary L. Marco

The National Program for Graduate School Selection is under the
policy direction of the Graduate Record Examinations Board, an
affiliate of the Association of Graduate Schools, the Council of
Graduate Schools, and Educational Testing Service.

ACKNOWLEDGMENTS

CONTENTS

TABLES

6

PURPOSE AND BACKGROUND

Until the 1967-68 academic year, the primary interpretive materials
for the Graduate Record Examinations (GRE) were the scores for basic
reference groups of college seniors, who for the most part took the tests
in 1952 (1). At its meeting in 1964, the Committee on Testing of the
Association of Graduate Schools recommended that new data--data represen-
tative of the performance of enrolled first-year graduate students--be
collected and published. This recommendation resulted in the initiation
of the current study. The purpose of this study was to obtain data on
the performance of first-year graduate students on the Aptitude Test and
the Advanced Tests of the Graduate Record Examinations.

Today the primary interpretive data for GRE tests are norms for
National Program candidates tested from May 1964 through April 1967 (1).
However, since not all National Program candidates attend graduate school,
the data on first-year graduate students described here should be of further
use to graduate schools and fellowship sponsors in interpreting GRE scores.

POPULATION AND SAMPLE

The population of the study consisted of those students who enrolled
as full-time graduate students for the first time in the fall of 1964 in
a college or university belonging to the 228-member Council of Graduate
Schools (CGS). Students from countries where the primary language is not
English and students who had physical handicaps (such as blindness) which
might have affected their GRE scores were excluded from the population.

Subpopulations were composed of students enrolled in graduate study
in 19 major field categories--18 major fields for which GRE Advanced Tests
were appropriate and a nineteenth category called "other."

The Advanced Tests for the 18 major fields were as follows:

Biology	Engineering	Literature in	Physics
Business	French	English	Psychology
Chemistry	Geology	Mathematics	Sociology
Economics	Government*	Philosophy	Spanish
Education	History	Physical Education	

A two-stage sampling plan was used to select the samples for each of
the various subpopulations. The first stage involved the selection of
universities and colleges from the CGS members. CGS member institutions
were grouped into categories according to the number of graduate degrees
awarded in 1961-62 as reported by the U.S. Office of Education (3). The

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*The name of this test will be changed to Political Science in the
fall of 1968.

thirty institutions granting the most graduate degrees in 1961-62 were included in the sample. Also included were 15 institutions randomly selected from the 60 universities or colleges with the next highest number of conferred graduate degrees, and 15 randomly selected from the remaining institutions. A greater proportion of the large universities was included in the sample, so that those fields in which only a small number of students were enrolled would be adequately represented.

Of the 60 institutions in the sample invited to participate in the study, 52 agreed to furnish rosters of students and 35 agreed to test each of those students who had not taken the Aptitude Test or an Advanced Test in his major field. Eight schools did not participate. (A list of the participating colleges and universities in each of the three size categories is given in Appendix A.)

The second stage of sampling involved the selection of students within each institution. Some of the participating institutions selected their own samples following a plan suggested by ETS (see the "Plan of Data Collection" in Appendix B), while other institutions sent rosters to ETS for sampling. A spaced sample was chosen according to the ETS plan. The sampling ratios, which varied from field to field, were designed to yield a minimum of 300 students in the group for each of the 19 major field classifications. Thus, smaller percentages of students were sampled from the more popular major fields.

After the second stage of sampling was finished, the 1963 and 1964 ETS files were searched to determine which of the students in the sample had appropriate GRE scores. Each student who attended an institution

that agreed to conduct special testings was asked to take the Aptitude

Test if Aptitude scores were missing and the Advanced Test in his major

field (provided his undergraduate and graduate major fields were the

same) if the Advanced Test score was missing. The special testings were

conducted late in the first semester and early in the second semester of

the 1964-65 academic year.

PERFORMANCE ON THE GRE TESTS

How well did the first-year graduate students perform on the GRE tests? Score data for Verbal Ability, Quantitative Ability, and the Advanced Tests are given in Tables 1-3. These tables show the percent of graduate students scoring lower than selected scaled scores. It is important to note that, because of missing scores, the Advanced Test distribution for a particular major field was not based on the same students as the Aptitude Test distribution for that field.

The data in Tables 1-3 are based on weighted frequency distributions. Weighting was necessary to estimate the population frequency distributions from the sample data. The weights were determined primarily from the number of full-time first-year graduate students reported by the U.S. Office of Education for each of the participating institutions (4).

The score frequencies for a particular field and institution were adjusted for (a) the size of the institution's class of full-time first-year graduate students, (b) the number of full-time first-year graduate students in the size category (large, medium-sized, small) in which the institution was classified, and (c) the number of CGS schools in that particular size category. (The actual formula used in computing the weights is given in Appendix C.)

Since the score data for the fields of business, education, and physical education were probably biased (see next section), neither

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Aptitude Test nor Advanced Test score data are reported for these fields.
Aptitude Test data for these fields were, however, included in the dis-
tributions for "all fields." It was thought that any bias existing in
the data for the three fields would not have a biasing effect on the
overall Aptitude Test distributions.

12

TABLE F

HARVARD STUDENTS SCORING LOWER THAN SELECTED SCALED SCORES ON THE VERBAL SECTION OF THE APTITUDE TEST

				Field
				Biology
				Chemistry
				Economics
				Engineering
				French
				Geology
				Government
				History
				Literature in English
				Mathematics
				Philosophy
				Physics
				Psychology
				Sociology
				Spanish
				All Fields

Table 2

PERCENT OF GRADUATE STUDENTS SCORING LOWER THAN SELECTED SCALED SCORES
ON THE QUANTITATIVE SECTION OF THE APTITUDE TEST

Scaled Scores	Biology	Chemistry	Economics	Engineering	French	Geology	Government	History	Literature in English	Mathematics	Philosophy	Physics	Psychology	Sociology	Spanish	All Fields
900										98						
880																
860																
840			99							98	99	99				
820		99	98				99			98	99	93	98	99		99
800	98	97	98	94		99	98			96	99	93	95	96		96
780	97	96	94	96		99	98	99	99	89	96	84	93	96	99	93
760	96	92	92	98		98	98	98	98	86	95	58	89	97	98	96
740	94	88	89	98		92	95	98	96	82	82	56	89	98	98	90
720	92	82	82	88	93	83	95	91	97	32	85	34	85	92	98	82
700	90	67	76	79	90	78	88	88	84	24	82	24	79	80	62	73
680	88	60	71	69	87	63	85	83	80	16	71	19	64	75	88	77
660	79	55	65	58	85	54	81	88	84	32	66	16	61	80	95	64
640	74	43	58	48	80	44	76	81	88	32	60	13	64	59	95	48
620	72	33	51	24	87	44	56	58	55	38	55	10	54	52	55	45
600	67	28	44	18	68	35	53	53	48	24	48	5	52	47	49	39
580	64	27	37	13	75	33	52	52	42	16	16		43	43	62	31
560	57	22	32	11	79	26	70	45	42	10	35	2	42	39		24
540	44	18	24	9	82	22	68	35	34	9	28	1	37	32	20	22
520	38	12	20	4	54	18	62	28	25	7	23		28	29	17	18
500	30	12	16	2	44	11	55	23	18	5	20		23	26	16	13
480	26	5	12	2	20	10	44	20	17		18			23	9	10
460	19	5			10		16	16	12	1			17	20	17	7
440	18	3	1		6	2	13	8	10	1	3		12	17	10	6
420	17	4	2		4	2	10	6	7	1	2		9	16	2	4
400	12		4	1	3	2	8	2	1		2		5	9	2	2
380	11			2	2											
360	9															
340	7															
320	6					2										
300	4	2		1	1		5							4	1	2
280	2	2	1				3							2		2
260	2	2	2													
Number of Graduate Students	163	280	260	175	146	126	212	259	237	289	228	233	258	251	77	3612
Standard Deviation	123	110	116	83	105	98	129	110	109	105	115	69	111	112	77	109
Mean	543	652	524	686	496	637	513	522	504	681	606	730	589	515	445	653

Table 5

PERCENT OF GRADUATE STUDENTS SCORING LOWER THAN SELECTED SCALED SCORES ON THE ADVANCED TESTS

Scaled Scores	Biology	Chemistry	Economics	Engineering	French	Geology	Government	History	Literature in English	Mathematics	Philosophy	Physics	Psychology	Sociology	Spanish
950										93	97	98		99	
940										93	96	96			
920										92	96	95			
900										91	93	94		97	
880	99	99	99	99		97				79	83	82		96	99
860	97	96	98	98	98	96				60	85	86	91	90	84
840	96	96	98	98	97	97				53	85	80	94	88	83
820	95	94	94	94	98					59	88	88	95	91	84
800	94		88		99	80	88	90	83	66	91	76	98	96	99
780	90	88	84	93	93	87	87	85	76	74	77	78	78	78	80
760	89	84	74	90	98	84	78	82	68	67	64	74	82	76	76
740	81	79	70	81	97	69	71	65	62	64	56	64	95	65	65
720	65	73	66	72	76	65	65	60	56	53	50	63	94	62	62
700	55	69	57	64	91	59	58	54	43	60	35	59	92	51	56
680	54	56	59	58	83	53	48	48	56	59	30	56	82	78	54
660	52	48	43	50	80	44	58	60	62	55	26	55	95	70	59
640	48	52	34	44	48	37	35	65	56	52	23	45	47	41	45
620	44	40	29	37	60	34	31	38	34	49	18	30	89	28	43
600	36	30	23	33	37	30	24	29	22	38	12	22	17	11	54
580	34	22	22	22	32	27	18	23	34	36	12	15	55	43	54
560	31	17	15	19	25	14	36	29	22	36		22	20	11	18
540	29	12	10	12	19	8	31	15	13	16		7	20	26	19
520	22	11	9	11	11	2	24	11	11	9		22	15	24	15
500	19	9	5	9	10		18			21				23	20
480	15	8	5		8	2	8	11	7	17		7	7		
460		6		2	4	1	6		6	16		5	4	20	4
440	3	5	9		4		9		2	9		3	3	16	
420	2	4	3		4		6								
400	2	2			4	2	6			3	2		2		1
380	1	2		2	4		6	1	2	3		1	2	3	1
360														3	
340														1	
Mean	636	647	670	648	600	666	575	586	609	649	715	669	601	585	582
Standard Deviation	119	110	101	92	83	100	91	88	85	166	106	137	80	114	110
Number of Graduate Students	129	268	234	159	152	99	164	232	232	265	188	227	222	187	82

15

ACCURACY OF THE DATA

How accurate are the data reported in Tables 1-3? One way to answer this question is to determine confidence intervals for the various means of the score distributions. However, such a procedure can be used legitimately only if the sampling is random. Since there is reason to believe that the final samples were not random, this procedure was not considered appropriate. Another way to approach the question of accuracy is to examine (a) the representativeness of the original sample and (b) the number of students in the original sample with appropriate GRE scores.

The samples in three fields were considered unrepresentative because there were insufficient numbers of students in the samples from particular graduate schools. For example, because of a communication problem, no students from the University of Michigan were represented in the sample for education, even though a large number of first-year graduate students were enrolled in this field at the University of Michigan in the fall of 1964. Thus, the sample for education could not be considered representative. The other fields which were judged to have biased data because of inadequate representation from some colleges or universities were business, physical education, and "other".

The samples in some fields were also considered unrepresentative because of ambiguity in the definition of subpopulations. Since graduate

16

school personnel should be more able than anyone else to determine the subject-matter areas for which a given Advanced Test is appropriate, the colleges and universities that selected their own samples were asked to define the subpopulations for the various fields. Educational Testing Service defined the subpopulations when it selected the samples. (Subject-matter areas included under a particular major field heading when ETS selected the samples are indicated in Appendix D.) As a result, certain ambiguities arose. The fields most seriously affected were probably biology, education, and "other".

Even if samples of students are representative, the data might still be biased if appropriate test scores are not available for all of these students. In this study, not all of the students in the original sample had scores. Students at 17 institutions were not offered special testings, and only about 30% of the students asked to participate in the special testings offered by the other 35 institutions actually were tested. The number and the percent of students in the original sample for this study who had Advanced Test or Aptitude Test scores are reported in Table 4. The percent of students who had appropriate test scores ranged from 9% (in business) to 66% (in physics) for the Advanced Tests, and from 21% (in business) to 73% (in psychology) for the Aptitude Test. Because the percentages of students with GRE scores were so low, the Advanced Test distributions in the fields of business, education, and physical education and the Aptitude Test distributions in the field of business were probably biased.

Another way to approach the question of accuracy is to compare the distributions with data for other groups. Two such groups are the

Table 4

NUMBER AND PERCENTAGE OF STUDENTS IN A PARTICULAR SAMPLE
WHO HAD ADVANCED TEST OR APTITUDE TEST SCORES

Major Field	Number in Sample	Students with Advanced Test Scores		Students with Aptitude Test Scores	
		Number	%	Number	%
Biology	243	129	53	163	67
Business	332	31	9	69	21
Chemistry	458	268	59	280	61
Economics	445	234	53	260	58
Education	353	69	20	116	33
Engineering	348	159	46	175	50
French	397	152	38	146	37
Geology	202	99	49	126	62
Government	470	164	35	212	45
History	505	232	46	259	51
Literature in English	469	232	49	237	51
Mathematics	506	265	52	289	57
Philosophy	436	188	43	228	52
Physical Education	149	36	24	55	37
Physics	346	227	66	233	67
Psychology	355	222	63	258	73
Sociology	555	187	34	251	45
Spanish	251	82	33	77	31
Other	1044	--	--	378	36

18

GRE basic reference groups of college seniors (1) and 1963-64 GRE National Program Candidates (2). In general, the means for the Aptitude Test and the Advanced Tests from the current study were somewhat larger than those reported in the 1963-64 study and much larger than the means for the college seniors. The Verbal Ability and Quantitative Ability means of first-year graduate students were approximately 15 points higher than the corresponding means of the 1963-64 National Program candidates. The Verbal Ability mean for first-year graduate students was, on the average, 55 points higher than the corresponding mean of college seniors, while the Quantitative Ability mean was about 75 points higher. The Advanced Test scores of first-year graduate students averaged about 25 points higher than the scores of National Program candidates and about 100 points higher than the scores of college seniors. However, the means for first-year graduate students were slightly lower than the means for National Program candidates in biology (Verbal Ability mean), government (Quantitative Ability mean) and mathematics (Advanced Test mean).

A third comparison group is the 1964-67 norms group, who also were National Program candidates (see the Handbook for the Interpretation of GRE Scores, 1967-68). No data by major field are available on the 1964-67 group for the Aptitude Test. However, the overall Verbal Ability and Quantitative Ability means for first-year graduate students were approximately 25 points higher than the means for the 1964-67 norms group. The Advanced Test means for first-year graduate students in all fields but mathematics were also higher than the means for the 1964-67 group. In mathematics the mean for the norms group slightly exceeded the mean for first-year graduate students. In the other fields, the means of first-year

graduate students ranged from 23 points higher in biology to 58 points higher in geology.

Generally, these findings seem reasonable. Most of the persons who took the GRE tests in the National Program intended to go to graduate school or in some cases were already enrolled. However, a number of these persons were probably not admitted to CGS member schools, and others failed to attend any graduate school. Thus, one would expect the scores of the National Program candidates to be lower on the average than the scores of enrolled first-year graduate students. Likewise one would expect the scores of enrolled first-year graduate students to be substantially higher on the average than the scores of complete classes of college seniors, not all of whom actually attend graduate school.

That the means for first-year graduate students were lower than the means for National Program candidates in biology and government on the Aptitude Test and in mathematics on the Advanced Tests is somewhat disturbing. It might be that the means for first-year graduate students in these fields were low. However, a large percentage of the National Program candidates were applicants for National Science Foundation (NSF) fellowships. Each applicant was required to take the Aptitude Test and an Advanced Test if one was offered in his field. Advanced Tests were offered in biology, chemistry, economics, engineering, geology, government, mathematics, physics, psychology, and sociology. The percent of applicants for NSF fellowships in the 1964-67 norms group was particularly high in chemistry (26%), mathematics (25%), physics (23%), and geology (20%), respectively. Thus, the Advanced Test means for these four fields especially and the Aptitude Test means for the 1964-67 norms

group were somewhat inflated. If one removed the effect associated with the percentage and caliber of NSF fellowship applicants, the means for first-year graduate students would probably have been consistently higher than the means for National Program candidates.

. In summary, then, the Aptitude and Advanced Test data for the fields of business, education, and physical education and the Aptitude Test data for "other" fields were probably biased and are not reported. However, the data for the other fields appear to be reasonably consistent with comparative data from other sources, particularly when the percentages and caliber of NSF fellowship applicants are considered. The reported data are probably fairly accurate estimates of the performance of full-time first-year graduate students who attended colleges or universities belonging to CGS in the fall of 1964.

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APPENDICES

23

Appendix A

COLLEGES AND UNIVERSITIES WHICH PARTICIPATED IN THE
GRE STUDY OF FIRST-YEAR GRADUATE STUDENTS

Large Colleges or Universities	Medium-Sized Colleges or Universities	Small Colleges or Universities
Boston University	Alabama, University of	Akron, University of
California, University of (Berkeley)	Arkansas, University of	Atlanta University
California, University of (Los Angeles)	Cincinnati, University of	California Institute of Technology
Chicago, University of	Colorado, University of	California, University of (Santa Barbara)
Columbia University	Johns Hopkins University	Dartmouth College
Harvard University	Kent State University	Duke University
Illinois, University of	Miami University (Ohio)	Jefferson Medical College of Philadelphia
Iowa, University of	Nebraska, University of	Louisville, University of
Massachusetts Institute of Technology	Oklahoma State University	Maine, University of
Michigan State University	Oklahoma, University of	Miami, University of (Florida)
Michigan, University of	Princeton University	New York, State University of (Albany)
Minnesota, University of	Southern Illinois University	Tuskegee Institute
Missouri, University of	Western Michigan University	Utah State University
New York University		Virginia Polytechnic Institute
Northwestern University		Washington State University
Ohio State University		
Pennsylvania State University		
Pennsylvania, University of		
Purdue University		
Stanford University		
Syracuse University		
Washington, University of		
Wisconsin, University of		

Appendix B

PLAN OF DATA COLLECTION

I. Identification of students to be included in the sample

A. Major fields to be sampled. In the Graduate Record Examinations National Program for Graduate School Selection, the Aptitude Test and eighteen Advanced Tests are administered. It is planned to obtain Advanced Test norms on first-year graduate students enrolled in the corresponding major fields. Aptitude Test norms will be obtained on the basis of a cross section of all first-year graduate students. In order to provide Aptitude Test norms it is necessary to obtain score data on the Aptitude Test for students enrolled in other fields as well as for students enrolled in the eighteen major fields. In addition, it is planned to provide Aptitude Test norms on students enrolled in each major field. The major fields to be sampled are listed in the table in Section I-C.

B. Sampling ratios for the major fields. The number of cases needed in the sample to represent the population of each major field adequately is approximately 300. Since more students are enrolled in some fields than in others, it is desirable to use different sampling ratios for the different major fields to obtain adequate samples. Thus for a field with a large enrollment, such as engineering, a smaller proportion of the total enrollment would need to be selected than for a field with a smaller enrollment. In the case of a field with a very small enrollment every student may have to be selected. To adjust for differences in enrollment in the major fields the sampling ratios given in the table in Section I-C have been chosen.

C. Procedure for the selection of an unbiased sample. It is essential that the sampling within each major field be as nearly random as possible in order not to bias the norms. The following procedures are designed to produce an unbiased sample.

1. The population to be sampled consists of all students entering graduate school in the fall of 1964. Since sampling ratios differ from field to field (see table on following page), the total population of students must be identified according to the eighteen major fields designated in the table. All of the names of the students in major fields not specifically designated in the table should be listed on a combined roster and identified by

major field. Although a single roster is to be used for
major fields not listed in the table, the major field with
which each student is affiliated should still be indicated.

2. Within each of the eighteen fields named in the table and
within the combined category, each student should be assigned
a number from 1 to N (where N equals the total number of stu-
dents enrolled in the field or in the combined category).

3. In the actual selection of the students for a major field
sample, the first student to be selected will be the one
whose number corresponds to the initial selection number
given in the table. Then the following cases to be selected
will be determined by the sampling ratio for that major field.
Of course in the case of a sampling ratio of $1/1$, all cases
would be included in the sample. For example, if at institu-
tion A there were 100 graduate students enrolled in the History
Department in the fall of 1964, these students would be listed
on a roster and assigned consecutive numbers. In accordance
with the initial selection number in the table, the first stu-
dent to be selected would be student No. 2; and in accordance
with the sampling ratio for History $(1/3)$, every third student
thereafter, i.e., students numbered 5, 8, 11, etc., would be
selected until the entire list of students in the field was
exhausted.

Sampling Ratios and Initial Selection Numbers for Major Fields

Major Field	Sampling Ratio	Initial Selection No.	Major Field	Sampling Ratio	Initial Selection No.
Biology	1/5	1	Literature	1/5	1
Business	1/10	1	Mathematics	1/3	2
Chemistry	1/3	2	Philosophy	1/1	1
Economics	1/2	1	Physical		
Education	1/10		Education	1/2	1
Engineering	1/10		Physics	1/3	2
French	1/1	1	Psychology	1/3	2
Geology	1/1	1	Sociology	1/1	1
Government	1/2	1	Spanish	1/1	1
History	1/3	2	Major Fields		
			Not Listed	1/10	1

D. <u>Preparation and mailing of the rosters</u>. On the enclosed rosters
the names of the students selected for the samples should be listed
according to major fields. If GRE scores are readily available on
the students, they should be recorded in Columns 4-6 on the rosters.

For a student who has one or more missing GRE scores, the name of
the undergraduate college he last attended should be given; and
his date of birth should be provided if it is readily available.
When the rosters are completed, they are to be sent to:

> Dr. Philip R. Harvey
> Assistant Program Director
> Graduate-Record Examinations
> Educational Testing Service
> Princeton, New Jersey

II. Special test administration for securing missing data on students in
the sample

The students in the sample for whom GRE scores are available will not
need to be tested. ETS will search the files for the scores of those
students whose scores are not furnished by the cooperating institutions.
Students for whom the Advanced Test score and/or the Aptitude Test scores
are missing will be requested to take the test(s) for which scores are
not available. ETS will report to each cooperating institution the names
of students to be tested, and a test date will be arranged for the insti-
tution. Examination materials and instructions for testing will be pro-
vided by ETS.

Appendix C

WEIGHTS USED IN PREPARING THE FREQUENCY DISTRIBUTIONS

The weight for a college or university i in a given field was computed as follows:

$$W_i = \frac{N_i}{F_i} \times \frac{N}{N'} \times R \qquad (F_i \neq 0)$$

where N_i = The number of full-time first year graduate students at college or university i in the sample;

F_i = the number in the sample who had the appropriate GRE score;

N = ΣN_i for all colleges or universities in the same size category as college or university i;

N' = ΣN_i ($F_i \neq 0$) for all colleges or universities in the same size category as college or university i;

R = the weight based on the sampling ratio in the appropriate size category (1 for large colleges or universities, 4 for medium-sized colleges or universities, and 138/15 for small colleges or universities).

To see how this weighting scheme worked, consider the following example for the field of Biology:

Size Category	College or University ID No.	N	F	W
Large	1	21	0	--
(R=1)	3	48	4	15.5
	30	24	2	15.5
Medium-Sized	31	21	3	28.0
(R=4)	32	0	0	--
	45	19	1	76.0
Small	48	18	4	41.4
(R=138/15)	49	8	6	12.27
	60	9	1	82.8

In this example the weights for colleges or universities 3, 31, and 49 in
Biology were computed as follows:

$$\text{No. 3: } \frac{48}{4} \times \frac{93}{72} \times 1 = 15.5$$

$$\text{No. 31: } \frac{21}{3} \times \frac{40}{40} \times 4 = 28.0$$

$$\text{No. 49: } \frac{8}{6} \times \frac{35}{35} \times \frac{138}{15} = 12.27$$

For both the Aptitude Test and the Advanced Tests, the frequen-
cies were weighted according to the weights calculated by the formula
given previously. However, for the Aptitude Test frequencies were combined
across fields to give overall distributions for Verbal Ability and Quanti-
tative Ability as well as distributions for each of the major fields.

Appendix D

SPECIFIC FIELDS CLASSIFIED UNDER PARTICULAR MAJOR FIELDS
FOR SAMPLING PURPOSES

Biology:
Biology, General
Botany
Zoology

Business:
Accounting
Business Administration
Business and Commerce

Chemistry:
Chemistry (including
Analytical, Inorganic,
Organic, and Physical
Chemistry)

Economics:
Economics

Education:
Administration
Counseling and
    Guidance
Early Childhood
    Education
Education, General
Educational Psychology
Elementary Education
History and Philosophy
    of Education
Secondary Education

Engineering:
Aeronautical
Chemical
Civil
Electrical
Engineering, General
Industrial
Mechanical

French:
French

Geology:
Geology

Government:
Government
Political Science

History:
American History
European History
History, General

Literature:
Comparative Literature
English
Literature

Mathematics:
Mathematics
Statistics

Philosophy:
Philosophy

Physical
Education:
Physical Education

Physics:
Chemical Physics
Physics

Psychology:
Psychology (including
Clinical Psychology and
Social Psychology)

Sociology:
Sociology

Spanish:
Spanish