

UNCLASSIFIED

AD NUMBER
ADB951538
NEW LIMITATION CHANGE
TO Approved for public release, distribution unlimited
FROM Distribution authorized to U.S. Gov't. agencies and their contractors; Administrative/Operational Use; JUN 1944. Other requests shall be referred to Adjutant General's Office [Army], Washington, DC 20310.
AUTHORITY
ARI Notice, 13 Nov 1979

THIS PAGE IS UNCLASSIFIED

UNANNOUNCED

DTIC
ELECTE

MAR 7 1980

PRR Report 527

PRR-SSU

epv-ljb

PRR-4027

20 June 1944

ADB951538

STANDARDIZATION OF THE WEST POINT QUALIFYING EXAMINATION
WPQ-1 FOR THE 1944 FOURTH CLASS

I. PROBLEM:

In a previous study* the WPQ-1 type tests were found to be valid predictors of First Term Grades in Languages and Mathematics. In this study the scores on the West Point Qualifying Examination WPQ-1 received by applicants for the 1944 West Point Fourth Class are used to determine norms.

Specifically, the purposes of this study are:

1. To develop tables for converting raw scores on each part and the total WPQ-1 into standard scores having a mean of 100 and a standard deviation of 20.
2. To report raw and standard scores for each applicant to the West Point Military Academy.
3. To determine reliabilities of WPQ-1 part and total scores as a check on previous determinations of their reliabilities.
4. To compare the performance in WPQ-1 of College Certificate Applicants with that of other applicants.

II. POPULATION:

The population studied consists of 2106 applicants for admission to the U.S. Military Academy tested in March 1944. This population is broken down into College Certificate and Other Applicants to facilitate analysis of these groups. The numbers in each group were as follows:

College Certificate Applicants	701
Other Applicants	1405
Total	2106

III. VARIABLES:

West Point Qualifying Examination WPQ-1. This examination consists of two parts. Part 1. Language: a 30 minute test of 59 items requiring facility with an artificial language. Part 2. Mathematics: a 30 minute test of 75 items requiring mathematical ingenuity.

*"Collection of West Point Cadets. A Comparison of the AGO Experimental Battery WPQ-1, X-1 and the West Point Qualifying Examination for Prediction of First Term Academic Performance of Fourth Classmen Entering July 1942". PRR-SASS esb/ljb, 7 June 1943. PRR Study #433.

79 11 20 065

003620

FILE COPY

IV. PROCEDURE AND RESULTS:

The West Point Qualifying Examination WPQ-1 was administered under the supervision of the U.S.N.A. and the answer sheets were sent to the Personnel Research Sub-section for scoring. Extreme care was exercised to insure absolute accuracy of scoring. The test was machine scored twice. Each operator scored independently and did not know the score the other operator had obtained. To insure 100 percent accuracy any discrepancy between operators was resolved by hand scoring.

Distributions of raw scores for parts and total WPQ-1 were prepared and means and standard deviations computed. These are shown in Table I.

TABLE I

DISTRIBUTIONS OF RAW SCORES ON WEST POINT QUALIFYING EXAMINATION WPQ-1
ADMINISTERED TO U.S.N.A. CANDIDATES MARCH 1942

<u>Score Interval</u>	<u>WPQ-1 Raw Score</u>		
	<u>Lang.</u>	<u>Math.</u>	<u>Total</u>
140-144			
135-139			
130-134			14
125-129			34
120-124			51
115-119			62
110-114			73
105-109			81
100-104			94
095-099			123
090-094			119
085-089			124
080-084			146
075-079		19	135
070-074		108	136
065-069		80	131
060-064		134	117
055-059	109	161	124
050-054	174	174	109
045-049	162	213	106
040-044	250	241	74
035-039	232	246	83
030-034	245	218	55
025-029	241	211	46
020-024	245	111	22
015-019	180	88	22
010-014	130	50	22
005-009	92	35	9
000-004	46	17	4
N	2106	2106	2106
M	31.8	41.7	73.5
σ	14.2	16.4	27.6

On the basis of these results the raw scores were converted into standard scores which have a mean of 100 and a standard deviation of 20. The following formula was used:

$$\frac{X - M_x}{\sigma_x} = \frac{Y - M_y}{\sigma_y}$$

where X is a raw score, M_x the mean and σ_x the standard deviation of the raw score distribution. Y is a standard score, $M_y = 100$ and $\sigma_y = 20$. Tables II, III, and IV are the resulting tables for converting raw scores into standard scores.

TABLE II

CONVERSION TABLE FOR CONVERTING WEST POINT QUALIFYING EXAMINATION
WPQ-1 LANGUAGE RAW SCORES TO STANDARD SCORES
MARCH 1944 U.S.M.A. EXAMINATION

Raw Score	Standard Score	Raw Score	Standard Score	Raw Score	Standard Score
59	138	39	110	18	80
58	137	38	109	17	79
57	136	37	107	16	78
56	134	36	106	15	76
55	133	35	105	14	75
54	131	34	103	13	73
53	130	33	102	12	72
52	129	32	100	11	71
51	127	31	99	10	69
50	126	30	97	9	68
49	124	29	96	8	66
48	123	28	95	7	65
47	121	27	93	6	64
46	120	26	92	5	62
45	119	25	90	4	61
44	117	24	89	3	59
43	116	23	88	2	58
		22	86	1	56
42	114	21	85	0	55
41	113	20	83		
40	112	19	82		

2

TABLE III

CONVERSION TABLE FOR CONVERTING WEST POINT QUALIFYING EXAMINATION
 WPQ-1 MATHEMATICS RAW SCORES TO STANDARD SCORES
 MARCH 1944 U.S.M.A. EXAMINATION

<u>Raw</u> <u>Score</u>	<u>Standard</u> <u>Score</u>	<u>Raw</u> <u>Score</u>	<u>Standard</u> <u>Score</u>
75	141	37	94
74	139	36	93
73	138	35	92
72	137	34	91
71	136	33	89
70	134	32	88
69	133	31	87
68	132	30	86
67	131	29	85
66	130	28	83
65	128	27	82
64	127	26	81
63	126	25	80
62	125	24	78
61	124	23	77
60	122	22	76
59	121	21	75
58	120	20	74
57	119	19	72
56	117	18	71
55	116	17	70
54	115	16	69
53	114	15	67
52	113	14	66
51	111	13	65
50	110	12	64
49	109	11	63
48	108	10	61
47	106	9	60
46	105	8	59
45	104	7	58
44	103	6	57
43	102	5	55
42	100	4	54
41	99	3	53
40	98	2	52
39	97	1	50
38	95	0	49

TABLE IV

CONVERSION TABLE FOR CONVERTING WEST POINT QUALIFYING EXAMINATION WPQ-1
TOTAL RAW SCORES* TO STANDARD SCORES. MARCH 1944 U.S.M.A. EXAMINATION

<u>Raw Score</u>	<u>Standard Score</u>	<u>Raw Score</u>	<u>Standard Score</u>	<u>Raw Score</u>	<u>Standard Score</u>
134	144	89	111	44	79
133	143	88	110	43	78
132	142	87	110	42	77
131	142	86	109	41	76
130	141	85	108	40	76
129	140	84	108	39	75
128	139	83	107	38	74
127	139	82	106	37	74
126	138	81	105	36	73
125	137	80	105	35	72
124	137	79	104	34	71
123	136	78	103	33	71
122	135	77	103	32	70
121	134	76	102	31	69
120	134	75	101	30	68
119	133	74	100	29	68
118	132	73	100	28	67
117	131	72	99	27	66
116	131	71	98	26	66
115	130	70	97	25	65
114	129	69	97	24	64
113	129	68	96	23	63
112	128	67	95	22	63
111	127	66	95	21	62
110	126	65	94	20	61
109	126	64	93	19	61
108	125	63	92	18	60
107	124	62	92	17	59
106	124	61	91	16	58
105	123	60	90	15	58
104	122	59	89	14	57
103	121	58	89	13	56
102	121	57	88	12	55
101	120	56	87	11	55
100	119	55	87	10	54
99	118	54	86	9	53
98	118	53	85	8	53
97	117	52	84	7	52
96	116	51	84	6	51
95	116	50	83	5	50
94	115	49	82	4	50
93	114	48	82	3	49
92	113	47	81	2	48
91	113	46	80	1	47
90	112	45	79	0	47

*Total raw score is the sum of raw scores on Mathematics and Language.

Distributions of standard scores on parts and total WPQ-1 are shown in Table V. A roster of raw and standard scores was prepared and transmitted to West Point. A copy of this roster is included in the files of this study in the Statistical Services Unit.

Reliabilities of the part and total WPQ-1 scores estimated by the Kuder-Richardson formula #21 are as follows:

WPQ-1 Part 1 Language	.95
WPQ-1 Part 2 Mathematics	.94
WPQ-1 Total Score	.97
N = 2106	

These reliabilities determined on this population compare favorably with previous determinations of the reliabilities which were .91 for Language Aptitude and .87 for Mathematics.

TABLE V

DISTRIBUTIONS OF STANDARD SCORES ON WEST POINT QUALIFYING EXAMINATION WPQ-1
ADMINISTERED TO U.S.M.A. CANDIDATES MARCH 1944

Score Interval	WPQ-1 Standard Scores		
	Language	Mathematics	Total
140-144		19	24
135-139	41	85	54
130-134	114	87	73
125-129	128	90	103
120-124	134	118	125
115-119	128	145	166
110-114	190	132	153
105-109	192	174	213
100-104	156	183	181
95- 99	199	198	199
90- 94	131	184	139
85- 89	204	211	173
80- 84	116	179	143
75- 79	133	92	117
70- 74	72	79	101
65- 69	94	46	63
60- 64	37	45	30
55- 59	32	22	34
50- 54		13	12
45- 49		4	3
N =	2106	2106	2106

Table VI shows the distributions of scores for men qualified on the basis of a college certificate.

TABLE VI

DISTRIBUTIONS OF RAW AND STANDARD SCORES ON WEST POINT
QUALIFYING EXAMINATION WPQ-1 ADMINISTERED TO U.S.N.A. CANDIDATES
MARCH 1944 FOR COLLEGE CERTIFICATE APPLICANTS

Score Interval	WPQ-1 Raw Scores			WPQ-1 Standard Scores		
	Lang	Math	Total	Lang	Math	Total
140-144					8	8
135-139				14	23	15
130-134			5	38	20	24
125-129			12	55	30	40
120-124			8	54	41	40
115-119			22	50	53	53
110-114			27	74	59	65
105-109			35	59	58	72
100-104			26	59	64	75
095-099			33	61	87	83
090-094			56	39	64	47
085-089			41	67	69	66
080-084			52	37	70	33
075-079		9	53	35	25	36
070-074		27	53	18	13	25
065-069		20	59	28	6	3
060-064		46	40	9	6	4
055-059	38	59	37	4	4	4
050-054	69	76	40			2
045-049	64	68	28		1	1
040-044	100	94	24			
035-039	73	95	20			
030-034	89	75	14			
025-029	70	80	5			
020-024	76	26	4			
015-019	53	13	2			
010-014	33	4	3			
005-009	28	3	1			
000-004	8	1	1			
N =	701	701	701	701	701	701

To test for a significant difference on central tendency and dispersion of scores between the College Certificate group and the other applicants the critical ratios of differences between means and standard deviations were found as shown in Table VII.

TABLE VII

CRITICAL RATIOS OF DIFFERENCES BETWEEN MEANS AND STANDARD DEVIATIONS OF THE COLLEGE CERTIFICATE GROUP AND OTHER APPLICANTS TO WEST POINT IN 1944 ON WPQ-1

	College Certificate Applicants		Other Applicants		$M_1 - M_2$	$1 - 2$
	M_1	1	M_2	2	d	d
WPQ-1, Language	33.3	13.9	30.9	14.3	4.2	-1.1
WPQ-1, Mathematics	43.3	14.4	41.0	17.4	3.2	-5.9
WPQ-1, Total	76.6	24.9	72.0	28.8	3.7	-4.6

Table VII indicates that the College Certificate applicants have significantly greater means than the other applicants in performance on the WPQ-1. In addition the College Certificate applicants have less dispersion than the other applicants. This difference, however, is not significant in the case of Language Aptitude. These findings indicate that the College Certificate applicants are both superior on the average and more homogeneous than the other applicants in performance on WPQ-1.

V. CONCLUSIONS:

1. Tables were developed for converting raw scores on each part and the total WPQ-1 into standard scores having a mean of 100 and a standard deviation of 20.
2. A roster of raw and standard scores was prepared and transmitted to the West Point Military Academy.
3. The reliabilities of the part and total scores on WPQ-1 are highly satisfactory, ranging from .94 to .97 as determined on this population. These compare favorably with previous determinations of the reliabilities.
4. College certificate applicants are both superior and more homogeneous than the other applicants in performance on WPQ-1 tests.

VI. TECHNICIANS:

1. Responsible for analysis and preparation of report: E. P. Virono, Ph D.
2. Military Classification Unit Consultant: E. S. Bordin, Ph D.