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TestMetrics: User Friendly Tools for Test Analysis, Standard Setting and Reporting

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ATP Innovations in Testing 2007
Palm Springs, California

Objectives

1. Establish need for practical psychometric tools for test development specialists
2. Demonstrate tool use with alternative test data sets and configurations from test delivery providers
3. Compute item/test analysis statistics, create comparable test forms, set performance standards and prepare summary tables for technical test reports.

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TestMetrics Overview

- Test specialists need user-friendly tools to streamline item/test data analysis from test delivery providers.
- Score records are consistently parsed and results stored in a database and spreadsheet formats.
- TestMetrics readily computes item and test analysis statistics from these test score data.
- Item analysis results include item difficulty, item total correlations, high-low group discriminations, item reliability and item average time.
- Answer option analyses include answer options, number and percent choosing each answer option, point biserial correlations, average time and score quintiles for answer options.

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TestMetrics Overview

- Test specialists can review item selections and automatically create and evaluate comparable test forms.
- Test form statistics include examinee counts, item counts, score means, standard deviations, standard errors of mean, standard errors of measurement, alpha reliability and test time.
- Similar statistics and correlation matrices are computed for each test section.
- Performance Standard Setting (Angoff, Bookmark, Borderline Survey) can be conducted with TestMetrics.
- Tables and charts are produced for test score distributions, testing time, and passing scores.
- All results can be automatically inserted in technical reports.

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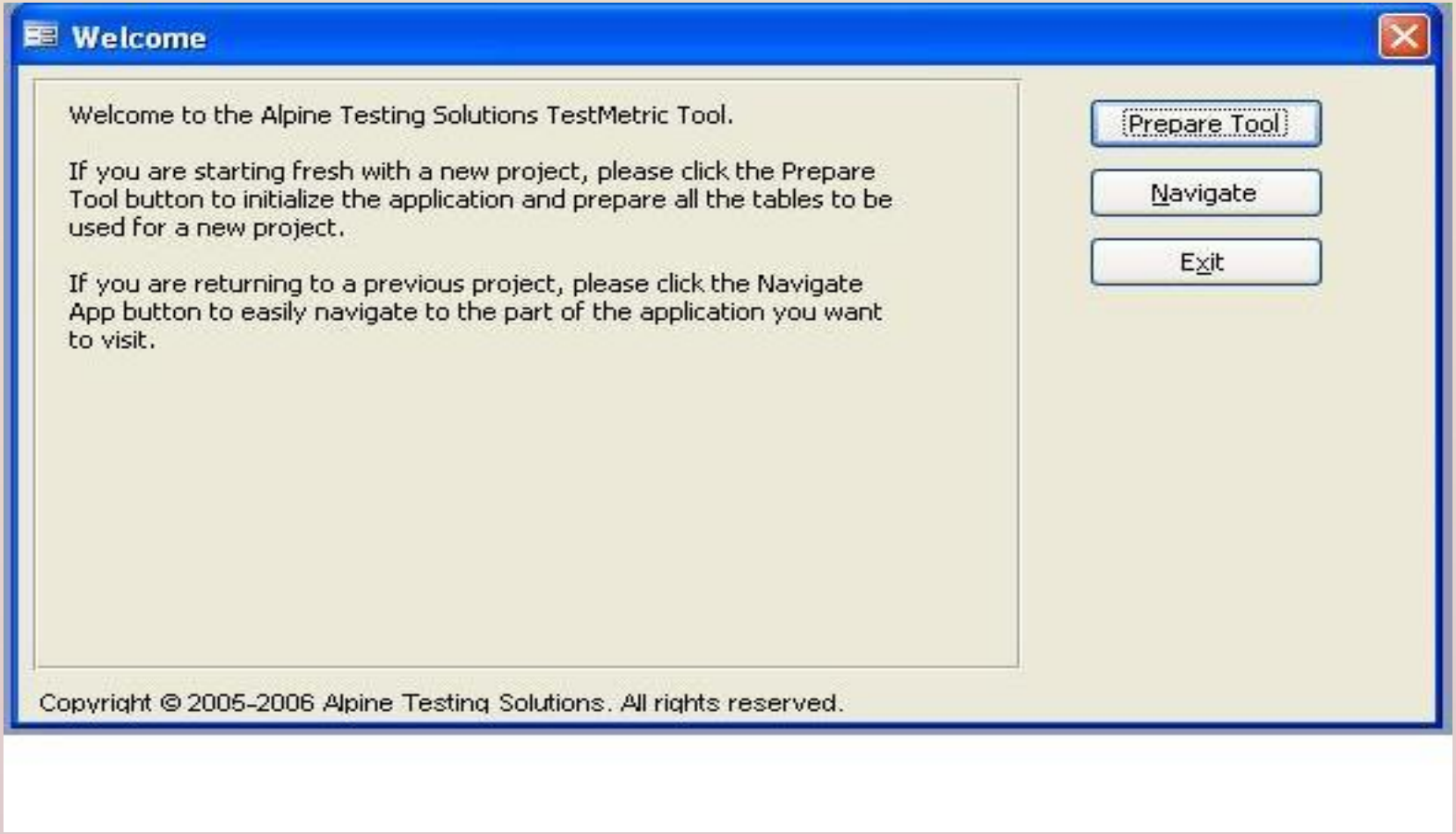
TestMetrics Intro



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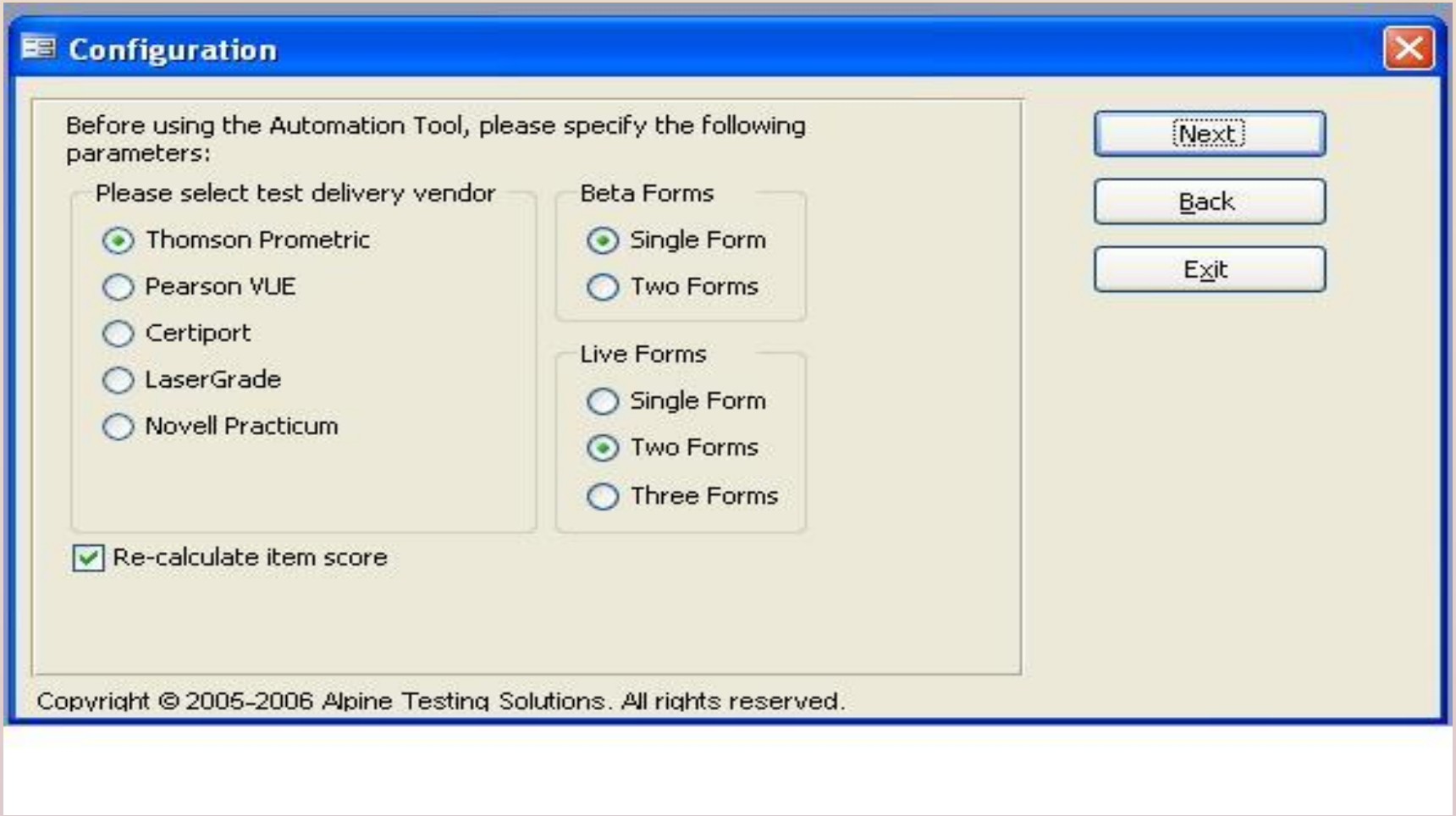
TestMetrics Data Input Formats



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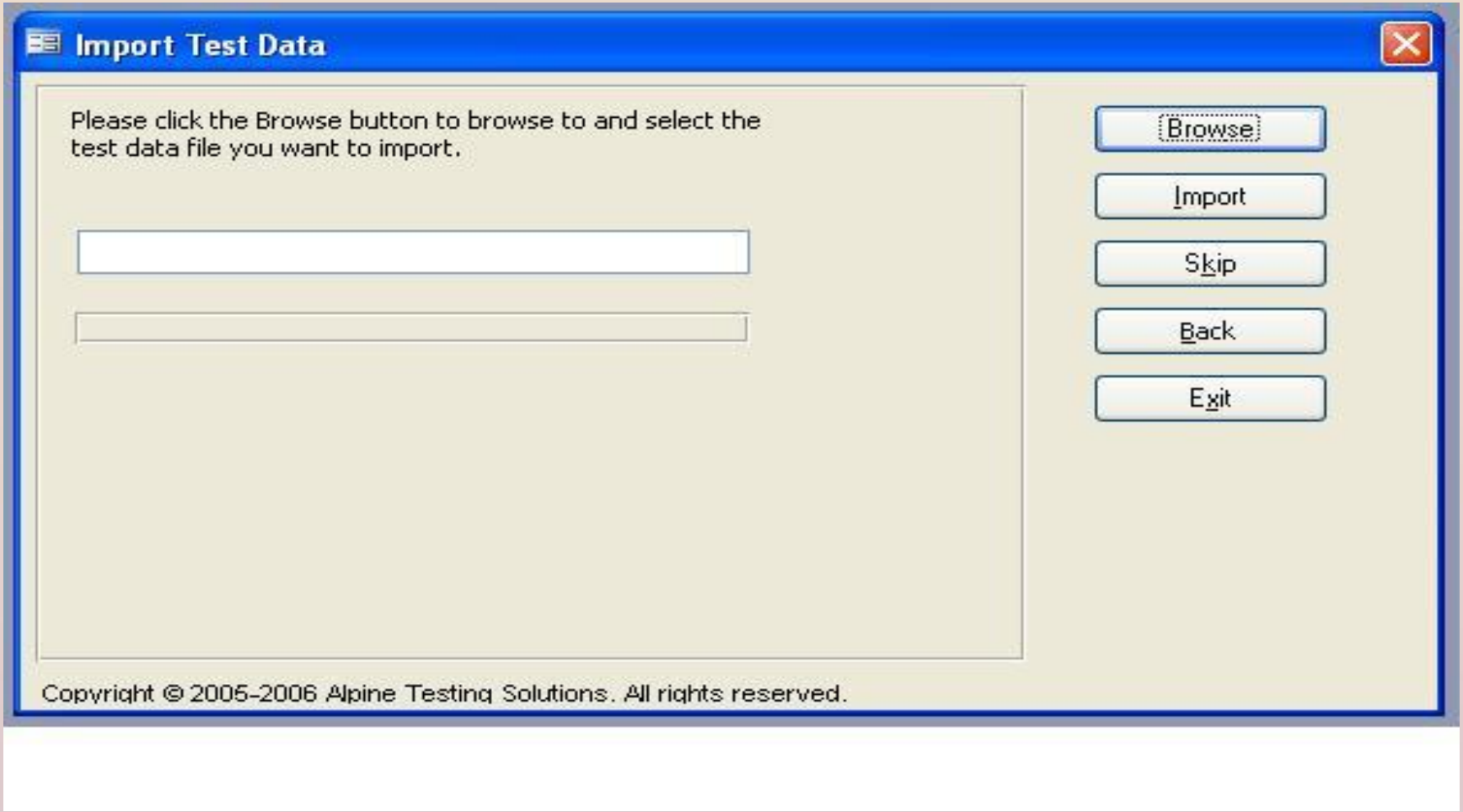
Import Test Data



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Prepare Score Matrix , Data Matrix and Time (Sec) Matrix

RegistrationI	043_2_3_a	043_2_3_c	043_3_1_a	043_3_1_b
l9edtt50aa		1		
la1lon524a	0			0
la2par5059	0		0	
la3dtt5325	0		0	
laalon51eb	0			1
laasyd5054		1		
labdus5000	1			0
laclon50b9	1			1
lacsyd5147	0		0	
lb1dtt5094		1		
lb1dtt547a	1		1	
lb2dus5084	0			0
lbedus506f	1		1	
lbesyd5228	0		1	

RegistrationN	043_2_3_a	043_2_3_c	043_3_1_a	043_3_1_b
00000000Key	B	A	AC	BE
l9edtt50aa		BD		
la1lon524a	CE			E
la2par5059	BC		B	
la3dtt5325	AB		B	
laalon51eb	AB			C
laasyd5054		BD		
labdus5000	BE			B
laclon50b9	BE			C
lacsyd5147	AB		A	
lb1dtt5094		BD		
lb1dtt547a	BE		C	
lb2dus5084				
lbedus506f	BE		C	

CandidateID	205_1_1_c	205_1_1_f	205_1_1_f	205_1_1_j
lc7dtt5373	1		1	2
lc7dtt53e4		42		
lc7dtt53f1	117		33	168
lc7dtt53fd		42		
lc8dtt50bf		121		
lc8dtt50d1	75		106	79
lc8dtt5129	35		73	133
lc8dtt523a		51		
lc8dtt5353	107		55	69
lc8dtt539f		31		
lc8dtt53a2		24		
lcedtt52b7	69		79	107
ld3dtt54e1		37		
ld4dus5000	108		54	44

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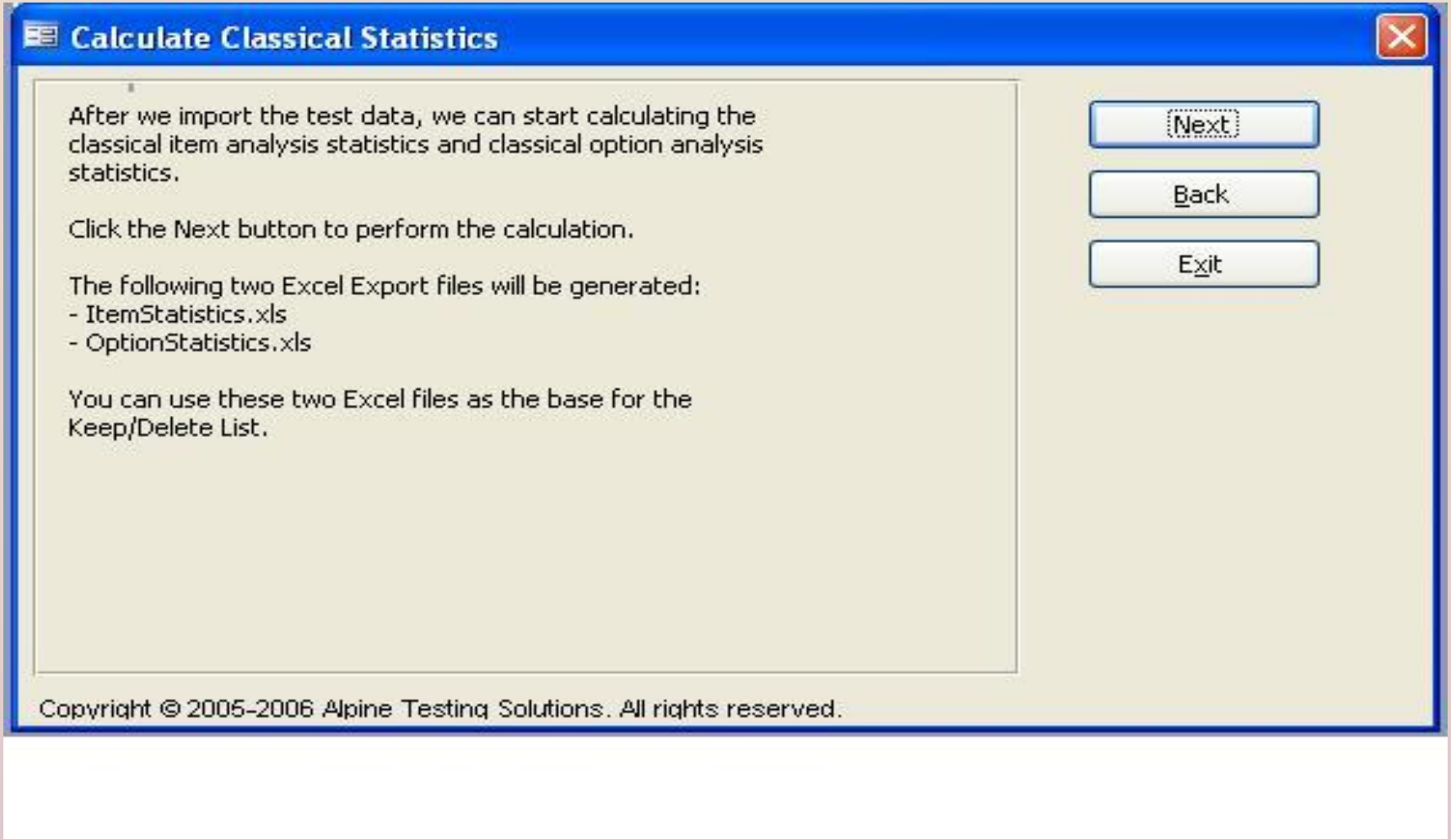
Classical Test Statistics



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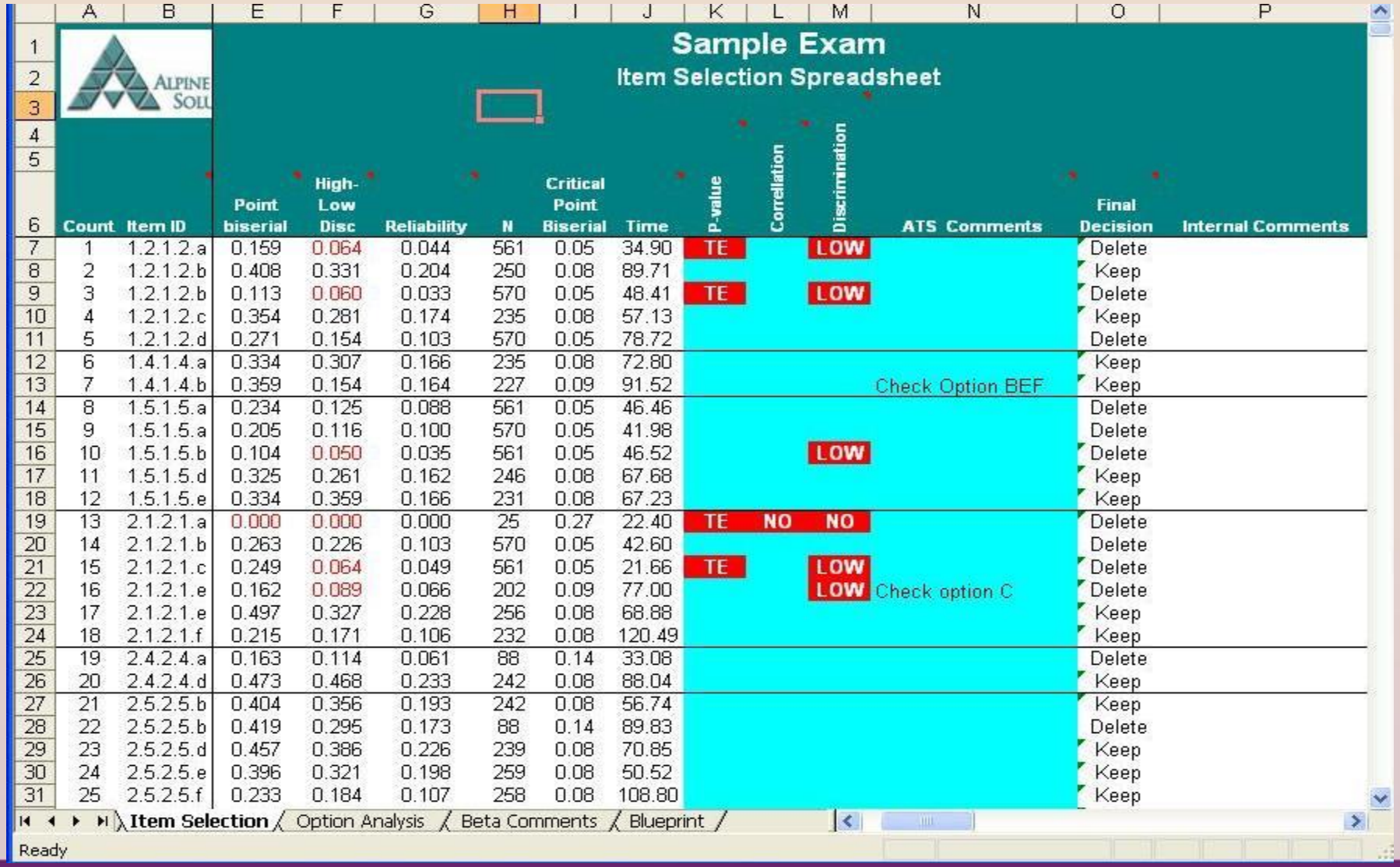
Item Selection Work Sheet with Classical Statistics Items & Options



Sample Exam
Item Selection Spreadsheet

Count	Item ID	Point biserial	High-Low Disc	Reliability	N	Critical Point Biserial	Time	P-value	Correlation	Discrimination	ATS Comments	Final Decision	Internal Comments
1	1.2.1.2.a	0.159	0.064	0.044	561	0.05	34.90	TE		LOW		Delete	
2	1.2.1.2.b	0.408	0.331	0.204	250	0.08	89.71					Keep	
3	1.2.1.2.b	0.113	0.060	0.033	570	0.05	48.41	TE		LOW		Delete	
4	1.2.1.2.c	0.354	0.281	0.174	235	0.08	57.13					Keep	
5	1.2.1.2.d	0.271	0.154	0.103	570	0.05	78.72					Delete	
6	1.4.1.4.a	0.334	0.307	0.166	235	0.08	72.80					Keep	
7	1.4.1.4.b	0.359	0.154	0.164	227	0.09	91.52				Check Option BEF	Keep	
8	1.5.1.5.a	0.234	0.125	0.088	561	0.05	46.46					Delete	
9	1.5.1.5.a	0.205	0.116	0.100	570	0.05	41.98					Delete	
10	1.5.1.5.b	0.104	0.050	0.035	561	0.05	46.52			LOW		Delete	
11	1.5.1.5.d	0.325	0.261	0.162	246	0.08	67.68					Keep	
12	1.5.1.5.e	0.334	0.359	0.166	231	0.08	67.23					Keep	
13	2.1.2.1.a	0.000	0.000	0.000	25	0.27	22.40	TE	NO	NO		Delete	
14	2.1.2.1.b	0.263	0.226	0.103	570	0.05	42.60					Delete	
15	2.1.2.1.c	0.249	0.064	0.049	561	0.05	21.66	TE		LOW		Delete	
16	2.1.2.1.e	0.162	0.089	0.066	202	0.09	77.00			LOW	Check option C	Delete	
17	2.1.2.1.e	0.497	0.327	0.228	256	0.08	68.88					Keep	
18	2.1.2.1.f	0.215	0.171	0.106	232	0.08	120.49					Keep	
19	2.4.2.4.a	0.163	0.114	0.061	88	0.14	33.08					Delete	
20	2.4.2.4.d	0.473	0.468	0.233	242	0.08	88.04					Keep	
21	2.5.2.5.b	0.404	0.356	0.193	242	0.08	56.74					Keep	
22	2.5.2.5.b	0.419	0.295	0.173	88	0.14	89.83					Delete	
23	2.5.2.5.d	0.457	0.386	0.226	239	0.08	70.85					Keep	
24	2.5.2.5.e	0.396	0.321	0.198	259	0.08	50.52					Keep	
25	2.5.2.5.f	0.233	0.184	0.107	258	0.08	108.80					Keep	

Item Selection | Option Analysis | Beta Comments | Blueprint

Ready

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Answer Option Analysis Statistics with Score Quintiles

	A	B	C	D	E	F	G	H	I	J	K	L
1												
2	ItemID	N	Keyed Response	Item Response	Count Of Chosen	P-value	Point Biserial	18 to 50	51 to 55	56 to 59	60 to 66	67 to 94
3	1.2.1.2.a	561		A	26	0.046	-0.045	8	4	5	2	7
4	1.2.1.2.a	561		B	8	0.014	-0.019	3	1	1	0	3
5	1.2.1.2.a	561		C	1	0.002	0.019	0	0	0	1	0
6	1.2.1.2.a	561		D	11	0.020	-0.236	8	2	1	0	0
7	1.2.1.2.a	561	>	E	515	0.918	0.159	76	117	94	118	110
8	1.2.1.2.b	248	>	A	123	0.496	0.408	12	22	14	36	39
9	1.2.1.2.b	248		B	63	0.254	-0.142	10	17	17	13	6
10	1.2.1.2.b	248		C	42	0.169	-0.355	13	16	9	4	0
11	1.2.1.2.b	248		D	20	0.081	-0.178	8	4	2	3	3
12	1.2.1.2.b	569		A	9	0.016	-0.083	5	2	1	0	1
13	1.2.1.2.b	569		B	18	0.032	-0.075	7	4	3	2	2
14	1.2.1.2.b	569		C	4	0.007	0.014	1	1	0	1	1
15	1.2.1.2.b	569	>	D	517	0.909	0.113	126	114	80	102	95
16	1.2.1.2.b	569		E	21	0.037	-0.082	10	3	3	3	2
17	1.2.1.2.c	233		A	41	0.176	-0.411	15	15	5	6	0
18	1.2.1.2.c	233	>	B	136	0.584	0.354	15	30	24	29	38
19	1.2.1.2.c	233		C	39	0.167	-0.089	6	12	10	8	3
20	1.2.1.2.c	233		D	17	0.073	-0.127	6	5	0	6	0
21	1.2.1.2.d	569		A	1	0.002	-0.085	1	0	0	0	0
22	1.2.1.2.d	569		AB	4	0.007	-0.047	3	0	0	0	1
23	1.2.1.2.d	569		AC	17	0.030	-0.111	10	2	3	0	2
24	1.2.1.2.d	569		AD	6	0.011	-0.094	4	0	1	0	1
25	1.2.1.2.d	569		BC	56	0.098	-0.173	27	11	5	7	6

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TestMetrics Applications

- **Automated Test Form Assembly using test blueprints, content objective domains, beta item, test and time analysis.**
- **Setting Performance Standards using Angoff, Bookmark or Borderline Survey information**
- **Preparing Technical Reports on Test and Item Analysis.**

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Compute Test & Section Statistics

Test Summary Statistics

	Form A Raw	Form B Raw	Form A % Scale	Form B % Scale
Number of candidates	52	46		
Number of items	60	60		
Mean	36.98	37.21	61.63	62.029
Standard deviation	7.37	7.98	12.289	12.649
SE of mean	1.02	1.12	1.704	1.865
95% confidence interval for mean: plus or minus	2.00	2.20	3.340	3.626
Alpha Reliability	0.802	0.789		
Skew	-0.388	-0.907		
Kurtosis	-0.534	2.188		
SE of Measurement	3.28	3.67	5.468	5.810
95% average confidence interval for score: plus or minus	6.43	7.19	10.717	11.388
Average time (minutes)	50.577	47.189		
95% confidence max time (min)	70.183	72.774		

Form A Section Level Descriptive Statistics

Form A	Section 1	Section 2	Section 3
Mean	12.19	20.75	4.04
Standard Error of the Mean	0.341	0.626	0.205
Standard Error of Measurement	1.67	2.38	1.37
Standard Deviation	2.458	4.515	1.481
Alpha	0.536	0.722	0.145
Kurtosis	-0.008	-0.558	0.147
Skewness	-0.297	-0.318	-0.671
Candidates	52	52	52
N of Items	18	34	8
95% CI For Mean (Plus or Minus)	0.668	1.221	0.402
95% CI For Score (Plus or Minus)	3.273	4.665	2.685

Form B Section Level Descriptive Statistics

Form B	Section 1	Section 2	Section 3
Mean	12.93	19.35	4.93
Standard Error of the Mean	0.407	0.690	0.216
Standard Error of Measurement	1.804	2.521	1.316
Standard Deviation	2.760	4.682	1.467
Alpha	0.573	0.710	0.195
Kurtosis	1.141	1.554	-0.253
Skewness	-0.566	-0.501	-0.324
Count	46	46	46
N of Items	18	34	8
95% CI For Mean (Plus or Minus)	0.798	1.352	0.423
95% CI For Score (Plus or Minus)	3.353	4.941	2.579

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Automated Parallel Form Generation (Three to Five Forms)

Test Summary Statistics for Parallel Forms

Stats	*Form A Raw*	*Form B Raw*	*Form C Raw*
Number of items	60	60	60
Mean	30.98	31.10	31.20
Standard deviation	8.97	8.66	9.25
SE of mean*	0.43	0.41	0.44
95% confidence interval for mean: plus or minus*	0.83	0.81	0.86
Alpha Reliability	0.853	0.843	0.865
Standard Error of Measurement	3.44	3.43	3.39
95% Confidence Interval for score (plus and minus)	6.75	6.72	6.65
Average Test Time (minutes)	89.77	86.90	89.13
Average Item Measure	0.688	0.691	0.683
Standard deviation of item measures	0.951	0.998	1.000
Information at target cut score	12.53	12.33	12.21
SE at target cut score	0.282	0.285	0.286
Estimated number correct at target cut score	32.09	32.10	32.08
Percent correct at target cut score	53.5%	53.5%	53.5%

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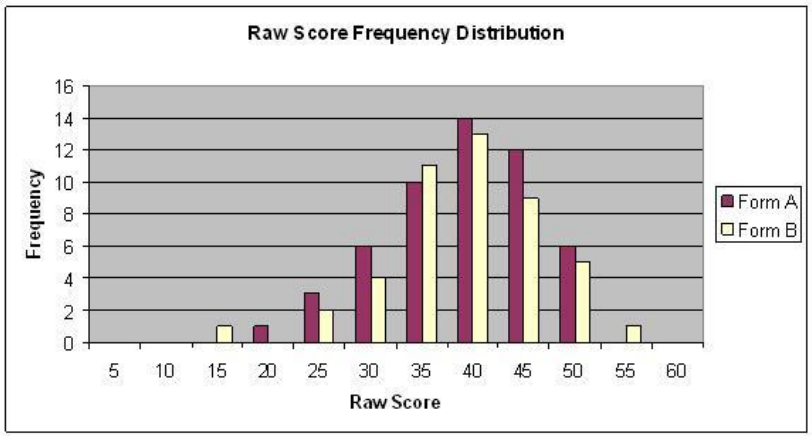
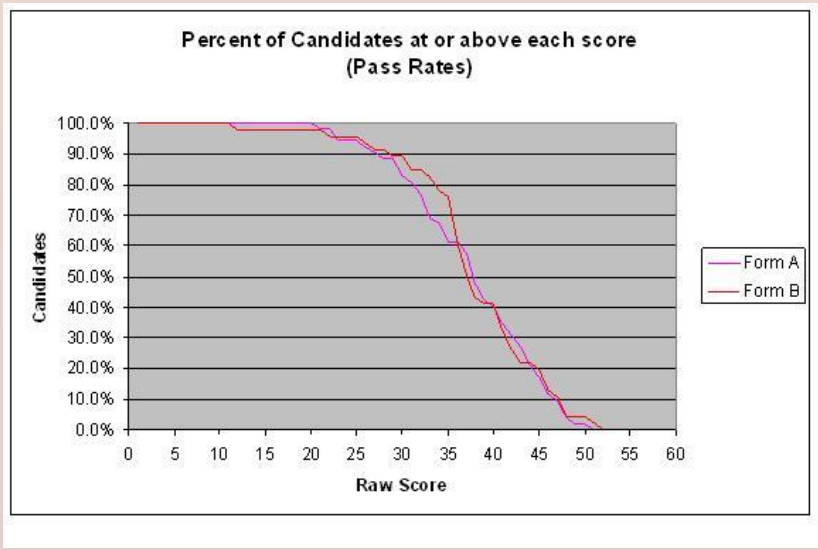
Compute Test Score and Passing Score Distributions





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Import TestMetrics Statistical Tables in Technical Psychometric Reports

Test and Item Inservice Analysis Report
Certified Storage Networker

August 2, 2005
James B Olsen, Ph.D.
Russell Smith, Ph.D.

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Import TestMetrics Statistical Tables in Technical Psychometric Reports

Test Form Assembly Report
Database: Fundamentals Exam
Russell W. Smith, Ph.D.
September 11, 2006

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