ACES

Report Requested: 04-27-2011 **Study ID:** R110406

Placement Validity Report for Mt. San Jacinto College

Your College Board Validity Report is designed to assist your institution in validating your placement decisions. This report provides a nontechnical discussion of important findings.

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Section 1: The purpose of this report

The purpose of an ACES™ Placement Validity Report is to assist you in using academic measures to identify the course level that is most appropriate for a student's ability level. This report will enable you to use these measures to predict the probability that the student will succeed in a particular course. This report will also help you to decide which measures to use to predict that success.

ACES reports often mention the terms **predictor variables** and **criterion**. Predictor variables include such things as scores from standardized tests, as well as specific campus measures. A criterion is a course outcome measure of success. An example of a criterion is the final grade in the course.

When requesting this report, you indicated that you wished to study placement in five courses.

- You chose to study the following as predictors of success in Math-050: ACCUPLACER Arithmetic and ACCUPLACER Elementary Algebra.
- You chose to study the following as predictors of success in Math-051: ACCUPLACER Arithmetic and ACCUPLACER Elementary Algebra.
- You chose to study the following as predictors of success in Math-090: ACCUPLACER Arithmetic and ACCUPLACER Elementary Algebra.
- You chose to study the following as predictors of success in Math-096: ACCUPLACER Arithmetic, ACCUPLACER Elementary Algebra, and ACCUPLACER College-Level Math.
- You chose to study the following as predictors of success in MATH-102-105-140-155: ACCUPLACER Elementary Algebra and ACCUPLACER College-Level Math.

Using final course grade as the criterion, your report provides predictions for two levels of success. These levels are:

- Success defined as a final course grade of C or higher, and
- Success as a final course grade of B or higher.

Students who met the level of success by achieving the identified grade or a higher grade were considered successful, while those students who earned less than the identified grade in each success level were not.

Limitations of this information

ACES Placement Validity Reports are useful when your primary concern is predicting a student's success in a course on the basis of that student's score on a specific test. In certain cases, a student's predicted success may not be the only consideration in making placement decisions. For some courses, prerequisite knowledge of other subjects may be desired.

This report assumes that the predictor variables (test scores, for example) were collected before students had taken the course in which you are trying to predict success, with no intervening course taken in this subject other than the course in the analysis.

It is sometimes appropriate to collect test scores at the end of the course instead. For help in making placement decisions in situations where the information in this report does not apply, click on the Validity Handbook link on the ACES Web site for additional information (http://professionals.collegeboard.com/higher-ed/validity/aces/handbook). You may also contact the ACES staff at aces@info.collegeboard.org for advice.

The College Board makes every effort to ensure that the information provided in this report is accurate. Inaccurate findings may be the result of missing or inaccurate data provided by the institution.

Section 2: Your sample of students

In your report, the **sample** is the group of students for whom you have scores on the predictor variable(s) and on the criterion. Using the data derived from the sample of students used to generate this report, you will generalize to a larger population of students. That is, using the same predictor variable(s), you can use this report to predict the probability of success for future students. Predictions are more likely to be accurate if the sample of students used to generate the report is similar to the group of students whose success you want to predict. It is important that the sample be similar to the population for which you will be making predictions in ways that are and are not measured by the predictors. Some examples of these characteristics that are not measured by the predictors are gender balance, ethnic/racial make-up, and age range.

The following tables provide information about the sample of students for your specified courses. The sample is defined and represented two ways. The **study sample** consists of students for whom you provided course grades and information for at least one of the predictor variable(s) that you requested be used in your study. The **complete data sample**, a subset of your study sample, consists of students for whom you provided course grades **and** who have scores on **all** the predictor variables specified in your request.

Institutions frequently ask, ''How large a sample is large enough?'' In general, the larger the sample, the more accurate the prediction formulas resulting from your study. The minimum number of students required for a study depends on the number of predictors used. If one to three predictors are used, a minimum of 30 students is required; for four predictors, a minimum of 40 students; and for five predictors, a minimum of 50 students.

Characteristics of Students Taking Math-050 Using ACCUPLACER Scores		
	Study Sample	Complete Data Sample
ACCUPLACER Arithmetic		
N	677	425
Mean	29	29
S.D.	7	7
ACCUPLACER Elementary Algebra		
N	425	425
Mean	30	30
S.D.	6	6
Gender (N & %)		
Male	256 (38%)	157 (37%)
Female	419 (62%)	266 (63%)

Characteristics of Students Taking Math-051 Using ACCUPLACER Scores		
	Study Sample	Complete Data Sample
ACCUPLACER Arithmetic		
N	244	171
Mean	58	58
S.D.	9	10
ACCUPLACER Elementary Algebra		
N	171	171
Mean	33	33
S.D.	6	6
Gender (N & %)		
Male	120 (49%)	85 (50%)
Female	123 (51%)	85 (50%)

Characteristics of Students Taking Math-090 Using ACCUPLACER Scores		
	Study Sample	Complete Data Sample
ACCUPLACER Arithmetic		
N	123	119
Mean	83	83
S.D.	22	22
ACCUPLACER Elementary Algebra		
N	514	119
Mean	50	39
S.D.	8	7
Gender (N & %)		
Male	250 (48%)	74 (62%)
Female	267 (52%)	45 (38%)

Characteristics of Students Taking Math-096 Using ACCUPLACER Scores		
	Study Sample	Complete Data Sample
ACCUPLACER Arithmetic		
N	4	
Mean	105	
S.D.	12	
ACCUPLACER Elementary Algebra		
N	423	
Mean	80	
S.D.	11	
ACCUPLACER College-Level Math		
N	14	
Mean	37	
S.D.	11	
Gender (N & %)		
Male	190 (45%)	
Female	233 (55%)	

Characteristics of Students Taking MATH-102-105-140-155 Using ACCUPLACER Scores		
	Study Sample	Complete Data Sample
ACCUPLACER Elementary Algebra		
N	252	251
Mean	109	109
S.D.	5	5
ACCUPLACER College-Level Math		
N	251	251
Mean	52	52
S.D.	13	13
Gender (N & %)		
Male	130 (52%)	129 (52%)
Female	121 (48%)	121 (48%)

The following tables summarize the relationship of the predictor variable(s) with final grades for each course in your study. For each course, a table provides the number of test-takers, the mean, and the standard deviation for each predictor variable for each of the possible course grades.

If + and/or - grades were submitted, they would have been grouped with the corresponding base grade. For example, in the following tables, the B column would include B+, B, and B- grades.

Average ACCUPLACER Scores by Grade in Math-050					
	A	B	C	D	F
ACCUPLACER Arithmetic					
N	223	156	140	40	118
Mean	31	30	29	27	28
S.D.	7	6	6	6	7
ACCUPLACER Elementary Algebra					
N	137	105	83	29	71
Mean	31	30	30	30	28
S.D.	6	6	7	6	6

Average ACCUPLACER Scores by Grade in Math-051					
	A	B	C	D	F
ACCUPLACER Arithmetic					
N	97	64	38	11	34
Mean	58	58	58	56	56
S.D.	10	10	8	8	9
ACCUPLACER Elementary Algebra					
N	78	40	20	4	29
Mean	35	34	31	31	32
S.D.	5	6	6	4	6

Average ACCUPLACER Scores by Grade in Math-090					
	A	B	C	D	F
ACCUPLACER Arithmetic					
N	37	30	36	6	14
Mean	89	82	80	75	81
S.D.	17	20	25	18	24
ACCUPLACER Elementary Algebra					
N	133	127	134	30	90
Mean	49	50	49	49	51
S.D.	9	8	8	6	7

Average ACCUPLACER Scores by Grade in Math-096					
	A	B	C	D	F
ACCUPLACER Arithmetic					
N	4	0	0	0	0
Mean	105	0	0	0	0
S.D.	12	0	0	0	0
ACCUPLACER Elementary Algebra					
N	125	119	107	20	52
Mean	83	80	78	76	76
S.D.	11	11	10	10	9
ACCUPLACER College-Level Math					
N	9	3	1	0	1
Mean	41	34	22	0	29
S.D.	11	4	0	0	0

Average ACCUPLACER Scores by Grade in MATH-102-105-140-155					
	A	B	C	D	F
ACCUPLACER Elementary Algebra					
N	58	106	61	13	14
Mean	111	109	108	109	108
S.D.	5	5	5	5	5
ACCUPLACER College-Level Math					
N	58	106	60	13	14
Mean	55	53	49	45	46
S.D.	12	14	12	12	13

Section 3: Strength of prediction

If you submitted data for more than one predictor variable, you will need to decide which predictor or combination of predictors to use in making placement decisions. You will want to examine the strength of the relationship between each predictor and the criterion and also, when submitting multiple predictor variables, the strength of the relationship between all combinations of predictor variables and the criterion measure. The predictors or combinations of predictors that correlate most highly with success in the course are the best measures to use in deciding whether or not to place a student into a course.

Correlation coefficient

A common method for measuring the strength of the relationship between a predictor and a criterion is the **correlation coefficient**. The correlation coefficient indicates the extent to which scores on the criterion can be predicted from scores on the predictor variable. For example, in this study, scores on ACCUPLACER Arithmetic were used to predict final course grades in Math-050. The sign and size of the correlation denote the direction and degree of relationship between two variables.

Correlation coefficients always have a value between -1 and 1. If there is no relationship between two variables, their correlation will be 0.00. A positive correlation coefficient indicates that high scores on the predictor variable are associated with high values on the criterion, and low scores on the predictor variable are associated with low values on the criterion (e.g., high ACCUPLACER Arithmetic scores with high course grades, and low ACCUPLACER Arithmetic scores with low course grades). A negative correlation indicates that high scores on the predictor variable are associated with low values on the criterion, and low scores on the predictor variable are associated with high values on the criterion (e.g., high ACCUPLACER Arithmetic scores with low course grades, and low ACCUPLACER Arithmetic scores with high course grades).

Percent correctly placed

Another way to measure the strength of prediction is to estimate the percentage of students "correctly placed" by the predictor. A student is considered to be "correctly placed" by the predictor if either: (1) it was predicted that the student would succeed, and he or she did succeed (e.g., the student earned a course grade of C or higher when C or higher was defined as a level of success), or (2) it was predicted that the student would not succeed, and he or she did not succeed (e.g., the student earned a course grade of D or lower). The analyses reported here predict that a student will succeed if the student's estimated probability of success is .50 or higher. Notice, however, that when nearly all of the students in the class succeed, a predictor can have a high success rate even if it correlates very poorly with the criterion. For example, if 95 percent of the students succeed in the course, and the predictor simply predicts that all students will succeed, the "% Correctly Placed" will be 95.

Composite predictor

Predictor variables do not have to be used individually. Two or more predictors can be used together to form a **composite predictor** that may be stronger than either of the individual predictor variables alone. A composite predictor is reported when the total number of students who have scores on all of the predictors is at least 10 times the total number of predictors but not less than 30.

If you elected to use more than one predictor variable, the composite predictor is calculated by multiplying each individual predictor by a number that indicates its weight, or strength, in the prediction. The weighted predictors are added together. The resulting number is then added to another number, called the "constant," to put all the composite predictors on the same number scale, which results in composite predictor scores between approximately -3 and +3. You requested more than one predictor variable; thus, this report may include one or more formulas (or models) that can be used to calculate a composite predictor.

Important points

The tables presented in this section show the correlations between the criterion and the individual predictor variables. When more than one predictor was analyzed, the correlations between the criterion and the composite predictors may also be shown. Comparing the correlations in these tables will help you decide which individual or composite predictor to use for placement purposes. In making this decision, you should avoid comparing statistics derived from groups of students that are very different from each other.

In deciding which predictors to use, you have to balance the increase in accuracy that results from using an additional predictor against the cost of obtaining that information. Here are factors to keep in mind when making that decision:

- If the number of students in the sample is small, the correlation between a predictor variable and the criterion in the sample may be quite different from what it would be in another group of students, whether or not the number of students is the same or greater.
- Some predictor variables may be highly correlated with each other. If two predictors are highly correlated with each other, using them together may be only slightly better than using either of them individually.
- *A note about possible consequences of predictor variables which have been constructed from two or more variables that are highly correlated:*

  The ACES user should exercise caution when interpreting ACES study results that include highly correlated predictor variables (multicollinearity). The analyses performed by ACES are made with the assumption that the predictor variables are independent (uncorrelated); violating this assumption may result in less reliable model estimates. A typical situation where correlation of the predictor variables exists is when a constructed variable, such as an average or a sum of other predictors, is used as a predictor in the same analysis where any of the individual predictors comprising the constructed variable are also used.

The tables presented in this section show an estimate of "% Correctly Placed" for each separate predictor variable and for each composite predictor when more than one predictor variable is used in the analysis. The estimates shown are for the decisions that would be made if the only students placed in the course are those whose predicted probability of success on the criterion is at least .50. If there are insufficient data for a predictor variable, then the corresponding cells will be shaded, and that predictor variable will be left out of subsequent tables.

If you submitted more than one predictor variable, normally the ACES system will calculate a prediction equation for each possible combination of predictor variables for which there are sufficient data - i.e., the number of students in the sample with scores on all of the predictor variables and on the criterion variable must be at least 10 times the total number of predictors and at least 30. For each criterion variable, the system will print up to five prediction equations. If more than five combinations of predictors are possible, the system will print the five prediction equations that have the highest correlations between the composite predictor and the criterion variable.

An exception occurs when the correlation between the composite and the criterion variable is lower for the composite than for one of the predictors included in the composite. With the type of analysis used in the ACES Placement Validity Report, such an occurrence is possible. For example, the correlation of the composite of predictors X and Y with the criterion variable might actually be lower than the correlation for predictor X alone. In that case, the composite of predictors X and Y would not be reported.

Another exception occurs when the contribution of an individual predictor to the composite is in the opposite direction to its correlation with the criterion variable. For example, it is possible that predictor X could correlate positively with the criterion variable but take on a negative weight in the composite of X and Y. In such a case, the composite of predictors X and Y would not be reported.

Logistic Biserial Correlations* of Predictors with Success on the Criterion Criterion: Final Course Grade of C or Higher in Math-050 Using ACCUPLACER Scores						
Predictor Variable(s)	Study Sample			Complete Data Sample		
	N	Logistic Biserial Correlation*	% Correctly Placed	N	Logistic Biserial Correlation*	% Correctly Placed
Individual Predictors						
ACCUPLACER Arithmetic	677	0.19	77	425	0.17	76
ACCUPLACER Elementary Algebra	425	0.15	76	425	0.15	76
Composite Predictors						
Model Number 1	425	0.20	76	425	0.20	76
Model Number 1 includes ACCUPLACER Arithmetic and ACCUPLACER Elementary Algebra						

*The logistic biserial correlation is a measure of the strength of association. It is related to a biserial correlation but has been modified to be consistent with logistic regression and has been adapted to single and multiple predictors.

Using the students in your study sample we see that:

- When used as individual predictors, all predictors place at least 76 percent of the students correctly.
- The ACCUPLACER Arithmetic test, with a value of 0.19, has the strongest measure of association with the criterion among the individual predictors.
- Of the individual predictors, the ACCUPLACER Arithmetic test, with a value of 77, has the highest percentage of students correctly placed.
- The composite predictor, Model Number 1, has a measure of association with the criterion of 0.20.
- The composite predictor, Model Number 1, places 76 percent of the students correctly.

Using the students in your complete data sample we see that:

- When used as individual predictors, all predictors place at least 76 percent of the students correctly.
- The ACCUPLACER Arithmetic test, with a value of 0.17, has the strongest measure of association with the criterion among the individual predictors.
- The composite predictor, Model Number 1, has a measure of association with the criterion of 0.20.
- The composite predictor, Model Number 1, places 76 percent of the students correctly.

Technical notes:

- A biserial correlation is a measure of the association between a dichotomous variable (one with only two possible values) and a variable with many possible values, such as a test score. For example, the dichotomous variable might be earning (or not earning) a course grade of at least C. The biserial correlation assumes that the dichotomous variable is a perfect indicator of some underlying continuous variable that is not measured directly. In this example, the underlying continuous variable would be quality of performance in the course. The biserial correlation is an estimate of the correlation of the many-valued variable (the test score) with that underlying continuous variable (quality of performance in the course).
- Biserial correlations computed from the scores of a small group of students or of a group that includes very few students who did not succeed on the criterion (or very few who succeeded) often will not generalize beyond that particular group of students.

- A logistic biserial correlation is a type of biserial correlation that has been modified to be consistent with logistic regression. It can also be used with multiple predictors; in that case, it is an estimate of the measure of association between the predictors (e.g., scores on two or more tests) and the underlying continuous variable (quality of performance in the course) indicated by the dichotomous variable (a grade of C or better).

Logistic Biserial Correlations* of Predictors with Success on the Criterion Criterion: Final Course Grade of B or Higher in Math-050 Using ACCUPLACER Scores						
Predictor Variable(s)	Study Sample			Complete Data Sample		
	N	Logistic Biserial Correlation*	% Correctly Placed	N	Logistic Biserial Correlation*	% Correctly Placed
Individual Predictors						
ACCUPLACER Arithmetic	677	0.20	59	425	0.16	58
ACCUPLACER Elementary Algebra	425	0.10	57	425	0.10	57

*The logistic biserial correlation is a measure of the strength of association. It is related to a biserial correlation but has been modified to be consistent with logistic regression and has been adapted to single and multiple predictors.

Using the students in your study sample we see that:

- When used as individual predictors, all predictors place at least 57 percent of the students correctly.
- The ACCUPLACER Arithmetic test, with a value of 0.20, has the strongest measure of association with the criterion among the individual predictors.
- Of the individual predictors, the ACCUPLACER Arithmetic test, with a value of 59, has the highest percentage of students correctly placed.

Using the students in your complete data sample we see that:

- When used as individual predictors, all predictors place at least 57 percent of the students correctly.
- The ACCUPLACER Arithmetic test, with a value of 0.16, has the strongest measure of association with the criterion among the individual predictors.
- Of the individual predictors, the ACCUPLACER Arithmetic test, with a value of 58, has the highest percentage of students correctly placed.

Technical notes:

- A biserial correlation is a measure of the association between a dichotomous variable (one with only two possible values) and a variable with many possible values, such as a test score. For example, the dichotomous variable might be earning (or not earning) a course grade of at least B. The biserial correlation assumes that the dichotomous variable is a perfect indicator of some underlying continuous variable that is not measured directly. In this example, the underlying continuous variable would be quality of performance in the course. The biserial correlation is an estimate of the correlation of the many-valued variable (the test score) with that underlying continuous variable (quality of performance in the course).
- Biserial correlations computed from the scores of a small group of students or of a group that includes very few students who did not succeed on the criterion (or very few who succeeded) often will not generalize beyond that particular group of students.
- A logistic biserial correlation is a type of biserial correlation that has been modified to be consistent with logistic regression. It can also be used with multiple predictors; in that case, it is an estimate of the measure of association between the predictors (e.g., scores on two or more tests) and the underlying continuous variable (quality of performance in the course) indicated by the dichotomous variable (a grade of B or better).

Likewise, the following tables can be used to examine the strength of the relationship between the predictor(s) and criterion for the other course(s) in your study.

Logistic Biserial Correlations* of Predictors with Success on the Criterion Criterion: Final Course Grade of C or Higher in Math-051 Using ACCUPLACER Scores						
Predictor Variable(s)	Study Sample			Complete Data Sample		
	N	Logistic Biserial Correlation*	% Correctly Placed	N	Logistic Biserial Correlation*	% Correctly Placed
Individual Predictors						
ACCUPLACER Arithmetic	244	0.12	82	171	0.10	81
ACCUPLACER Elementary Algebra	171	0.20	81	171	0.20	81
Composite Predictors						
Model Number 1	171	0.22	81	171	0.22	81
Model Number 1 includes ACCUPLACER Arithmetic and ACCUPLACER Elementary Algebra						

*The logistic biserial correlation is a measure of the strength of association. It is related to a biserial correlation but has been modified to be consistent with logistic regression and has been adapted to single and multiple predictors.

Technical notes:

- A biserial correlation is a measure of the association between a dichotomous variable (one with only two possible values) and a variable with many possible values, such as a test score. For example, the dichotomous variable might be earning (or not earning) a course grade of at least C. The biserial correlation assumes that the dichotomous variable is a perfect indicator of some underlying continuous variable that is not measured directly. In this example, the underlying continuous variable would be quality of performance in the course. The biserial correlation is an estimate of the correlation of the many-valued variable (the test score) with that underlying continuous variable (quality of performance in the course).
- Biserial correlations computed from the scores of a small group of students or of a group that includes very few students who did not succeed on the criterion (or very few who succeeded) often will not generalize beyond that particular group of students.
- A logistic biserial correlation is a type of biserial correlation that has been modified to be consistent with logistic regression. It can also be used with multiple predictors; in that case, it is an estimate of the measure of association between the predictors (e.g., scores on two or more tests) and the underlying continuous variable (quality of performance in the course) indicated by the dichotomous variable (a grade of C or better).

Logistic Biserial Correlations* of Predictors with Success on the Criterion Criterion: Final Course Grade of B or Higher in Math-051 Using ACCUPLACER Scores						
Predictor Variable(s)	Study Sample			Complete Data Sample		
	N	Logistic Biserial Correlation*	% Correctly Placed	N	Logistic Biserial Correlation*	% Correctly Placed
Individual Predictors						
ACCUPLACER Arithmetic	244	0.07	66	171	0.02	69
ACCUPLACER Elementary Algebra	171	0.28	71	171	0.28	71
Composite Predictors						
Model Number 1	171	0.28	71	171	0.28	71
Model Number 1 includes ACCUPLACER Arithmetic and ACCUPLACER Elementary Algebra						

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Technical notes:

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- Biserial correlations computed from the scores of a small group of students or of a group that includes very few students who did not succeed on the criterion (or very few who succeeded) often will not generalize beyond that particular group of students.
- A logistic biserial correlation is a type of biserial correlation that has been modified to be consistent with logistic regression. It can also be used with multiple predictors; in that case, it is an estimate of the measure of association between the predictors (e.g., scores on two or more tests) and the underlying continuous variable (quality of performance in the course) indicated by the dichotomous variable (a grade of B or better).

Logistic Biserial Correlations* of Predictors with Success on the Criterion Criterion: Final Course Grade of C or Higher in Math-090 Using ACCUPLACER Scores						
Predictor Variable(s)	Study Sample			Complete Data Sample		
	N	Logistic Biserial Correlation*	% Correctly Placed	N	Logistic Biserial Correlation*	% Correctly Placed
Individual Predictors						
ACCUPLACER Arithmetic	123	0.11	84	119	0.11	83
ACCUPLACER Elementary Algebra	514	-0.07	77	119	-0.15	83
Composite Predictors						
Model Number 1	119	0.17	83	119	0.17	83
Model Number 1 includes ACCUPLACER Arithmetic and ACCUPLACER Elementary Algebra						

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Logistic Biserial Correlations* of Predictors with Success on the Criterion Criterion: Final Course Grade of B or Higher in Math-090 Using ACCUPLACER Scores						
Predictor Variable(s)	Study Sample			Complete Data Sample		
	N	Logistic Biserial Correlation*	% Correctly Placed	N	Logistic Biserial Correlation*	% Correctly Placed
Individual Predictors						
ACCUPLACER Arithmetic	123	0.17	59	119	0.17	57
ACCUPLACER Elementary Algebra	514	-0.02	48	119	-0.19	60
Composite Predictors						
Model Number 1	119	0.24	60	119	0.24	60
Model Number 1 includes ACCUPLACER Arithmetic and ACCUPLACER Elementary Algebra						

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Technical notes:

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Logistic Biserial Correlations* of Predictors with Success on the Criterion Criterion: Final Course Grade of C or Higher in Math-096 Using ACCUPLACER Scores						
Predictor Variable(s)	Study Sample			Complete Data Sample		
	N	Logistic Biserial Correlation*	% Correctly Placed	N	Logistic Biserial Correlation*	% Correctly Placed
Individual Predictors						
ACCUPLACER Arithmetic	4					
ACCUPLACER Elementary Algebra	423	0.24	83			
ACCUPLACER College-Level Math	14					

*The logistic biserial correlation is a measure of the strength of association. It is related to a biserial correlation but has been modified to be consistent with logistic regression and has been adapted to single and multiple predictors.

Technical notes:

- A biserial correlation is a measure of the association between a dichotomous variable (one with only two possible values) and a variable with many possible values, such as a test score. For example, the dichotomous variable might be earning (or not earning) a course grade of at least C. The biserial correlation assumes that the dichotomous variable is a perfect indicator of some underlying continuous variable that is not measured directly. In this example, the underlying continuous variable would be quality of performance in the course. The biserial correlation is an estimate of the correlation of the many-valued variable (the test score) with that underlying continuous variable (quality of performance in the course).
- Biserial correlations computed from the scores of a small group of students or of a group that includes very few students who did not succeed on the criterion (or very few who succeeded) often will not generalize beyond that particular group of students.
- A logistic biserial correlation is a type of biserial correlation that has been modified to be consistent with logistic regression. It can also be used with multiple predictors; in that case, it is an estimate of the measure of association between the predictors (e.g., scores on two or more tests) and the underlying continuous variable (quality of performance in the course) indicated by the dichotomous variable (a grade of C or better).
- For one or more of your individual predictors, the number of students with grades below C in Math-096 was too small (fewer than five) to yield reliable results for the analyses based on this level of success. There is a substantial probability that the statistics for those predictors in this analysis at this particular level of success would not generalize to another group of students. Please see Section 2 of this report for predictor scores by grade in Math-096 to determine which predictor(s) has fewer than five students with a grade below C.
- For one or more of your individual predictors, the number of students with grades of C or higher in Math-096 was too small (fewer than five) to yield reliable results for the analyses based on this level of success. There is a substantial probability that the statistics for those predictors in this analysis at this particular level of success would not generalize to another group of students. Please see Section 2 of this report for predictor scores by grade in Math-096 to determine which predictor(s) has fewer than five students with a grade of C or higher.

Logistic Biserial Correlations* of Predictors with Success on the Criterion Criterion: Final Course Grade of B or Higher in Math-096 Using ACCUPLACER Scores						
Predictor Variable(s)	Study Sample			Complete Data Sample		
	N	Logistic Biserial Correlation*	% Correctly Placed	N	Logistic Biserial Correlation*	% Correctly Placed
Individual Predictors						
ACCUPLACER Arithmetic	4					
ACCUPLACER Elementary Algebra	423	0.23	61			
ACCUPLACER College-Level Math	14					

*The logistic biserial correlation is a measure of the strength of association. It is related to a biserial correlation but has been modified to be consistent with logistic regression and has been adapted to single and multiple predictors.

Technical notes:

- A biserial correlation is a measure of the association between a dichotomous variable (one with only two possible values) and a variable with many possible values, such as a test score. For example, the dichotomous variable might be earning (or not earning) a course grade of at least B. The biserial correlation assumes that the dichotomous variable is a perfect indicator of some underlying continuous variable that is not measured directly. In this example, the underlying continuous variable would be quality of performance in the course. The biserial correlation is an estimate of the correlation of the many-valued variable (the test score) with that underlying continuous variable (quality of performance in the course).
- Biserial correlations computed from the scores of a small group of students or of a group that includes very few students who did not succeed on the criterion (or very few who succeeded) often will not generalize beyond that particular group of students.
- A logistic biserial correlation is a type of biserial correlation that has been modified to be consistent with logistic regression. It can also be used with multiple predictors; in that case, it is an estimate of the measure of association between the predictors (e.g., scores on two or more tests) and the underlying continuous variable (quality of performance in the course) indicated by the dichotomous variable (a grade of B or better).
- For one or more of your individual predictors, the number of students with grades below B in Math-096 was too small (fewer than five) to yield reliable results for the analyses based on this level of success. There is a substantial probability that the statistics for those predictors in this analysis at this particular level of success would not generalize to another group of students. Please see Section 2 of this report for predictor scores by grade in Math-096 to determine which predictor(s) has fewer than five students with a grade below B.
- For one or more of your individual predictors, the number of students with grades of B or higher in Math-096 was too small (fewer than five) to yield reliable results for the analyses based on this level of success. There is a substantial probability that the statistics for those predictors in this analysis at this particular level of success would not generalize to another group of students. Please see Section 2 of this report for predictor scores by grade in Math-096 to determine which predictor(s) has fewer than five students with a grade of B or higher.

Logistic Biserial Correlations* of Predictors with Success on the Criterion Criterion: Final Course Grade of C or Higher in MATH-102-105-140-155 Using ACCUPLACER Scores						
Predictor Variable(s)	Study Sample			Complete Data Sample		
	N	Logistic Biserial Correlation*	% Correctly Placed	N	Logistic Biserial Correlation*	% Correctly Placed
Individual Predictors						
ACCUPLACER Elementary Algebra	252	0.10	89	251	0.10	89
ACCUPLACER College-Level Math	251	0.27	89	251	0.27	89

*The logistic biserial correlation is a measure of the strength of association. It is related to a biserial correlation but has been modified to be consistent with logistic regression and has been adapted to single and multiple predictors.

Technical notes:

- A biserial correlation is a measure of the association between a dichotomous variable (one with only two possible values) and a variable with many possible values, such as a test score. For example, the dichotomous variable might be earning (or not earning) a course grade of at least C. The biserial correlation assumes that the dichotomous variable is a perfect indicator of some underlying continuous variable that is not measured directly. In this example, the underlying continuous variable would be quality of performance in the course. The biserial correlation is an estimate of the correlation of the many-valued variable (the test score) with that underlying continuous variable (quality of performance in the course).
- Biserial correlations computed from the scores of a small group of students or of a group that includes very few students who did not succeed on the criterion (or very few who succeeded) often will not generalize beyond that particular group of students.
- A logistic biserial correlation is a type of biserial correlation that has been modified to be consistent with logistic regression. It can also be used with multiple predictors; in that case, it is an estimate of the measure of association between the predictors (e.g., scores on two or more tests) and the underlying continuous variable (quality of performance in the course) indicated by the dichotomous variable (a grade of C or better).

Logistic Biserial Correlations* of Predictors with Success on the Criterion Criterion: Final Course Grade of B or Higher in MATH-102-105-140-155 Using ACCUPLACER Scores						
Predictor Variable(s)	Study Sample			Complete Data Sample		
	N	Logistic Biserial Correlation*	% Correctly Placed	N	Logistic Biserial Correlation*	% Correctly Placed
Individual Predictors						
ACCUPLACER Elementary Algebra	252	0.18	65	251	0.17	65
ACCUPLACER College-Level Math	251	0.24	63	251	0.24	63
Composite Predictors						
Model Number 1	251	0.26	63	251	0.26	63
Model Number 1 includes ACCUPLACER Elementary Algebra and ACCUPLACER College-Level Math						

*The logistic biserial correlation is a measure of the strength of association. It is related to a biserial correlation but has been modified to be consistent with logistic regression and has been adapted to single and multiple predictors.

Technical notes:

- A biserial correlation is a measure of the association between a dichotomous variable (one with only two possible values) and a variable with many possible values, such as a test score. For example, the dichotomous variable might be earning (or not earning) a course grade of at least B. The biserial correlation assumes that the dichotomous variable is a perfect indicator of some underlying continuous variable that is not measured directly. In this example, the underlying continuous variable would be quality of performance in the course. The biserial correlation is an estimate of the correlation of the many-valued variable (the test score) with that underlying continuous variable (quality of performance in the course).
- Biserial correlations computed from the scores of a small group of students or of a group that includes very few students who did not succeed on the criterion (or very few who succeeded) often will not generalize beyond that particular group of students.
- A logistic biserial correlation is a type of biserial correlation that has been modified to be consistent with logistic regression. It can also be used with multiple predictors; in that case, it is an estimate of the measure of association between the predictors (e.g., scores on two or more tests) and the underlying continuous variable (quality of performance in the course) indicated by the dichotomous variable (a grade of B or better).

Section 4: Deciding what probability of success to require for placement into a course

In determining whether to place a student into a course, there are two types of **correct** decisions:

- Placing a student into a course where the student eventually succeeds, or
- Denying placement into a course to a student who would not have succeeded.

Similarly, there are two types of **incorrect** decisions:

- Placing a student who will not succeed into a course, or
- Denying placement into a course to a student who would have succeeded.

If you wish to make as many correct placement decisions and as few incorrect decisions as possible, there is a simple way to achieve this goal: place into a course all those students, and only those students, whose estimated probability of success is .50 or higher. However, this simple solution may not be the best choice for all placement situations. In some cases, it may be wise to tolerate more incorrect decisions of one type in order to make fewer incorrect decisions of the other type.

For example, if a course is expensive in terms of resources required by each student, you may want to place only those students whose probability of success is substantially higher than .50. In these situations, you may want to require a probability of success of at least .67 (two out of three students placed into the course are likely to succeed) or .75 (three out of four students placed are likely to succeed) or possibly higher.

In situations where the consequences of not being successful in the course (as defined in this report) are not severe, you may want to place into the course some students with a lower probability of success. For example, a first-year English composition course may be of substantial benefit even to students who do not earn a grade that is considered successful. In these cases, you may want to place students whose estimated probability of success is somewhat lower than .50.

Prediction involves uncertainty. In this section, the probability estimates and cut scores presented in the tables show you how much uncertainty there is for various cut scores. If the probability of success is very low or very high, there is little uncertainty in the decision. A probability of success near .50 carries a great deal of uncertainty, particularly when sample sizes are small. Remember that there will always be some level of uncertainty in predicting students' success in college courses. Using the information in this report will improve your predictions but will not enable you to predict correctly for all students.

Tables in this section contain the probability of success associated with various cut scores in each course for which you requested a placement report. Each row of the table corresponds to a specific probability of success on the criterion. This report defines two levels of success:

- A grade of C or higher, or
- A grade of B or higher.

There is one table for each of these levels of success for each course you requested. The tables contain a column for each individual predictor variable with sufficient data. If you elected to use more than one predictor variable for a course, the tables may also contain another column for the composite predictor. Cut scores in this composite predictor column typically fall in the range of -3 to +3. The formula(s) for the composite predictor is(are) listed below the table. Which predictor(s) you use to make a prediction for an individual student will depend upon which of the student's scores you decide to use after reviewing Section 3 of this report.

All tables in this section are based on your **study sample**. In general, this sample has the larger number of students, which provides the most stable probability and cut score estimates.

Shaded areas of the table indicate success probabilities that correspond to scores above the maximum possible score or below the minimum possible score for that predictor. If the space for .95 is shaded, even a student with the highest possible score on the predictor would have less than a .95 probability of success. If the space for .05 is shaded, even the student with the lowest possible score on the predictor would have more than a .05 probability of success. If the probability that you are interested in has a shaded cut score value, then use the closest probability with a non-shaded cut score.

Technical note:

A large number of shaded cells, particularly around the probability in which you are interested, or an entire column of shaded cells indicates incompatibilities between your data and the statistical methods used in ACES placement studies. This may result from the statistical model fitting your data poorly. Such an outcome can occur for many reasons; some of the more common ones include a lack of sufficient number of grades above or below the specified level of success for the analysis, and/or a negative correlation between the predictor in question and the course grade used to determine the level of success indicated in the table. For help in interpreting the results of your study, please contact the ACES staff at aces@info.collegeboard.org.

Cut Scores Associated with Predicted Probability of Success Criterion: Final Course Grade of C or Higher in Math-050 Using ACCUPLACER Scores			
Probability of Success	ACCUPLACER Arithmetic Only	ACCUPLACER Elementary Algebra Only	Composite Predictor
0.95	62	69	2.94
0.90	48	52	2.20
0.85	39	42	1.73
0.80	33	34	1.39
0.75	27	28	1.10
0.70	22	22	0.85
0.65			0.62
0.60			0.41
0.55			0.20
0.50			0.00
0.45			-0.20
0.40			-0.41
0.35			-0.62
0.30			-0.85
0.25			-1.10
0.20			-1.39
0.15			-1.73
0.10			-2.20
0.05			-2.94
The following model(s) can be used to calculate the composite predictor shown in the table above. Model Number 1 = -0.88269 + (0.03717) × ACCUPLACER Arithmetic + (0.03353) × ACCUPLACER Elementary Algebra			

Using the probability table above:

Suppose you want to set the probability of success in Math-050 (considering your criterion is a grade of C or higher) at 0.70. That is, you will place a student into Math-050 if a student's value(s) on available predictors is(are) at or above the cut point(s) corresponding to a probability of success of 0.70. If the only academic measure you have for a student is the ACCUPLACER Arithmetic score, you would place that student into Math-050 if the student scored 22 or greater on ACCUPLACER Arithmetic. If the student scored below 22, you would not place that student into Math-050.

If you decide to use a composite predictor to predict placement into Math-050 (using a grade of C or higher as a level of success), then the composite predictor cut score of 0.85 corresponds to a probability of success of 0.70. You can obtain this by reading down the column labeled "Probability of Success" to 0.70 and then reading across to the last column labeled "Composite Predictor". If you want to use more than one measure to determine whether or not to place a student into the course, use the formula at the bottom of the table to compute a composite predictor score. When more than one predictor is used for placement decisions, there are various combinations of predictors that will result in a decision to place a student into the course. Use the model equation(s) at the bottom of the table to determine if a student should be placed in the course.

The following tables of cut scores and associated predicted probabilities can be used to derive an estimated probability of success for students in the course and level of success indicated in the tables.

Cut Scores Associated with Predicted Probability of Success Criterion: Final Course Grade of B or Higher in Math-050 Using ACCUPLACER Scores		
Probability of Success	ACCUPLACER Arithmetic Only	ACCUPLACER Elementary Algebra Only
0.95	77	118
0.90	63	93
0.85	55	78
0.80	49	66
0.75	44	57
0.70	40	49
0.65	36	41
0.60	32	34
0.55	29	27
0.50	25	21
0.45	22	
0.40		
0.35		
0.30		
0.25		
0.20		
0.15		
0.10		
0.05		

A composite predictor could not be produced for this course at this level of success.

Cut Scores Associated with Predicted Probability of Success Criterion: Final Course Grade of C or Higher in Math-051 Using ACCUPLACER Scores			
Probability of Success	ACCUPLACER Arithmetic Only	ACCUPLACER Elementary Algebra Only	Composite Predictor
0.95	118	56	2.94
0.90	87	44	2.20
0.85	67	37	1.73
0.80	53	32	1.39
0.75	41	27	1.10
0.70	30	23	0.85
0.65	20		0.62
0.60			0.41
0.55			0.20
0.50			0.00
0.45			-0.20
0.40			-0.41
0.35			-0.62
0.30			-0.85
0.25			-1.10
0.20			-1.39
0.15			-1.73
0.10			-2.20
0.05			-2.94
The following model(s) can be used to calculate the composite predictor shown in the table above. Model Number 1 = -1.61720 + (0.01704) × ACCUPLACER Arithmetic + (0.06332) × ACCUPLACER Elementary Algebra			

Cut Scores Associated with Predicted Probability of Success Criterion: Final Course Grade of B or Higher in Math-051 Using ACCUPLACER Scores			
Probability of Success	ACCUPLACER Arithmetic Only	ACCUPLACER Elementary Algebra Only	Composite Predictor
0.95		57	2.94
0.90		48	2.20
0.85		43	1.73
0.80	107	39	1.39
0.75	87	36	1.10
0.70	70	33	0.85
0.65	54	31	0.62
0.60	40	28	0.41
0.55	26	26	0.20
0.50		24	0.00
0.45		21	-0.20
0.40			-0.41
0.35			-0.62
0.30			-0.85
0.25			-1.10
0.20			-1.39
0.15			-1.73
0.10			-2.20
0.05			-2.94
The following model(s) can be used to calculate the composite predictor shown in the table above. Model Number 1 = -2.21078 + (0.00184) × ACCUPLACER Arithmetic + (0.08884) × ACCUPLACER Elementary Algebra			

Cut Scores Associated with Predicted Probability of Success Criterion: Final Course Grade of C or Higher in Math-090 Using ACCUPLACER Scores			
Probability of Success	ACCUPLACER Arithmetic Only	ACCUPLACER Elementary Algebra Only	Composite Predictor
0.95			2.94
0.90			2.20
0.85	92		1.73
0.80	55		1.39
0.75	24		1.10
0.70			0.85
0.65			0.62
0.60			0.41
0.55			0.20
0.50			0.00
0.45			-0.20
0.40			-0.41
0.35			-0.62
0.30			-0.85
0.25			-1.10
0.20			-1.39
0.15			-1.73
0.10			-2.20
0.05			-2.94
The following model(s) can be used to calculate the composite predictor shown in the table above. Model Number 1 = 2.40426 + (0.00714) × ACCUPLACER Arithmetic + (-0.03543) × ACCUPLACER Elementary Algebra			

Reasons for an entire column of shaded cells are offered in the technical note preceding the tables in this section.

Cut Scores Associated with Predicted Probability of Success Criterion: Final Course Grade of B or Higher in Math-090 Using ACCUPLACER Scores			
Probability of Success	ACCUPLACER Arithmetic Only	ACCUPLACER Elementary Algebra Only	Composite Predictor
0.95			2.94
0.90			2.20
0.85			1.73
0.80			1.39
0.75			1.10
0.70			0.85
0.65	113		0.62
0.60	98		0.41
0.55	84		0.20
0.50	71		0.00
0.45	57		-0.20
0.40	43		-0.41
0.35	28		-0.62
0.30			-0.85
0.25			-1.10
0.20			-1.39
0.15			-1.73
0.10			-2.20
0.05			-2.94
The following model(s) can be used to calculate the composite predictor shown in the table above. Model Number 1 = 0.82902 + (0.01218) × ACCUPLACER Arithmetic + (-0.04465) × ACCUPLACER Elementary Algebra			

Reasons for an entire column of shaded cells are offered in the technical note preceding the tables in this section.

Cut Scores Associated with Predicted Probability of Success Criterion: Final Course Grade of C or Higher in Math-096 Using ACCUPLACER Scores	
Probability of Success	ACCUPLACER Elementary Algebra Only
0.95	111
0.90	93
0.85	82
0.80	73
0.75	66
0.70	60
0.65	55
0.60	50
0.55	45
0.50	40
0.45	35
0.40	30
0.35	25
0.30	
0.25	
0.20	
0.15	
0.10	
0.05	

A composite predictor could not be produced for this course at this level of success.

Cut Scores Associated with Predicted Probability of Success Criterion: Final Course Grade of B or Higher in Math-096 Using ACCUPLACER Scores	
Probability of Success	ACCUPLACER Elementary Algebra Only
0.95	
0.90	
0.85	115
0.80	106
0.75	99
0.70	93
0.65	87
0.60	82
0.55	77
0.50	72
0.45	67
0.40	61
0.35	56
0.30	50
0.25	44
0.20	37
0.15	28
0.10	
0.05	

A composite predictor could not be produced for this course at this level of success.

Cut Scores Associated with Predicted Probability of Success Criterion: Final Course Grade of C or Higher in MATH-102-105-140-155 Using ACCUPLACER Scores		
Probability of Success	ACCUPLACER Elementary Algebra Only	ACCUPLACER College-Level Math Only
0.95		70
0.90	111	51
0.85	98	39
0.80	88	30
0.75	80	23
0.70	73	
0.65	67	
0.60	61	
0.55	55	
0.50	50	
0.45	44	
0.40	38	
0.35	32	
0.30	26	
0.25		
0.20		
0.15		
0.10		
0.05		

A composite predictor could not be produced for this course at this level of success.

Cut Scores Associated with Predicted Probability of Success Criterion: Final Course Grade of B or Higher in MATH-102-105-140-155 Using ACCUPLACER Scores			
Probability of Success	ACCUPLACER Elementary Algebra Only	ACCUPLACER College-Level Math Only	Composite Predictor
0.95		118	2.94
0.90		97	2.20
0.85		83	1.73
0.80		73	1.39
0.75	116	64	1.10
0.70	112	57	0.85
0.65	109	50	0.62
0.60	106	44	0.41
0.55	102	38	0.20
0.50	99	32	0.00
0.45	96	26	-0.20
0.40	93	20	-0.41
0.35	90		-0.62
0.30	86		-0.85
0.25	82		-1.10
0.20	78		-1.39
0.15	73		-1.73
0.10	65		-2.20
0.05	54		-2.94

The following model(s) can be used to calculate the composite predictor shown in the table above.

Model Number 1 = -4.86062 + (0.03681) × ACCUPLACER Elementary Algebra + (0.02929) × ACCUPLACER College-Level Math

Section 5: Following up on your placement decisions

It is important to review the results of your placement decisions. *The Code of Fair Test Practices in Education*, prepared by the Joint Council on Testing Practices, asks that test-users follow up such decisions with two actions:

- Explain how passing scores were set.
- Gather evidence to support the appropriateness of the cut scores.

Copies of *The Code of Fair Test Practices in Education* can be obtained from the National Council on Measurement in Education, 1230 17th Street NW, Washington, D.C. 20036.

This report provides much of the documentation needed to explain how the cut scores were set. It is important, however, to document the decisions required when interpreting the report and making the final cut score decision. Your documentation should explain the criterion used for the predicted probability of success tables.

While every attempt has been made to give accurate and complete information, the decisions made at each step of the process, such as the ability of the results to be generalized, the set of predictor variables used, and so on, can only be made with the information available. Sometimes the results of a placement study, despite the best intentions of all parties involved, have unintended or unexpected results. It is important to collect information on the effects of your placement decisions so that any unexpected consequences can be identified and remedied. Such information might include the proportion of test-takers who pass the course, the characteristics of students who take placement tests as opposed to entering the course after the prerequisite course(s), and pass/fail results for selected groups of test-takers.

The ACES staff is available to assist you with any questions you may have about your study. In addition, the complete statistical output is available on request. To contact the ACES staff:

- Call 609 683-2255, or
- E-mail aces@info.collegeboard.org.

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