



ACT COMPASS:
NUMERICAL SKILLS/PRE-ALGEBRA TEST
ALGEBRA TEST

APPLICATION FOR RENEWAL AS A LOCALLY
MANAGED TEST

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Santa Monica College (SMC) is hereby submitting a request to continue to locally manage the COMPASS Pre-Algebra and Algebra test whose probationary approval as a second party assessment instrument by the California Community College Chancellor’s Office expired in the past year.

SMC uses the COMPASS computer-adaptive college placement tests, developed and published by ACT, to assess students’ math skills. All students taking the COMPASS exams are initially exposed to the Pre-algebra test, and depending on their performance they are then either stopped (and recommended for placement into elementary algebra math course) or routed to the more difficult Algebra test.

The Pre-Algebra test is used to place students into one of three courses, MATH 81: Basic Arithmetic, MATH 84: Pre-Algebra and MATH 31: Elementary Algebra. MATH 81 is open to any student regardless of their test scores, and is the lowest math course available at the college.

The Algebra test is used to place students into two different levels of math, each of which provides students the choice to enroll in a selection of courses. The table below breaks down the two levels and options available for students.

Placement Levels for Algebra Test	
Score Range	Placement Course Options
0-38	Routed back to Pre-Algebra Placement
39-49	MATH 20: Intermediate Algebra MATH 32: Plane Geometry MATH 18: Intermediate Algebra for Statistics and Finite Mathematics
50-100	MATH 21: Finite Mathematics MATH 26: Functions and Modeling for Business and Social Science MATH 41: Mathematics for Elementary Teachers MATH 54: Elementary Statistics

The purpose of the current report is to establish whether the COMPASS Pre-Algebra and Algebra tests accurately and fairly places students in the appropriate math courses at SMC. The college has conducted or plans to conduct various studies to validate the assessment instruments. The current report summarizes the findings of completed studies (reliability, test bias, content validity, and disproportionate impact) and describes plans for future studies (consequential and criterion validity).

CONTENT VALIDITY

During the spring 2012 semester faculty teaching the reviewed courses were asked to evaluate the extent to which the items on the Pre-Algebra and Algebra tests measure the prerequisite/entry knowledge and skills in the approved math courses. Instructors were provided with ACT COMPASS sample questions (14 for Pre-Algebra and 16 for Algebra) and were directed to measure the extent to which they believed that the academic skills or knowledge measured by the items were important for successful acquisition of the skills taught in the specified course. They were given the option to mark “critically important”, “important”, “moderately important”, “slightly important” and “not relevant” for each item.

The surveys were sent out and completed by five faculty in the math department that are teaching, or have taught courses that use the Pre-Algebra and Algebra test for placement.

In the tables below, the results of the survey are aggregated by course. Each of the different items is categorized by a value, with “critically important” being a value of “5,” and “not relevant” a value of “1”. The average score for each item is in the last column, with the average score per course in the last row.

Pre-Algebra Item Number	MATH 81 Average	MATH 84 Average	MATH 31 Average	Item Average
1	2.8	4	4.4	3.7
2	2.6	4	4.6	3.7
3	2.2	3.2	4.2	3.2
4	2	3.4	4.4	3.3
5	1.8	3	4.2	3.0
6	2	3	4.2	3.1
7	1.6	1.8	3.2	2.2
8	1.6	1.8	3	2.1
9	2.2	3.8	4.4	3.5
10	1.6	3.2	3.4	2.7
11	2.2	3.4	4.2	3.3
12	2	3.2	3.8	3.0
13	2	2.8	4	2.9
14	2	3	3.8	2.9
Average per Course	2.0	3.1	4.0	

Of the 14 items faculty were asked to evaluate, five had an average score under “3”, or “moderately important”. No test items averaged a score for all three courses in the “Not Relevant at all” range.

The average score per test, the last row in the column, shows that faculty rated the importance of the test items higher for MATH 31 than the two lower courses. MATH 81 averages the lowest overall score, with a “2.0” which is in the “Slightly Important” range. Since this is the lowest class offered at the college, and students can enroll in it without assessing, the score is considered acceptable.

Algebra Item Number	MATH 20 Average	MATH 32 Average	MATH 18 Average	MATH 21 Average	MATH 26 Average	MATH 41 Average	MATH 54 Average	Item Average
1	4.6	4.2	4.6	4.4	4.8	4.6	4.4	4.5
2	2.8	2.2	2.6	3.4	3.4	3.8	3.4	3.1
3	4.2	3.8	4.0	4.4	4.2	4.2	4.2	4.1
4	3.8	3.6	3.8	4.6	3.8	3.8	3.8	3.9
5	4.8	4.4	4.6	4.6	4.4	4.4	3.8	4.4
6	4.6	4.6	4.6	4.4	4.4	4.4	3.8	4.4
7	4.6	4.4	4.4	4.6	4.8	4.6	4.2	4.5
8	4.4	4.4	4.4	4.4	4.8	4.6	4.2	4.5
9	4.8	4.8	4.8	4.6	5.0	4.4	4.0	4.6
10	4.8	4.6	4.8	4.6	4.6	4.2	4.2	4.5
11	4.6	4.4	4.6	4.4	4.6	4.2	4.4	4.5
12	3.6	3.0	3.6	4.2	4.4	3.2	3.8	3.7
13	4.4	4.0	4.4	4.4	4.4	4.0	4.2	4.3
14	3.6	3.4	3.8	4.4	4.4	3.8	4.4	4.0
15	4.6	4.6	4.6	4.4	4.6	4.4	4.8	4.6
16	4.2	4.6	4.0	3.8	4.0	4.0	3.8	4.1
Average per Course	4.3	4.1	4.2	4.4	4.4	4.2	4.1	

Faculty rated the majority of the items in the Algebra sample as “Important”, with only three items averaging a score in the “Moderately Important” range. The average ratings per course were all in the “Important” range. Based on the results, the faculty believed that the academic skills or knowledge measured by the Algebra items were important for successful acquisition of the skills taught in the specified courses.

RELIABILITY INFORMATION

INTERNAL CONSISTENCY

Although reliability estimates for computer adaptive testing cannot be calculated with conventional formulas due to different items being presented to individuals with variant abilities, marginal reliability coefficients are calculated for these tests by taking into account individual student variation and performance on the test. To calculate a final **internal consistency** reliability estimate, individual reliabilities are averaged across examinees. Reliability estimates presented herein are based on approximately 100,000 test administrations reported by the test publisher in their technical manual.

As a computer adaptive test, it is possible to administer tests of different lengths; therefore, the test publisher carried out test administrations of three lengths: Standard, Extended, and Maximum. Reliability estimates were then calculated for each of these as depicted in the table below. Individual colleges select the administration mode they deem appropriate. Santa Monica College utilizes the “maximum” administration mode to achieve better placement. Internal consistency coefficients fall within commonly accepted ranges (.80s and .90s).

Test Length Options and Corresponding Reliability Estimates for COMPASS Tests						
Test	Standard Administration		Extended Administration		Maximum Administration	
	Average Test Length	Reliability	Average Test Length	Reliability	Average Test Length	Reliability
Pre-Algebra	10.3	0.85	13.4	0.88	14.9	0.90
Algebra	9.7	0.86	13.2	0.89	14.9	0.90

STANDARD ERROR OF MEASUREMENT

The standard errors of measurement (SEM) are presented below at 5-point intervals throughout the score scale for the COMPASS tests. The SEMs are based once again on over 100,000 standard length test administrations reported by the publisher in their technical manual.

Conditional Standard Errors of Measurement for the COMPASS Trigonometry Test		
Score	Pre-Algebra: SES	Algebra: SES
25	7.3	6.8
30	8.3	7.9
35	8.8	8.7
40	9.1	9.6
45	9.2	10.2
50	9.4	10.5
55	9.0	10.6
60	8.7	10.5
65	8.7	10.3
70	8.2	10.3
75	7.9	9.6
80	7.0	9.0
85	5.9	7.7
90	4.8	6.2

TEST BIAS

ITEM DEVELOPMENT PROCEDURES FOR PLACEMENT TEST

The item development procedures for the Pre-Algebra and Algebra placement test as reported by the test publisher in their technical manual are as follows.

Items submitted by item writers were internally reviewed for fairness, content, accuracy and general quality of composition by ACT staff. This was followed by an external review for soundness and fairness (sensitivity) by ACT commissioned consultants. This involved content review of each item by experts, who were mostly teachers in Mathematics. Thereafter, ACT formed a five-member panel made up of one person each from five ethnic groups and interests, namely, African Americans, Asian Americans, Latino/Latina Americans, Native Americans, and Women. The panel also examined the items for fairness and soundness. After a review of the items by individual panel members, a teleconference was organized by ACT to enable the panelists to discuss their findings. On this basis, some items were chosen for further consideration.

Following this was the formation of five panels (made up of five members each), consisting of the same ethnic groups, to judge the items chosen. Each of the panels reviewed 234 items for the Pre-Algebra test and 235 items for the Algebra test. On the panels' recommendations, some items were edited, while the ones found extremely unsound and /or biased were dropped. The resulting changes left users with the revised item pool.

Differential Item Functioning (DIF) analyses were also performed for each of the items. These were to compare the performance of a focal (minority) group against a matched base or referent (majority) group. Here, ACT used the Mantel-Haenzel Common-Odds ratio (MH or MH index) as the statistical index for performing the DIF analyses.

The results of the DIF for Pre-Algebra are summarized in the table below.

Comparison Group		Items Reviewed	Mantel-Haenzel Values*			Focal Group Sample Size		
Focal Group	Referent Group		A	B	C	Min.	Max.	Med.
Female	Male	122	1	120	1	424	56,552	14,866
African Americans/Black	Caucasian	117	1	114	2	150	17,335	2,835
Mexican American/Chicano American/Latino/Puerto-Rican/Cuban, Other Hispanics	Caucasian	107	0	106	1	150	5,563	1,518
Asian Americans/pacific Islanders/Filipinos	Caucasian	105	2	99	4	218	2,349	881

*** Legend:**

A = Items with Mantel-Haenzel values of less than .5, therefore favoring the focal group.

B = Items with Mantel-Haenzel values between .5 and 2.0, therefore judged to favor no group.

C = Items with Mantel-Haenzel values exceeding 2.0, therefore judged as favoring the referent group

A total of 451 comparisons were made, of which 12 (3%) were flagged with MH values that exceeded the criteria. Eight of the flagged comparisons favored the base group and the other 4 favored the focal group. Although a precise confidence level for the Mantel-Haenszel statistic is not known, experience led them to expect that chance alone will dictate that roughly 5% of all items will fall into the A and C categories even when no DIF is present.

The 12 flagged comparisons (involving 12 items) were reviewed. Three items received at least one comment and were submitted to additional examination and discussion. For 1 of the 3 items, the possibility of bias was deemed sufficient for one or more groups, and the determination was made to delete this item (and any related stimulus materials as appropriate) from the pool.

The results of the DIF for Algebra are summarized in the table below.

Comparison Group		Items Reviewed	Mantel-Haenzel Values*			Focal Group Sample Size		
Focal Group	Referent Group		A	B	C	Min.	Max.	Med.
Female	Male	98	0	98	0	227	55,251	10,335
African Americans/Black	Caucasian	84	0	84	0	185	18,520	1,683
Mexican American/Chicano American/Latino/Puerto-Rican/Cuban, Other Hispanics	Caucasian	74	0	74	0	167	5,652	1,288
Asian Americans/pacific Islanders/Filipinos	Caucasian	77	1	75	1	162	3,616	1,161

A total of 333 comparisons were made, of which 2 (1%) were flagged with MH values that exceeded the criteria. One of the flagged items favored the focal group, and the other item favored the base group. These results are consistent with chance. The 2 flagged items were reviewed and no plausible rationale was found for the pattern of results obtained and the items were allowed to remain in the Algebra item pool.

In view of the foregoing, we are not in doubt that ACT followed acceptable procedures to ensure that the items in the placement test pool are sound and free of cultural bias.

CUT SCORE VALIDATION

SMC has been using the COMPASS Trigonometry test for approximately ten years. The initial cut scores were based on normed data obtained from the publisher and professional judgment from our math faculty. Pre-Algebra cut scores were validated and have remained constant based on studies done in 2004, 2007 and in 2008. Algebra cut scores have remained the same over the last two studies done in 2007 and 2008.

A high level overview of the success rates for students in courses that use the Pre-Algebra and Algebra tests was completed in spring 2012. Course grade information was collected for all fall and spring terms during the calendar years 2009-2011.

The table below contains two different cohorts, those students who used their placement scores to enter a course, who successfully completed (a grade of A,B,C or P) the pre-requisite course.

Placement Course Level	Used Placement Score to Enroll in Course	Enrolled by Successfully Completed Prerequisite Course	Difference
MATH 81	45.0%	45.0%	0.0%
MATH 84	50.9%	48.0%	3.0%
MATH 32	49.6%	47.8%	1.7%
Pre-Algebra Total	48.0%	47.6%	0.5%
			0.0%
MATH 20, 32	55.3%	48.1%	7.2%
MATH 21,26,41,54	49.3%	57.5%	-8.2%
Algebra Total	52.9%	53.6%	-0.7%

Students that used the Pre-Algebra and Algebra exams had success rates nearly identical to students that successfully completed the pre-requisite courses. A more complex analysis was conducted using these term grades and test scores. While the relationships were found to be statistically significant, the validity coefficients did not meet the accepted level of 0.35.

In order to meet the criterion and consequential validity standards set forth by the Chancellor's office, there will be surveys administered to faculty and students during the fall 2012 semester. Students will be asked to evaluate their preparedness for their math course, and whether they feel they have been correctly placed. Faculty will be asked to supply mid-term grades for students, and to evaluate if they are adequately prepared for the course work.

IMPACT OF TESTING

In accordance with Title 5 and Matriculation regulations, a disproportionate impact study was conducted in to assess the rate of placement for impacted groups (gender, ethnicity, age, non-native English speakers) into courses currently accessible through the CCDT placement exam. In order to evaluate the extent of disproportionate impact, the 80% guideline established by the EEOC's *Uniform Guidelines for Selection Procedures* was utilized as stipulated by the California Community Colleges Chancellor's Office. According to this guideline, the ratio between the *minority* placement rates over the *majority* rate should be greater than 80% to demonstrate that disproportionate impact does not exist. If the resulting ratio is less than 80%, there is sufficient evidence of disproportionate impact. When this is the case, Title 5, Section 55512 delineates the proper procedure to remedy this situation.

To assess disproportionate impact, variables studied were broken down by *minority* and *majority* subgroups. For example:

- **Gender:** females are considered the impacted or *minority group* and males, the non-impacted or *majority group*.
- **Ethnicity:** African American, Asian and Latinos constitute the *minority group*; White students the *majority group*.
- **Age:** Students over the age of 22 constitute the *minority group*; those age 22 and under, the *majority group*;
- **Language:** Study not conducted as Santa Monica College no longer collects this information.
- **Disability:** Study not carried as there were too few self-identified disabled students.

DEMOGRAPHIC CHARACTERISTICS OF THE SAMPLE

The sample for the disproportionate impact study consisted of 10,784 students who took the Pre-Algebra and Algebra tests from January 1, 2010 to March 5, 2011; the most recent date assessment information is available. The college uses the Pre-Algebra test to place students into three different course levels, MATH 81, MATH 84, and the highest Pre-Algebra level, MATH31. Once they are routed to the Algebra test, students may place at the MATH 20 and 32 level or the MATH 21, 26, 41, and 54 level.

Placement Recommendation by Gender

Cohort Group	MATH 81	MATH 84	MATH 31	MATH 20,32	MATH 21,26,41,54	Total Eligible (100%)
Females	37.8%	20.4%	11.9%	11.1%	18.8%	5,591
Males	30.3%	17.0%	19.1%	11.5%	22.1%	5,193
80% of the Placement for Male Students	24.2%	13.6%	15.3%	9.2%	17.7%	10,784

In assessing disproportionate impact for gender, the minority group was female students. There was no evidence for disproportionate impact in the two lower levels of the Pre-Algebra test (MATH 81, 84), but some for the highest level, MATH 31. This is mitigated by the fact that the next level in the adaptive test is MATH 20 or MATH 32, in which there is no evidence of disproportionate impact for females.

Placement Recommendation by Ethnicity

In assessing disproportionate impact for ethnicity, the minority or impacted groups were African American/Black, Asian/Pacific Islander and Latino students.

Cohort Group	MATH 81	MATH 84	MATH 31	MATH 20,32	MATH 21,26,41,54	Total Eligible (100%)
Asian/Pacific Islander	17.1%	13.7%	13.3%	13.7%	42.1%	881
Black	57.3%	19.9%	10.4%	5.5%	6.9%	905
Hispanic	47.1%	22.1%	10.6%	9.5%	10.7%	2,408
White	25.0%	17.6%	25.6%	12.3%	19.4%	2,025
80% of the Placement for White Students	20.0%	14.1%	20.5%	9.9%	15.5%	6,219

While on initial viewing, there seems to be disproportionate impact in regards to Asian/Pacific Islander students in the Pre-Algebra test, specifically MATH 81, MATH 84 and MATH 31, this is mitigated by the fact that the majority are placing into higher level math courses. They place above the 80% threshold in both levels of the Algebra exam.

On the other hand, there is some evidence of disproportionate impact in regards to Black and Hispanic students. Hispanic students do not make the 80% threshold at the highest level of the Pre-Algebra exam, MATH 31. They are less than 1% below in the lowest level of Algebra, and do not meet the threshold for the MATH 21,26,41,54 level.

Placement Recommendation by Age

Cohort Group	MATH 81	MATH 84	MATH 31	MATH 20,32	MATH 21,26,41,54	Total Eligible (100%)
20 and under	34.2%	19.6%	13.4%	12.0%	20.8%	8,444
21 and older	33.9%	15.8%	22.6%	8.6%	19.1%	2,340
80% of the Placement for 20 and under Students	27.4%	15.7%	10.7%	9.6%	16.6%	10,784

Students in the 21 and older group do not meet the 80% threshold only at the lowest level of the Algebra exam, MATH 20 and 32. They do meet it for the higher levels, therefore providing evidence that there is not a disproportionate impact based on age.

Overall Disproportionate Impact Assessment

This study revealed that disproportionate impact on COMPASS Pre-Algebra and Algebra placement exists for impacted groups. Specifically, more Black and Hispanic students fail to test into the highest level for each test. In addition to a more comprehensive analysis of student and faculty perception of placement, a review of the methods and actions taken to help change the impact on other minority groups will be reviewed and shared with staff and faculty in both the math and counseling departments in order to address the lack of Black and Hispanic students assessing at higher levels of math.

ADA COMPLIANCE & ACCOMMODATION

Santa Monica College is well known throughout the State of California for possessing an outstanding Center for Students with Disabilities. All students with documented disabilities are entitled to receive approved modifications, appropriate academic adjustments, or auxiliary aids that will enable them to participate in, and have the opportunity to benefit from all educational programs and activities provided by the college. The Assessment Center has worked with appropriate personnel to ensure that students with given disabilities are granted accommodations to which they may be entitled. In the case of COMPASS, accommodations range from using 21” monitors accompanied by Zoom Text software to magnify portions of the screen to using a projector to further increase the size of the entire screen. Additionally, when necessary, readers are provided to read items to students and to “click” on their responses while taking the test. Additional accommodations are provided as students’ needs necessitate and often arranged in concert with the Center for Students with Disabilities.

Appendix A:

Request for Approval Form

Revised, January 2004

Chancellor's Office
California Community Colleges
Request for Approval for the Use or Renewal of a Performance Assessment or Locally
Constructed or Managed Test

Directions: Provide all requested information. Attach additional pages as needed. Note that this form is to be signed by the identified individuals of the college and submitted with supporting material. When requested, indicate which Standards' areas have been investigated or addressed and those areas not as yet addressed. **Note: Studies addressing all of the Standards' areas need not be completed in order to request approval of an instrument.** The minimum requirements are that you provide at least one type of validity evidence and that the test bias standard be addressed. If information exists in a technical report or other sources, summarize the information for this report and draw conclusions from the information on whether you feel a specific standard has been met at a minimal level for your instrument. Submission of extended reports or exhaustive documentation evidence to support your claims is not required or desired for review of this request.

1. Identify the test with its complete title: _____
COMPASS Numerical Skills/PreAlgebra Test _____
COMPASS Algebra Test _____

2. For which course(s) is this test used to assist with the placement of students? Please identify:
PreAlgebra: MATH81,84,31
Algebra: Math 20,32,21,26,41,54

3. Have there been investigations of the validity of the use of scores obtained from this test? (If your response is no to this question, do not submit this request until some validity evidence is available.)

_____ YES, all required studies have been completed. Attach a brief narrative that summarizes the procedures and findings from all such investigations.

✓ YES, but not all required studies have been completed. Attach a brief narrative that summarizes the procedures and findings from all such investigations.

✓ Projected completion date for required studies not completed: __12/2013__

4. Have there been investigations of the reliability of scores obtained from this test?

YES. Attach a brief narrative that summarizes the procedures and findings from all such investigations.

NO. Projected completion date: _____

5. Have there been investigations of test bias? (If your response is no to this question, do not submit this request until some test bias evidence is available.) Note also that the required evidence may be different depending on whether this is an initial or renewal request for an instrument.

YES. Attach a brief narrative that summarizes the procedures and findings from all such investigations.

6. Have there been investigations of the adequacy of the cut or placement score(s) used with this test?

YES. Attach a brief narrative that summarizes the procedures and findings from all such investigations.

NO. Projected completion date: _____12/2013_____

7. Have there been investigations planned (for first-time submissions) or conducted (for renewal) of disproportionate impact in those courses that rely on this test to assist in placement decisions?

YES. Attach a brief narrative that summarizes the procedures and findings from all such investigations.

NO. Projected completion date: _____

There is documented evidence in the appropriate college or district office to support the adequacy, suitability and usefulness of this test to provide fair and equitable course placement information to our students as described in the California Community College Standards. At a minimum, evidence from at least one validity study (content, criterion-related or consequential) and bias study must be sufficient to support the continued use of the instrument for placement advisement.

NOTICE: Locally Managing a Second Party Test

The California Community Colleges Chancellor's Office assumes that the local college has received authorization from the publisher for use of this test as a locally managed, second party test.

College Superintendent/President

Date

College Assessment Officer

Date

College Research Officer

Date

College Subject Discipline Faculty/Chair

Date