

El Camino College

Math Validation Study

Fall 2013



This report provides analysis of placements and outcomes in Math to determine whether the cut scores from the Math Placement Test is set appropriately for these courses. All courses included in this analysis are below transfer-level Math and are taken for a letter grade with the exception of Math-37. Three courses, Math-12, Math-23, and Math-37 are Basic Skills Math courses and while four courses, Math-40, Math-67, Math-73 and Math-80, are college-preparatory course. Math-12 (*Basic Arithmetic*) is a 3-unit credit, non-degree applicable Math course that is four levels below transfer-level Math. Math-23 (*Pre-Algebra*) is a 3-unit credit, non-degree applicable math course that is three levels below transfer-level Math. Students placing in either Math-12 or Math-23 had the option of enrolling into Math-37 (*Basic Accelerated Mathematics*) a 5-unit credit, degree applicable math course that is two levels below transfer-level Math. Math-40 (*Elementary Algebra*) is a 4-unit credit, degree applicable Math course that is two levels below transfer-level Math. Math-73 (*Intermediate Algebra for General Education*) is a 5-unit credit, degree applicable Math course that is one-level below transfer-level Math. Math-80 (*Intermediate Algebra for Science, Technology, Engineering, Mathematics*) is a 5-unit credit, degree applicable Math course that is one-level below transfer-level Math.

Table 1
Math Courses Included in this Study

Course	Course Subject	Levels Below Transfer-Level Math	Required Arithmetic Score	Required Algebra Score
Math-12	<i>Basic Arithmetic</i>	4	0-40	-
Math-23	<i>Pre-Algebra</i>	3	42-69	-
Math-37	<i>Basic Accelerated Mathematics</i>	2	0-69	-
Math-40	<i>Elementary Algebra</i>	2	74-120*	45-69*
Math-73	<i>Intermediate Algebra for General Education</i>	1	-	70-120
Math-80	<i>Intermediate Algebra for Science, Technology, Engineering, Mathematics</i>	1	-	70-120

*Math-40 requires both test scores to be in the indicated range to be placed in the course.

Sections from both the El Camino Torrance Campus and Compton Center were surveyed. At the Torrance Campus, 41 of the 60 sections fully completed the surveys (68% response rate), and 56 of the 60 sections at Compton Center fully completed the surveys (93 % response rate). Faculty members were asked to evaluate their students in the first half of the term to assess how well the assessment test placed them into their respective Math courses. Based on early course performance, faculty determined whether each student was placed “too low” (should be

in a higher Math course), “too high” (should be in a lower Math course), or “just right” (correct placement). Students in these courses were asked to rate whether or not they felt they were appropriately placed in the correct Math course using the same scale as the faculty. These surveys produced a total of 944 individual ratings (498 from the Torrance Campus and 446 from the Compton Center). Combining the surveys with college records, success rates and disproportionate impact analysis were calculated.

Cut Score Analysis

To determine whether or not cut scores continue to be set at appropriate levels, success rates in each course were calculated. These success rates were calculated using grades from the students who participated in the validation survey. The following table shows the success rates of each course including all students, then divided by campus location. The majority of the courses surveyed had a majority of their students successfully pass their respective courses. However, at Compton Center, Math-37 and Math-40 success rates fell below 50% (25% and 45.8%, respectively) and a majority did not pass the course. Overall, Compton Center had a 65% success rate for courses in this study while El Camino College had a 66.7%. The overall success rate for the combined campuses was 65.9%.

Table 2
Student Success Rates

Course	Total	El Camino College	Compton Center
Math 12	65.9%	67.1%	64.8%
Math 23	77.2%	62.9%	90.5%
Math 37	68.6%	81.5%	25.0%
Math 40	53.7%	64.7%	45.8%
Math 73	63.5%	70.7%	57.4%
Math 80	58.5%	61.1%	53.1%
Total Success Rate	65.9%	66.7%	65%

*Success rate is defined as the percentage of students earning an A, B, C or P grade out of all students enrolled in the course.

In addition to success rates, faculty rated if each of their students were appropriately placed in their respective courses. The following table shows how many students were in each course and the percentage of students who were rated by faculty as being appropriately placed or misplaced. Overall, faculty felt the majority of students were appropriately placed (73.0%). When comparing the two campuses, there is a discrepancy in regards to the percentage of students who should have been placed lower in Math-23 – faculty at the Compton Center rated 3.2% of the students to have been placed too high compared to the 24.7% of students at the Torrance Campus. Additionally, faculty at the Compton Center rated 29.4% of Math-73

students as having placed too high compared to the 19.0% at the Torrance Campus. Also notable is the high percentage of overall students (97.1%) in Math-37 whose faculty indicated they were placed appropriately.

There was a course, Math-12, where there was a high percentage of students (20.7%) who instructors felt should have been placed higher. The assessment scores of these students showed a wide range of test scores – they were not clustered near the cut scores. Therefore, lowering cut scores would not assist all students who faculty thought should've been placed higher. However, this finding could support the need for alternative assessment measures to appropriately place all students.

Table 3
Faculty Ratings - Fall 2013

Course	Both Campuses				El Camino College				Compton Center			
	<i>n</i>	Appropriate Placement	Should be Placed Lower	Should be Placed Higher	<i>n</i>	Appropriate Placement	Should be Placed Lower	Should be Placed Higher	<i>n</i>	Appropriate Placement	Should be Placed Lower	Should be Placed Higher
Math 12	328	67.4%	11.9%	20.7%	149	63.1%	7.4%	29.5%	179	70.9%	15.6%	13.4%
Math 23	184	79.9%	13.6%	6.5%	89	73.0%	24.7%	2.2%	95	86.3%	3.2%	10.5%
Math 37	70	97.1%	2.9%	0.0%	54	100.0%	0.0%	0.0%	16	87.5%	12.5%	0.0%
Math 40	41	78.0%	12.2%	9.8%	17	76.5%	11.8%	11.8%	24	79.2%	12.5%	8.3%
Math 73	126	69.0%	24.6%	6.3%	58	72.4%	19.0%	8.6%	68	66.2%	29.4%	4.4%
Math 80	195	68.7%	27.2%	4.1%	131	73.3%	22.9%	3.8%	64	59.4%	35.9%	4.7%
Total	944	73.0%	16.4%	10.6%	498	73.1%	15.3%	11.6%	446	72.9%	17.7%	9.4%

Students were also asked to rate whether they were appropriately placed into the Math course they were enrolled in. The majority of students (77.3%) in all Math courses surveyed indicated that they were placed in the right course, while 20.4% of students indicated that they should have been placed in a higher leveled course (23.3% from the Torrance Campus, 17.3% from Compton Center). When compared to faculty ratings, students were less likely to indicate that they should have been placed in a lower course.

Table 4
Student Ratings – Fall 2013

Course	Both Campuses				El Camino College				Compton Center			
	<i>n</i>	Appropriate Placement	Should be Place Lower	Should be Place Higher	<i>n</i>	Appropriate Placement	Should be Place Lower	Should be Place Higher	<i>n</i>	Appropriate Placement	Should be Place Lower	Should be Place Higher
Math 12	328	75.0%	1.8%	23.2%	149	70.5%	0.0%	29.5%	179	78.8%	3.4%	17.9%
Math 23	184	72.3%	0.5%	27.2%	89	68.5%	1.1%	30.3%	95	75.8%	0.0%	24.2%
Math 37	70	88.6%	0.0%	11.4%	54	85.2%	0.0%	14.8%	16	100.0%	0.0%	0.0%
Math 40	41	68.3%	0.0%	31.7%	17	70.6%	0.0%	29.4%	24	66.7%	0.0%	33.3%
Math 73	126	81.7%	4.0%	14.3%	58	79.3%	1.7%	19.0%	68	83.8%	5.9%	10.3%
Math 80	195	81.0%	4.6%	14.4%	131	77.9%	6.1%	16.0%	64	87.5%	1.6%	10.9%
Total	944	77.3%	2.2%	20.4%	498	74.7%	2.0%	23.3%	446	80.3%	2.5%	17.3%

Demographic Breakdown

A disproportionate impact analysis was conducted to examine whether results from the Math placement test impacts certain groups of students differently than others. There is a potential for disproportionate impact on students based on their gender, ethnicity, and age. For each category (gender, ethnicity, and age), data regarding the percentage of students of each subgroup in each course and how each subgroup was divided amongst the courses are reported.

Gender

Tables 5-7 illustrate the percentage of students who identify as male and female for each course. Overall, there are more women than men enrolled in the Math courses in this study (N=545 and N=399, respectively). As the Math courses increase in level, more men outnumber women, making up the majority of the higher leveled courses. An overwhelming 62.1% of students in the lower level Math courses (3 and 4 levels below transfer) are female while men account for 53%, of students in upper level Math course (1 and 2 levels below transfer). This general trend was seen at both campuses.

Table 5
Gender by Course – Both Campuses

Both Campuses						
Gender	Math 12 (N = 328)	Math 23 (N = 184)	Math 37 (N = 70)	Math 40 (N = 41)	Math 73 (N = 126)	Math 80 (N = 195)
Female	66.8%	53.8%	72.9%	31.7%	57.9%	46.2%
Male	33.2%	46.2%	27.1%	68.3%	42.1%	53.8%
Total	100%	100%	100%	100%	100%	100%

Table 6
Gender by Course – Torrance Campus

El Camino College						
Gender	Math 12 (N = 149)	Math 23 (N = 34)	Math 37 (N = 54)	Math 40 (N = 17)	Math 73 (N = 58)	Math 80 (N = 131)
Female	62.4%	50.6%	74.1%	81.3%	53.4%	46.6%
Male	37.6%	49.4%	25.9%	18.8%	46.6%	53.4%
Total	100%	100%	100%	100%	100%	100%

Table 7
Gender by Course - Compton Center

Compton College						
Gender	Math 12 (N = 179)	Math 23 (N = 95)	Math 37 (N = 16)	Math 40 (N = 24)	Math 73 (N = 68)	Math 80 (N = 64)
Female	70.4%	56.8%	60.1%	29.2%	61.8%	45.3%
Male	29.6%	43.2%	39.9%	70.8%	38.2%	54.7%
Total	100%	100%	100%	100%	100%	100%

Taking the same data regarding gender and placement, Tables 8 examined how students belonging to each gender were placed amongst the courses. The majority of female students from both the Torrance Campus (33.7%) and Compton Center (46.8%) were placed in Math-12. The majority of male students from the Torrance Campus were placed in Math-80 (31.5%), while the majority of male Compton Center students were placed in Math-12 (29.9%).

Table 8

Placement by Gender in Math Courses

Course	Both Campuses		El Camino College		Compton Center	
	Female (N = 545)	Male (N = 399)	Female (N = 276)	Male (N = 222)	Female (N = 269)	Male (N = 177)
Math 12	40.2%	27.3%	33.7%	25.2%	46.8%	29.9%
Math 23	18.2%	21.3%	16.3%	19.8%	20.1%	23.2%
Math 37	9.4%	4.8%	14.5%	6.3%	4.1%	2.8%
Math 40	2.4%	7.0%	2.2%	5.0%	2.6%	9.6%
Math 73	13.4%	13.3%	11.2%	11.7%	15.6%	14.7%
Math 80	16.5%	26.3%	22.1%	31.5%	10.8%	19.8%
Total	100%	100%	100%	100%	100%	100%

Age Group

Tables 9-11 show the age make-up of each Math course, first using both campuses' data (Table 9), and then separated by campus (Table 10 and 11). Overall, the majority age group is 17-19 for both campuses followed by the 20-24 age group. However, the disparity in percentage of younger and older students was smaller at the Compton Center.

Table 9

Age by Course - Both Campuses

Both Campuses						
Age	Math 12 (N = 328)	Math 23 (N = 184)	Math 37 (N = 70)	Math 40 (N = 41)	Math 73 (N = 126)	Math 80 (N = 195)
< 17	0.3%	1.1%	0.0%	0.0%	0.0%	0.0%
17-19	51.8%	54.3%	70.0%	41.5%	66.7%	78.6%
20-24	28.4%	26.1%	22.9%	39.0%	25.4%	17.9%
25-29	9.1%	6.0%	1.4%	9.8%	4.0%	2.1%
30-39	6.1%	9.8%	4.3%	9.8%	2.4%	1.0%
40+	4.3%	2.7%	1.4%	0.0%	1.6%	0.5%
Total	100%	100%	100%	100%	100%	100%

Table 10
Age by Course - Torrance Campus

El Camino College						
Age	Math 12 (N = 149)	Math 23 (N = 89)	Math 37 (N = 54)	Math 40 (N = 17)	Math 73 (N = 58)	Math 80 (N = 131)
< 17	0.7%	1.1%	0.4%	0.0%	0.0%	0.0%
17-19	56.4%	58.4%	65.9%	41.2%	63.8%	80.9%
20-24	30.2%	28.1%	24.4%	41.2%	27.6%	15.3%
25-29	6.0%	4.5%	3.8%	0.0%	3.4%	2.3%
30-39	4.0%	7.9%	4.4%	17.6%	5.2%	1.5%
40+	2.7%	0.0%	1.0%	0.0%	0.0%	0.0%
Total	100%	100%	100%	100%	100%	100%

Table 11
Age by Course - Compton Center

Compton Center						
Age	Math 12 (N = 179)	Math 23 (N = 95)	Math 37 (N = 16)	Math 40 (N = 24)	Math 73 (N = 68)	Math 80 (N = 64)
< 17	0.0%	1.1%	0.0%	0.0%	0.0%	0.0%
17-19	48.0%	50.5%	43.8%	41.7%	69.1%	73.4%
20-24	26.8%	24.2%	43.8%	37.5%	23.5%	23.4%
25-29	11.7%	7.4%	0.0%	16.7%	4.4%	1.6%
30-39	7.8%	11.6%	12.5%	4.2%	0.0%	0.0%
40+	5.6%	5.3%	0.0%	0.0%	2.9%	1.6%
Total	100%	100%	100%	100%	100%	100%

Tables 12-14 show how each age group was placed amongst the courses. These tables show where each age group's initial Math skills were placed by course. Overall, the majority of each age group placed in the lowest level Math course, Math-12. The majority of students from each age group from both campuses generally placed the same with one exception, the 17-19 age group. The majority of students in the 17-19 age group (N=573) from the Torrance campus placed into Math-80 while the majority of students from the same age group at Compton Center placed into Math-12, a difference in course transfer level of one and four levels below transfer-level Math, respectively. Students in this age group are also placing differently at the lower level Math-12 course (four levels below transfer-level Math) at each campus. At the Torrance campus, 25.6% of students in this age group place into Math-12 while at Compton Center 35.1% placed into Math-12. Within this age group, there is a slight difference in placement in the one-level below transfer-level Math courses, Math-73 and Math-80, at each campus. Torrance campus students account for 43.6% of students in the 17-19 age group while at Compton Center 38.4% of students account for those placed into these two courses.

Amongst the 20-24 age group, the second highest (N=240), the overall distribution between one and four levels below transfer Math placement is similarly equal. Similar trends are seen at both campuses.

Table 12
Placement by Age in Math Courses – Both Campuses

Both Campuses						
Course	<17 (N = 3)	17-19 (N = 573)	20-24 (N = 240)	25-29 (N = 55)	30-39 (N = 50)	40+ (N = 23)
Math 12	*	29.7%	38.8%	54.5%	40.0%	60.9%
Math 23	*	17.5%	20.0%	20.0%	36.0%	21.7%
Math 37	*	8.6%	6.7%	1.8%	6.0%	4.3%
Math 40	*	3.0%	6.7%	7.3%	8.0%	0.0%
Math 73	*	14.7%	13.3%	9.1%	6.0%	8.7%
Math 80	*	26.7%	14.6%	7.3%	4.0%	4.3%
Total	*	100.0%	100.0%	100.0%	100.0%	100.0%

*Numbers suppressed due to low counts.

Table 13
Placement by Age in Math Courses – Torrance Campus

El Camino College						
Course	<17 (N = 2)	17-19 (N = 328)	20-24 (N = 122)	25-29 (N = 19)	30-39 (N = 22)	40+ (N = 5)
Math 12	*	25.6%	36.9%	47.4%	27.3%	80.0%
Math 23	*	15.9%	20.5%	21.1%	31.8%	0.0%
Math 37	*	12.8%	7.4%	5.3%	4.5%	20.0%
Math 40	*	2.1%	5.7%	0.0%	13.6%	0.0%
Math 73	*	11.3%	13.1%	10.5%	13.6%	0.0%
Math 80	*	32.3%	16.4%	15.8%	9.1%	0.0%
Total	*	100.0%	100.0%	100.0%	100.0%	100.0%

*Numbers suppressed due to low counts.

Table 14
Placement by Age in Math Courses – Compton Center

Compton Center						
Course	<17 (N = 1)	17-19 (N = 245)	20-24 (N = 118)	25-29 (N = 36)	30-39 (N = 28)	40+ (N = 18)
Math 12	*	35.1%	40.7%	58.3%	50.0%	55.6%
Math 23	*	19.6%	19.5%	19.4%	39.3%	27.8%
Math 37	*	2.9%	5.9%	0.0%	7.1%	0.0%
Math 40	*	4.1%	7.6%	11.1%	3.6%	0.0%
Math 73	*	19.2%	13.6%	8.3%	0.0%	11.1%
Math 80	*	19.2%	12.7%	2.8%	0.0%	5.6%
Total	*	100.0%	100.0%	100.0%	100.0%	100.0%

*Numbers suppressed due to low counts.

Ethnicity

Tables 15-17 show the ethnic make-up of each course surveyed. Overall, the majority ethnic group in every Math course was Hispanic, followed by African Americans (except in Math-40).

Table 15

Ethnicity by Course – Both Campuses

Both Campuses						
Ethnicity	Math 12 (N = 328)	Math 23 (N = 184)	Math 37 (N = 70)	Math 40 (N = 41)	Math 73 (N = 126)	Math 80 (N = 195)
African American	30.8%	21.2%	22.9%	7.3%	16.7%	14.4%
American Indian/ Alaskan Native	0.0%	0.0%	0.0%	0.0%	0.8%	0.0%
Asian	2.7%	6.0%	4.3%	7.3%	8.7%	13.3%
Hispanic	60.7%	65.2%	64.3%	73.2%	62.7%	57.9%
Pacific Islander	0.6%	0.0%	0.0%	2.4%	0.8%	0.0%
White	3.0%	3.8%	7.1%	9.8%	6.3%	11.8%
2 or more	1.8%	3.8%	1.4%	0.0%	3.2%	2.1%
Unknown or declined	0.3%	0.0%	0.0%	0.0%	0.8%	0.5%
Total	100%	100%	100%	100%	100%	100%

Table 16

Ethnicity by Course – Torrance Campus

El Camino College						
Ethnicity	Math 12 (N = 149)	Math 23 (N = 89)	Math 37 (N = 54)	Math 40 (N = 17)	Math 73 (N = 58)	Math 80 (N = 131)
African American	24.8%	16.9%	20.4%	5.9%	10.3%	13.0%
American Indian/ Alaskan Native	0.0%	0.0%	0.0%	0.0%	1.7%	0.0%
Asian	4.0%	9.0%	5.6%	17.6%	19.0%	19.1%
Hispanic	61.7%	61.8%	63.0%	47.1%	53.4%	49.6%
Pacific Islander	0.0%	0.0%	0.0%	5.9%	0.0%	0.0%
White	5.4%	5.6%	9.3%	23.5%	13.8%	16.0%
2 or more	3.4%	6.7%	1.9%	0.0%	1.7%	1.5%
Unknown or declined	0.7%	0.0%	0.0%	0.0%	0.0%	0.8%
Total	100%	100%	100%	100%	100%	100%

Table 17

Ethnicity by Course – Compton Center

Compton Center						
Ethnicity	Math 12 (N = 179)	Math 23 (N = 95)	Math 37 (N = 16)	Math 40 (N = 24)	Math 73 (N = 68)	Math 80 (N = 64)
African American	35.8%	25.3%	31.3%	8.3%	22.1%	17.2%
American Indian/ Alaskan Native	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Asian	1.7%	3.2%	0.0%	0.0%	0.0%	1.6%
Hispanic	59.8%	68.4%	68.8%	91.7%	70.6%	75.0%
Pacific Islander	1.1%	0.0%	0.0%	0.0%	1.5%	0.0%
White	1.1%	2.1%	0.0%	0.0%	0.0%	3.1%
2 or more	0.6%	1.1%	0.0%	0.0%	4.4%	3.1%
Unknown or declined	0.0%	0.0%	0.0%	0.0%	1.5%	0.0%
Total	100%	100%	100%	100%	100%	100%

Tables 18-20 show the percentage of each ethnic group as they were placed in the various Math courses. Overall, the majority of students who identified as African American or Hispanic placed in Math-12. The majority of Asians and Whites placed in Math-80 and those identified with two or more ethnicities placed into Math-23. Similar trends were found at the two campuses. Generally, the majority of students in each ethnic group placed within one level of transfer-level Math with the exception of African Americans and Hispanics. A majority of African Americans placed into a course that is four levels below transfer-level Math (48.6%) while only 23.6% placed into a course one level below transfer-level Math. Hispanics, though having fairly equal distribution amongst both, placed 34% into a course four levels below transfer-level Math and 32.8% into a course one level below transfer-level Math. These differences were consistent at both campuses.

Table 18

Placement by Ethnicity in Math Courses – Both Campuses

Both Campuses								
Course	African American (N = 208)	American Indian/ Alaskan Native (N = 1)	Asian (N = 63)	Hispanic (N = 586)	Pacific Islander (N = 4)	White (N = 57)	2 or more (N = 22)	Unknown or declined (N = 3)
Math 12	48.6%	*	14.3%	34%	*	18%	27.3%	*
Math 23	18.8%	*	17.5%	20.5%	*	12.3%	31.8%	*
Math 37	7.7%	*	4.8%	7.7%	*	8.8%	4.5%	*
Math 40	1.4%	*	4.8%	5.1%	*	7.0%	0.0%	*
Math 73	10.1%	*	17.5%	13.5%	*	14.0%	18.2%	*
Math 80	13.5%	*	41.3%	19.3%	*	40.4%	18.2%	*
Total	100%	*	100%	100%	*	100%	100%	*

*Numbers suppressed due to low counts.

Table 19

Placement by Ethnicity in Math Courses – Torrance Campus

El Camino College								
Course	African American (N = 87)	American Indian/Alaskan Native (N = 1)	Asian (N = 56)	Hispanic (N = 285)	Pacific Islander (N = 1)	White (N = 51)	2 or more (N = 15)	Unknown or declined (N = 2)
Math 12	42.5%	*	10.7%	32%	*	16%	33.3%	*
Math 23	17.2%	*	14.3%	19.3%	*	9.8%	40.0%	*
Math 37	12.6%	*	5.4%	11.9%	*	9.8%	6.7%	*
Math 40	1.1%	*	5.4%	2.8%	*	7.8%	0.0%	*
Math 73	6.9%	*	19.6%	10.9%	*	15.7%	6.7%	*
Math 80	19.5%	*	44.6%	22.8%	*	41.2%	13.3%	*
Total	100.0%	*	100.0%	100.0%	*	100.0%	100%	*

*Numbers suppressed due to low counts.

Table 20

Placement by Ethnicity in Math Courses – Compton Center

Compton Center								
Course	African American (N = 121)	American Indian/Alaskan Native (N = 0)	Asian (N = 7)	Hispanic (N = 301)	Pacific Islander (N = 3)	White (N = 6)	2 or more (N = 7)	Unknown or declined (N = 1)
Math 12	52.9%	*	*	36%	*	*	*	*
Math 23	19.8%	*	*	21.6%	*	*	*	*
Math 37	4.1%	*	*	3.7%	*	*	*	*
Math 40	1.7%	*	*	7.3%	*	*	*	*
Math 73	12.4%	*	*	15.9%	*	*	*	*
Math 80	9.1%	*	*	15.9%	*	*	*	*
Total	100%	*	*	100%	*	*	*	*

*Numbers suppressed due to low counts.

Conclusion

The study was conducted to re-validate the use of the Math Placement Test. It examines the continuing appropriateness of the established cut scores. The cut scores appear to be set at the appropriate level for the Math courses based on the large majority of Math faculty and students who agreed that the assessment placed students at the appropriate levels.

However, the presence of placement differences based on gender, age, and ethnicity, as well as opinions from instructors who believe that some students were placed inappropriately, hint that alternative assessment methods may be necessary to appropriately place all students.