

# *COLLEGE OF THE CANYONS*

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*Office of Institutional Research, Planning, and Institutional  
Effectiveness*

## **Math Placement Test Cut Score Validation: Fall 2011-Spring 2014**

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## Introduction

Per the requirements of the California Community College Chancellor's Office, the Office of Institutional Research, Planning, and Institutional Effectiveness assessed the validity of Accuplacer cut scores for placement into Math courses at College of the Canyons. California Community Colleges are required to perform several studies related to the validity of assessment tests when using a test from the Chancellor's Office approved list (California Community College Chancellor's Office, 2001). Specifically, content and cut-score validity studies are required every six years and disproportionate impact analyses for various demographic groups (including gender, age, racial, ethnic and disability groups) are required every three years.

## Methods

To conduct the cut score validity analysis, Accuplacer Placement Test data were obtained from College of the Canyons' Management Information System (MIS) Datatel. Placement tests taken between April 1, 2011 and March 30, 2014 for Math (excluding retests) were included in the analysis. Placement data were merged with enrollment data for Math (Fall 2011-Spring 2014). Students were then matched with the grade files.

Three full-time faculty members from the Math Department as well as the Math, Sciences, and Engineering Dean (a former and now current full-time math faculty member) met with researchers January 23 and January 28, 2015 and examined student success in comparison to their scores on the placement tests and made recommendations regarding potential changes to cut scores for MATH-058/059, MATH-075, MATH-060, MATH-070/083, MATH 103/111/130/140, MATH-102, MATH-104/240, and MATH-211. They also recommended cut scores for an advisory message recommending enrollment in new noncredit Math classes for students scoring below a certain level in arithmetic. Cut scores for MATH-025/026 were not discussed because those courses were archived effective Fall 2015 (cut scores would no longer be needed).

Recommendations for changes to cut scores and multiple measures weighting were then presented to the Math department at the Math department meeting held February 5, 2015. After discussion, the recommendations were endorsed by the department for implementation with new students for the Fall 2015 term.

The faculty group met again with researchers on February 24, 2015 to discuss potential adjustments to multiple measures and made additional recommendations for changes to multiple measures questions and weighting to take effect Fall 2015, and the department was updated March 27, 2015.

To perform the analyses, data obtained were analyzed using the Statistical Package for the Social Science (SPSS 2013) and Microsoft Excel (2013).

**Definitions:**

The following definitions are used for success and validity:

- ***Course Success:*** Course success reflects the percent of students successful in courses out of total enrolled in courses: Numerator = Number of students (duplicated) with an A, B, C, CR/P; Denominator = Number of students (duplicated) with an A, B, C, D, F, FW, CR/P, NC/NP, W, I. (This analysis uses the RP Group definition.) (Sources: USX files-CCCCO).
- ***Cut Score Validity:*** Cut score validity assesses the degree to which the cut scores determine in which course the student is most likely to succeed.
- ***Content Validity:*** Content Validity assesses the degree to which the placement items are aligned to the content of courses. For purposes of this study, content validity is delimited to assessing the degree to which there are enough items that assess the content of a course. The degree to which some course content was not assessed was not included in these analyses.

## Results

### Cut Score Validation

The cut score analysis is based on ratings from three full-time Math faculty members in addition to further discussion with the department as a whole. Faculty members examined success rates by score (please see Appendices A-H) and adjusted cut scores with the goal of allowing students who had a 55% likelihood of success to be placed into a course. There was insufficient data to make determinations based on past success rates by test score for MATH-102, MATH-104/240 and MATH-211, but adjustments were made to MATH-102 and MATH 104/240 cut scores based on changes that were made to courses below them in the sequence.

The participants' analyses resulted in recommendations to change cut scores for MATH 058/059, MATH-075, MATH-060, MATH-070/083, MATH-102, MATH-103/111/130/140, and MATH-104/240. No changes were made to cut scores for MATH-211.

Since MATH-058/059 will now be the lowest level credit course, the lower end of the range was adjusted to 20 on both the ARITH and ELEM tests. The upper end of the range for MATH-058/059 was reduced to a score of 49 on ARITH or a score of 51 on ELEM (from 111 on ARITH or 65 on ELEM). For MATH-060 and MATH-075, scores to qualify for those classes were lowered to 50-120 on ARITH or 52-81 on ELEM (from 112-120 on ARITH and 66-87 on ELEM). Scores to qualify for MATH-070, 083, or 075 were also lowered to include scores of 82-120 on ELEM (from 88-120) and scores of 20-53 on CLM.

Scores needed to qualify for MATH-103, 111, 130, or 140, were lowered to include CLM scores from 54-77 (previous score range was CLM 60-69). Scores needed to qualify for MATH-104 or 240 were also lowered to 78-111 on the CLM test (previous score range was CLM 85-111).

The faculty recommended that students scoring 20-34 on the Arithmetic subtest should receive a message advising them to take a Noncredit Arithmetic class either before or concurrently with taking MATH-058/059. The Math Accuplacer cut scores before and after the analysis of the pass rates for each course by test score are shown in Table 1 on the following page.

MATH-025/026 will no longer be offered effective Fall 2015, so revised cut scores were not needed for those courses. Two new noncredit courses in arithmetic (NC.BCSK-MA3 and NC.BCSK-MA4) were developed and will be offered for the first time in Fall 2015.

**Table 1. Cut Scores for Math Accuplacer Placement Tests Before and After the Cut Score Validation Study**

	Previous Score Range			Revised Score Range		
	ARITH	ELEM	CLM	ARITH	ELEM	CLM
<b>MATH-025/026</b>	20-57			N/A		
<b>MATH-058/059*</b>	58-111	20-65		20-49	20-51	
<b>MATH-060 OR 075</b>	112-120	66-87		50-120	52-81	
<b>MATH-070, 083 OR 075</b>		88-120			82-120	20-53
<b>MATH-103, 111, 130 OR 140</b>			60-69			54-77
<b>MATH-102</b>			70-84			54-77
<b>MATH-104 OR 240</b>			85-111			78-111
<b>MATH-211</b>			112-120			112-120

\*Students with ARITH scores 20-34 receive an advisory message recommending NC.BCSK-MA3/MA4.

### **Multiple Measures**

Faculty members also met February 23, 2015 and reviewed the current questions and weighting used as multiple measures to potentially adjust the raw Accuplacer scores before placement. The faculty recommended removing all negative weighting as well as removing the questions relating to parents' education level and time spent on homework.

The faculty recommended retaining questions relating to last completed math class (Intermediate Algebra = +1%, Trigonometry = +2%, Precalculus or Calculus = +3%) and successfully completed AP/Honors Math courses (Yes = +2%). The faculty recommended adding a question regarding overall high school GPA (2.5-2.9 GPA = +2%, 3.0-3.4 GPA = +3%, and 3.5 and above GPA = +4%) and also adding a grade qualification to the question regarding the highest level of mathematics completed with a grade of B- or higher (Elementary Algebra = +1%, Geometry = +1%, Intermediate Algebra = +2%, Trigonometry = +3%, Precalculus = +4%).

The Mathematics department was updated regarding the recommendations for changes to multiple measures for Fall 2015 placements on March 27, 2015. On May 8, 2015, the department agreed that disjunctive multiple measures discussions for future adjustments would continue through the summer.

## Recommendations and Next Steps

Upon review of the results, the following recommendation should be taken into consideration:

- Change the cut scores for MATH-058/059, MATH-075, MATH-060, MATH-070/083, MATH-103/111/130/140, MATH-102, and MATH-104/240 as indicated by the results of the faculty review.
- Provide students scoring 0-32 on the Arithmetic Subtest with an advisory message recommending enrollment in Noncredit Arithmetic either before or concurrently with enrollment in MATH-058/059.
- Change the multiple measures questions and weighting as indicated by the results of the faculty review.
- Continue to discuss the use of disjunctive multiple measures for placement.
- Complete additional analyses, including a disproportionate impact study and the validation of new cut scores once implemented.
- Use these results in combination with other sources of information, such as the Chancellor's Office Common Assessment Initiative and The RP Group's Multiple Measures Assessment Project, to help inform future decisions about placement processes.

### References

Chancellor's Office California Community Colleges. (2001, March). *Standards, policies, and procedures for the evaluation of assessment instruments used in the California Community Colleges*. Retrieved from <http://extranet.cccco.edu/Portals/1/SSSP/Matriculation/Assessment/ApprovedGuidelinesMarch2001.pdf>

## Appendices

### Appendix A – Math 025/026 Success Rates by Score

ARITH Score	Number Tested	Success Rate
20-26	641	42%
20-27	709	43%
20-34	1205	49%
20-37	1389	51%
20-49	1897	55%
20-50	1934	55%
28-37	748	59%
27-57	1487	63%
38-57	739	67%
51-66	323	69%

Note: some cut score bands above overlap, so total for Number Tested exceeds the number of students tested.



**Appendix B – Math 058/059 Success Rates by Score**

ARITH Score	ELEM Score	Number Tested	Success Rate
61-110		460	62%
	22-41	190	59%
	42-43	28	64%
	44-45	40	73%
	46-47	20	65%
	48-49	32	63%
	50-51	49	57%
	52-53	39	62%
	54-55	40	68%
	56-57	20	65%
	58-64	2	100%

**Appendix C – Math 075 Success Rates by Score**

ARITH Score	ELM Score	Number Tested	Success Rate
20-57		42	48%
59-104		63	63%
106-120		13	62%
	21-57	10	50%
	58	11	64%
	59	21	62%
	60	12	42%
	61	15	47%
	62	12	58%
	63	12	42%
	64	12	42%
	65	13	77%
	66	19	53%
	67	16	63%
	68	14	71%
	69	17	71%
	70	8	88%
	71	16	75%
	72	19	63%
	73	16	75%
	74	10	80%
	75	16	69%
	76	13	69%
	77	9	67%
	78	15	80%
	79	13	69%
	80	10	90%
	81	10	50%
	82	8	63%
	83	12	67%
	84-87	14	57%
	88-89	9	67%
	90-91	11	73%
	92-93	10	80%
	94-95	12	83%
	96-97	10	100%
	98-99	10	80%
	100-101	17	88%
	102-103	13	85%
	104-105	13	92%
	106-107	16	81%

**Appendix C – Math 075 Success Rates by Score (continued)**

<b>ARITH Score</b>	<b>ELM Score</b>	<b>Number Tested</b>	<b>Success Rate</b>
	108-109	9	89%
	111-112	7	86%
	113-115	4	50%
	118-120	3	67%

**Appendix D – Math 060 Success Rates by Score**

ARITH Score	ELM Score	Number Tested	Success Rate
20-50		74	42%
51-108		260	57%
109-111		172	62%
112		14	79%
	31-57	52	48%
	58-60	97	46%
	61-62	91	51%
	63-64	90	52%
	65-66	101	53%
	67-68	120	53%
	69-70	115	51%
	71-72	105	63%
	73-74	124	60%
	75-76	103	68%
	77-78	86	74%
	79-80	95	64%
	81-82	66	71%
	83-85	57	63%

**Appendix E – Math 070/083 Success Rates by Score**

ARITH Score	ELEM Score	CLM Score	Number Tested	Success Rate
63-120			51	73%
	82-87		188	51%
	88-89		107	57%
	90-91		105	59%
	92-93		97	53%
	94-95		93	63%
	96-97		87	61%
	98-99		99	67%
	100-101		109	61%
	102-103		103	74%
	104-105		97	73%
	106-107		82	62%
	108-109		62	65%
	110-111		47	70%
	112-113		55	58%
	114-115		32	81%
	116-117		19	58%
		20-32	368	49%
		32-57	879	59%

**Appendix F – Math 103/111/120/130/140 Success Rates by Score**

<b>ELEM Score</b>	<b>CLM Score</b>	<b>Number Tested</b>	<b>Success Rate</b>
85-120		283	54%
	55-56	37	84%
	57-58	53	42%
	59-60	76	54%
	61-62	66	47%
	63-64	29	59%
	65-66	13	46%

**Appendix G – Math 104/240 Success Rates by Score**

<b>ELEM Score</b>	<b>CLM Score</b>	<b>Number Tested</b>	<b>Success Rate</b>
87-120		125	89%
	78-84	55	93%
	85-86	15	60%
	87-88	10	80%
	89-90	8	100%
	91-92	9	89%
	93-94	10	100%
	95-96	7	100%
	97-98	4	75%
	99-100	3	100%
	101-103	4	100%

**Appendix H – Math 102 Success Rates by Score**

<b>ELEM Score</b>	<b>CLM Score</b>	<b>Number Tested</b>	<b>Success Rate</b>
72-120		144	83%
	64-65	14	100%
	66-67	18	83%
	68-69	17	82%
	70-71	27	93%
	72-73	23	78%
	74-75	19	79%
	76-77	11	82%
	78-79	8	75%
	80-81	4	75%