UTAH SYSTEM OF
HIGHER EDUCATION

Building a Stronger State of Minds℠

The following analyses were completed by USHE research analysts using data from students enrolled at all eight USHE institutions whose first math class between Summer 2012-Spring 2015[1] was Math 1010, Math 1030, Math/Stat 1040, or Math 1050.

- Validating Math ACT and Accuplacer for Placement (February 2016)
- Predicting Probability for Success (March 2016)

Along with the studies, input from the following campus groups have helped inform recommendations:

- institutional research staff
- testing directors
- math faculty
- representatives from College Board (Accuplacer licensor).

Recommendations below are based on these studies and conversations.

Findings

Previous term cumulative GPA is two times more predictive than placement test score for Math 1010 and Math 1050.

- 50% of students with a GPA of 3.4 or higher passed Math 1010 and Math/Stat 1040 with a C or better.
- 50% of students with a GPA of 3.7 or better passed Math 1050 with a C or better.
- Students were likely to pass the course with a 3.4 or 3.7 GPA, respectively, at scores lower than current cut scores utilized by many institutions.

Recommendations

- Institutions should consider using multiple measures to place students into math courses, in particular GPA in combination with placement exam.
    - o Accuplacer has a multiple weighted measures function that can assist with this.
- Institutions should consider adjusting ACT Math cut scores, especially if using multiple measures.
- Institutions should adjust how Accuplacer exams are used on their campuses to be in line with how the exams are designed to be used, including:
    - o Utilizing Elementary Algebra for placement into QL courses.
    - o Allowing the use of the calculator function when it is available in the Accuplacer exam.
    - o Revisiting cut scores using institutional data on a three-year cycle.
- Regents should consider developing a policy related to the use of multiple measures to ensure consistent placement decisions at USHE institutions.
- At the request of institutions, OCHE should consider providing training for campus-designated faculty and staff on cut score best practices.

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[1] For Utah State University, data was provided for Spring 2013 through Fall 2015.

Math Placement Scores:
Validating Math ACT and Accuplacer for Placement
February 2016

UTAH SYSTEM OF
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Building a Stronger State of Minds[SM]

This study investigates student placement into math courses and subsequent student success in those courses. This study was done in conjunction with a working group of USHE staff and campus senior administrators working on implementation of SB 196¸*Math Competency Initiative* (2015). Hence, the courses selected for study are those offered as concurrent enrollment courses at most USHE institutions (Math 1010, Math 1030, Math/Stat 1040, and Math 1050).

Students included in this study took any math course that is offered as concurrent enrollment, regardless of whether they were concurrent enrollment students or regular college students. Previous USHE research has shown that there are no statistically significant differences in performance between these two student types.

Study Variables

This study looks at all students, regardless of registration status[1], whose first math class was Math 1010, Math 1030, Math/Stat 1040, or Math 1050 between Summer 2012-Spring 2015[2] at any of the eight USHE institutions. This includes students who took their first math course as a concurrent enrollment student or as a regular college student. Total population studied was 57,572 students.

Student-level variables collected included:
- Course grade
- Gender
- Race/ethnicity
- Previous term cumulative GPA[3]
- Math ACT
- ACT test date
- Accuplacer test score including, if used at the institution,:
    - Accuplacer Arithmetic
    - Accuplacer Elementary Algebra
   - Accuplacer College-Level Math
- Accuplacer test date

A breakdown by institution at an overall system-level percentage of first enrollments in Math 1010, 1030, 1040, and 1050 is provided in the following chart. This includes all students enrolled at course end, regardless of grade earned.

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[1] For example, students may take their first math course as a high school student in concurrent enrollment or as continuing student with senior class standing.
[2] For Utah State University, data was provided for Spring 2013 through Fall 2015.
[3] Not available for students who took math in their first semester at the institution.

Enrollments in Math 1010, 1030, 1040, and 1050 as First Math Class by Institution and Overall
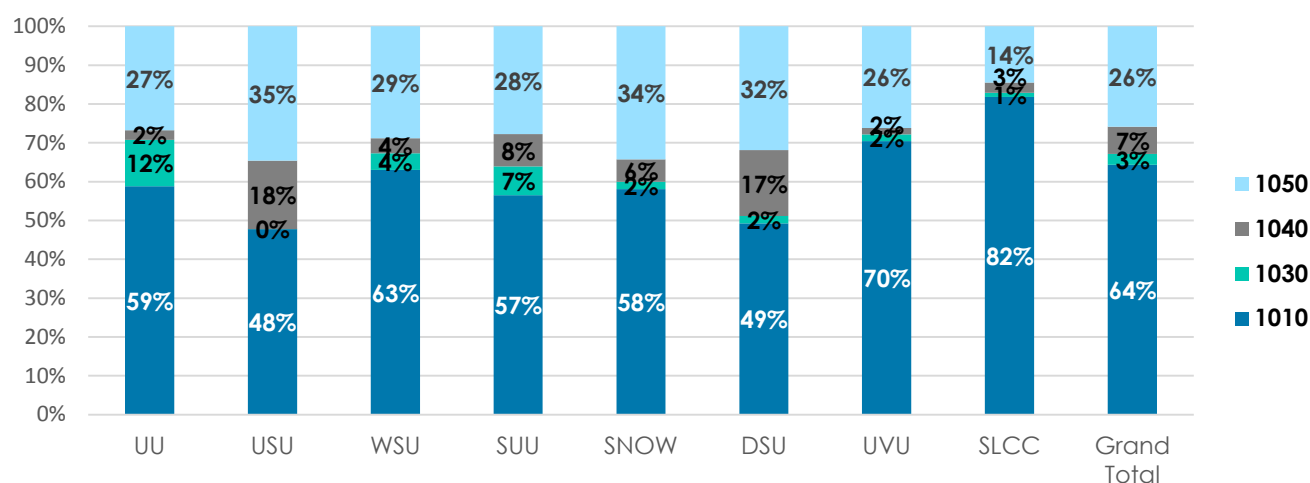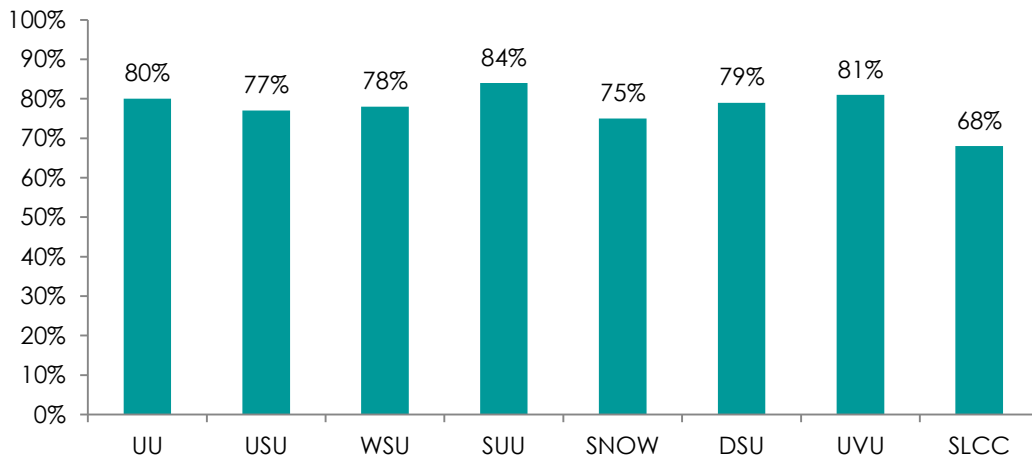

Pass Rates by Institution

For the purpose of this study, a grade of C or better is considered a 'Pass'. A grade of C- or lower was considered a 'Fail'. Grades of Withdrawal, Unofficial Withdrawal, Credit, Pass, and Incomplete were not included. Only students who completed the course with a grade (whether passing or failing) were included when calculating pass rates. To determine if differences exist between institutions for pass rates for math courses, chi-square tests were performed with the following results.

For students whose first math class is between Math 1010 and 1050, the majority have Math 1010 as their first class.

All courses: X^2 (7, N= 53,633) = 822.364, p<.01
Math 1010: X^2 (7, N= 34,004) = 773.893, p<.01
Math 1030: X^2 (6, N= 1,525) = 35.269, p<.01
Math/Stat 1040: X^2 (7, N= 3,809) = 15.938, p<.05
Math 1050: X^2 (7, N= 14,134) = 123.336, p<.01

As shown in charts below, while each level of analysis shows statistical significance, actual pass rates amongst institutions may not be practically significant, especially as other student factors (e.g. race/ethnicity, previous term cumulative GPA) are considered. The following charts show pass rates by institution for the math course in which each student first enrolled:

## First Enrolled Course (Math 1010-1050) Pass Rates by Institution

Bar chart pass rates:
- UU: 80%
- USU: 77%
- WSU: 78%
- SUU: 84%
- SNOW: 75%
- DSU: 79%
- UVU: 81%
- SLCC: 68%

Institution	Count of All 1010-1050 Students
UU	5,654
USU	10,655
WSU	4,009
SUU	3,260
SNOW	3,112
DSU	3,622
UVU	8,485
SLCC	14,866
Total	53,663

First Enrolled in Math 1010 Pass Rates by Institution

Bar chart pass rates:
- UU: 78%
- USU: 66%
- WSU: 75%
- SUU: 80%
- SNOW: 68%
- DSU: 79%
- UVU: 80%
- SLCC: 65%
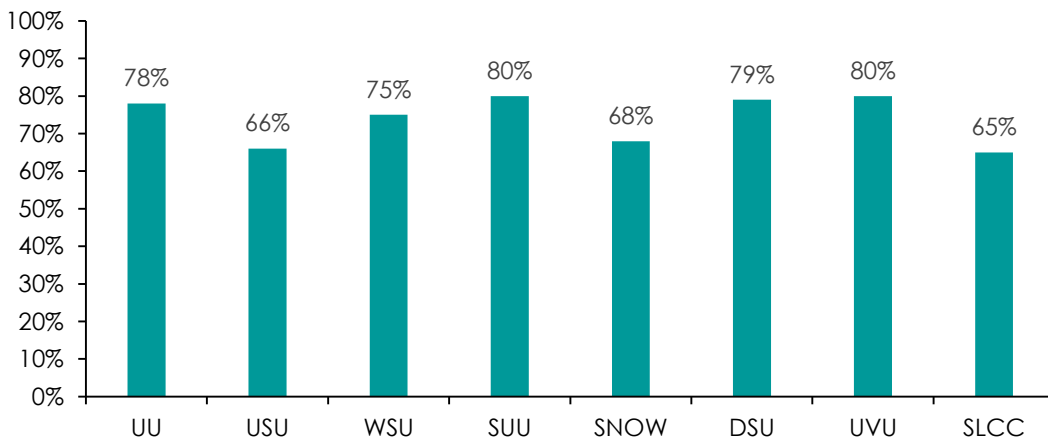
Institution	Count of 1010 Students
UU	3,319
USU	5,015
WSU	2,370
SUU	1,838
SNOW	1,772
DSU	1,738
UVU	5,992
SLCC	12,132
Total	34,176

First Enrolled in Math 1030 Pass Rates by Institution

Bar chart pass rates:
- UU: 85%
- WSU: 90%
- SUU: 92%
- SNOW: 80%
- DSU: 70%
- UVU: 89%
- SLCC: 78%
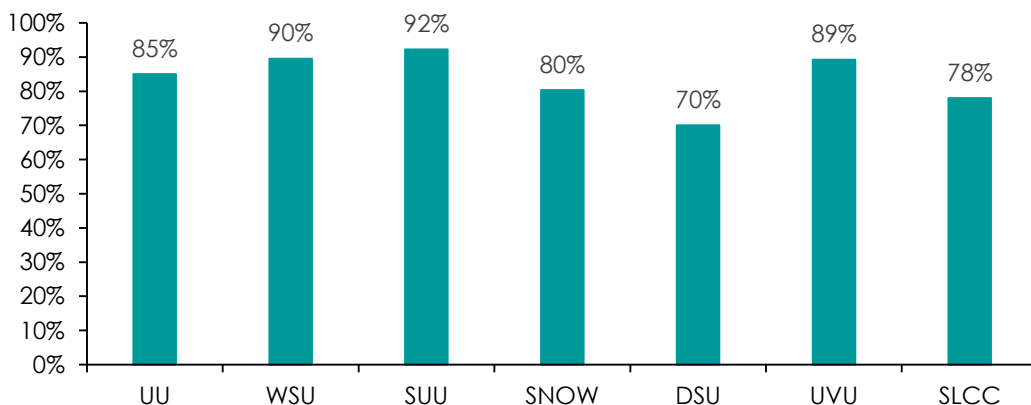
Institution	Count of 1030 Students
UU	674
WSU	182
SUU	245
SNOW	56
DSU	70
UVU	140
SLCC	164
Total	1,531

USU was excluded because they only had 4 students enroll during the study.

First Enrolled in Math/Stat 1040 Pass Rates by Institution
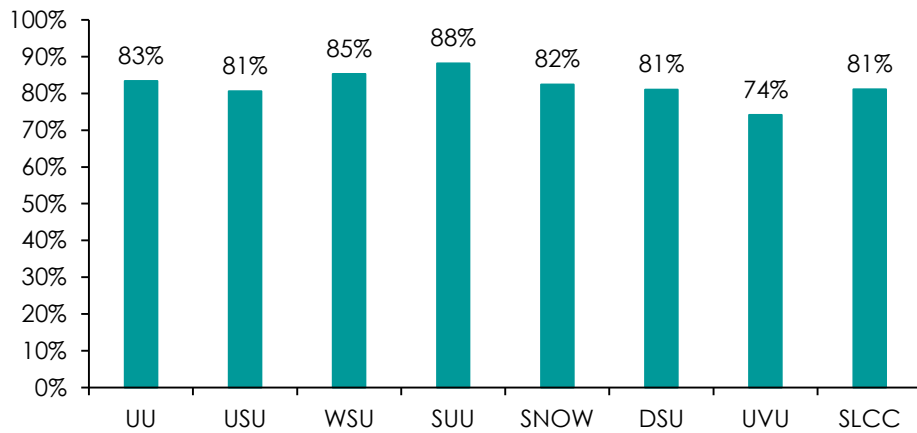
Institution	Count of 1040 Students
UU	138
USU	1,886
WSU	170
SUU	261
SNOW	182
DSU	627
UVU	147
SLCC	398
Total	3,809

Bar chart values: UU 83%, USU 81%, WSU 85%, SUU 88%, SNOW 82%, DSU 81%, UVU 74%, SLCC 81%

First Enrolled in Math 1050 Pass Rates by Institution
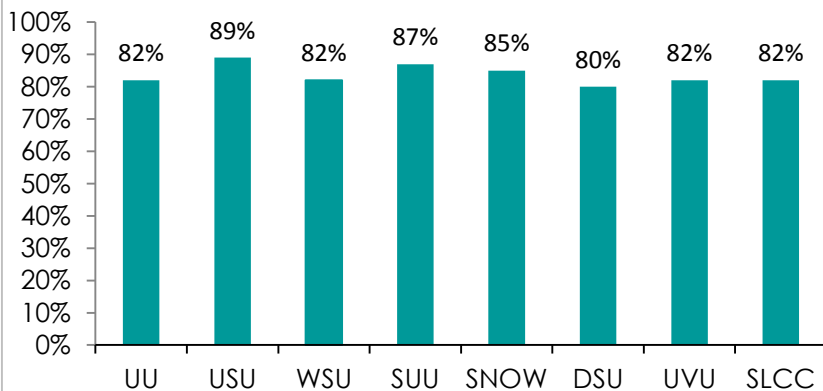
Institution	Count of 1050 Students
UU	1,523
USU	3,751
WSU	1,287
SUU	916
SNOW	1,102
DSU	1,187
UVU	2,206
SLCC	2,172
Total	14,144

Bar chart values: UU 82%, USU 89%, WSU 82%, SUU 87%, SNOW 85%, DSU 80%, UVU 82%, SLCC 82%

Withdrawal Rates

A withdrawal provides no information about a student's achievement in a course; therefore, withdrawals are excluded in the pass/fail calculation. However, because withdrawals are included in the overall enrollment percentages, withdrawal percentages by institution and course are shown below. This percentage includes both Withdrawals and Unofficial Withdrawals.

Withdrawal Percentages by Course and Institution

	UU	USU	WSU	SUU	SNOW	DSU	UVU	SLCC
1010	3%	5%	25%	8%	9%	12%	6%	6%
1030	3%		15%	6%	10%	5%	7%	3%
1040	3%	3%	12%	11%	6%	7%	6%	5%
1050	3%	2%	11%	6%	4%	7%	7%	5%
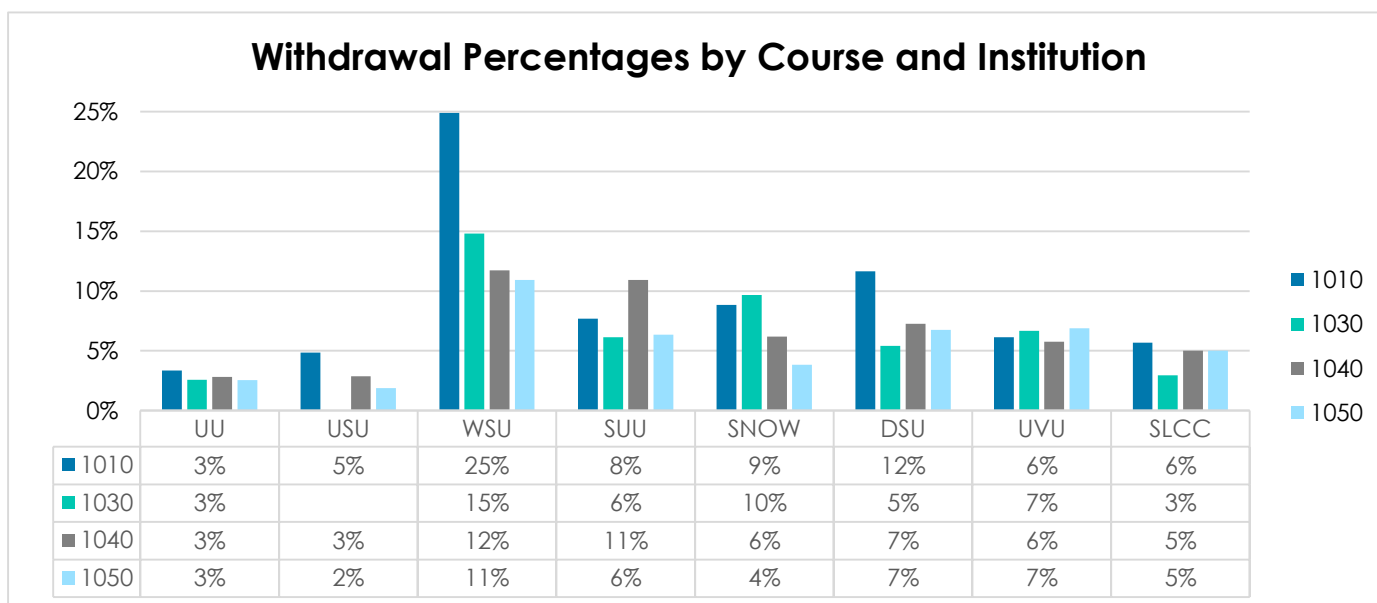
Placement Exams[4]

Typically, USHE students can enroll in math classes in one of two ways: 1) Passing the prerequisite course with an acceptable grade (typically a C or better); 2) Earning an acceptable score on a placement exam. The two most broadly used placement exams are the ACT Math subscore and the Accuplacer series of exams. A table of typical placement scores for the courses examined in this study are below.

Course	ACT Math Subscore	Accuplacer College Level Math	Accuplacer Elementary Algebra	Accuplacer Arithmetic
Math 1010	18 or 19	20-49	54-99	100-120[5]
Math 1030	23	43-89	89-120	N/A
Math/Stat 1040	23	43-89	80-120	N/A
Math 1050	23	43-89	89-120[6]	N/A

Because exams from different series (i.e. ACT and Accuplacer) may be used to place students into their first math class at a USHE institution, correlations between exams were performed to investigate

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[4] These cut scores represent data available when the study began. Many institutions are currently revisiting cut scores.
[5] Only at Dixie State University.
[6] Only at Snow College and Dixie State University.

their relationship to one another. Results indicated that while the Accuplacer Arithmetic and Elementary Algebra scores were related to the ACT math subscores for USHE students, the College Level Math scores showed almost no relationship to ACT math subscores.

Arithmetic and ACT Math r=.557, p<.01
Elementary Algebra and ACT Math: r =.482, p<.01
College Level Math and ACT Math r= .01, p<.01

The finding that the most common Accuplacer exam to place students into their quantitative literacy course – College Level Math – had almost no relationship with the other exam used to place students was concerning. A follow up conversation with College Board which administers the Accuplacer exam provided insight into why this may be the case. The Accuplacer examination used most often and appropriately to place students into their quantitative literacy course is the Elementary Algebra exam. The College Level Math exam is typically used to place students into Calculus courses. [7]

Cut Scores and Pass rates

While ACT cut scores for placement are generally consistent across institutions, more variation exists for those who place using Accuplacer exams. Knowing this and that the current ACT benchmark for readiness for College Algebra is a 22, pass rates by exam score were analyzed by course. Small sample sizes are noted with an *.

Math 1010 – Placement Exam Scores and Pass Rates

ACT Math Subscore	Count of Failed	% Failed	Count of Passed	% Passed
13	11*	50%*	11*	50%*
14	30	47%	34	53%
15	150	46%	173	54%
16	258	37%	440	63%
17	225	30%	530	70%
18	482	33%	958	67%
19	444	30%	1,024	70%
20	272	24%	861	76%
21	259	22%	934	78%
22	238	20%	947	80%

Arithmetic Exam	Count of Failed	% Failed	Count of Passed	% Passed
92-99	4*	40%*	6*	60%*
101-108	1*	8%*	11*	92%*
109-117	1*	9%*	10*	91%*

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[7] Keith White and Cyd Grua, Personal Communication, February 2016. Since the CLM exam is used mostly to place students into calculus type courses, no remediation solution exists with Accuplacer products. Additionally, College Board's Accuplacer "Course Placement" document shows a wide range of scores from a random sampling of institutions who use Accuplacer for placement.

Elementary Algebra Exam	Count of Failed	% Failed	Count of Passed	% Passed
49-53	150	37%	251	63%
54-58	506	48%	541	52%
59-63	876	46%	1,021	54%
64-68	745	40%	1,101	60%
69-73	662	37%	1,134	63%
74-78	511	34%	1,006	66%
79-83	332	28%	857	72%
84-88	256	25%	757	75%
89-93	113	23%	373	77%
94-98	71	25%	218	75%

College Level Math Exam	Count of Failed	% Failed	Count of Passed	% Passed
20-24	402	27%	1,096	73%
25-29	257	21%	986	79%
30-34	204	17%	1,024	83%
35-39	157	16%	823	84%
40-44	141	14%	867	86%
45-49	84	12%	616	88%
50-54	42	9%	434	91%
55-59	39	10%	338	90%
60-64	6	7%	75	93%

Math 1030 – Placement Exam Scores and Pass Rates

ACT Math Subscore	Count of Failed	% Failed	Count of Passed	% Passed
18	3*	13%*	21*	88%*
19	3*	13%*	21*	88%*
20	2*	13%*	14*	88%*
21	4	13%	28	88%
22	7	15%	40	85%
23	19	11%	152	89%
24	17	10%	147	90%
25	15	12%	110	88%
26	8	8%	87	92%
27	2	4%	44	96%
28	4	16%	21	84%

Elementary Algebra Exam	Count of Failed	% Failed	Count of Passed	% Passed
74-83	2*	18%*	9*	82%*
84-93	3*	18%*	14*	82%*
97-109	0*	0%*	12*	100%*

College Level Math Exam	Count of Failed	% Failed	Count of Passed	% Passed
40-49	13	29%	32	71%
50-59	6	10%	57	90%
60-69	5	13%	34	87%

Math/Stat 1040 – Placement Exam Scores and Pass Rates

ACT Math Subscore	Count of Failed	% Failed	Count of Passed	% Passed
19	8*	35%*	15*	65%*
20	8*	32%*	17*	68%*
21	0*	0%*	17*	100%*
22	7	23%	27	77%
23	31	24%	97	76%
24	24	13%	157	87%
25	21	13%	135	87%
26	18	14%	115	86%
27	8	8%	93	92%
28	7	9%	75	91%

Elementary Algebra Exam	Count of Failed	% Failed	Count of Passed	% Passed
79-83	66	34%	128	66%
84-88	63	28%	162	72%
89-93	40	16%	210	84%
94-98	53	22%	188	78%
99-103	42	19%	177	81%
104-108	24	13%	166	87%
109-113	22	13%	149	87%

College Level Math Exam	Count of Failed	% Failed	Count of Passed	% Passed
40-44	1*	6%*	15*	94%*
45-49	19	22%	69	78%
50-54	17	18%	80	82%
55-59	14	21%	53	79%
60-64	8	14%	49	86%
65-69	3	7%	39	93%

Math1050 – Placement Exam Scores and Pass Rates

ACT Math Subscore	Count of Failed	% Failed	Count of Passed	% Passed
18	11	20%	44	80%
19	23	26%	66	74%
20	16	25%	48	75%
21	26	19%	110	81%
22	46	22%	160	78%
23	383	23%	1,289	77%
24	334	19%	1,444	81%
25	182	12%	1,322	88%
26	135	12%	1,017	88%
27	55	7%	689	93%
28	27	7%	366	93%

Elementary Algebra Exam	Count of Failed	% Failed	Count of Passed	% Passed
74-78	12	26%	34	74%
79-83	15	37%	26	63%
84-88	10	24%	32	76%
89-93	18	19%	79	81%
94-98	13	13%	91	88%
99-103	14	14%	86	86%
104-108	14	17%	67	83%
109-113	5	9%	49	91%

College Level Math Exam	Count of Failed	% Failed	Count of Passed	% Passed
40-44	29	20%	115	80%
45-49	55	21%	205	79%
50-54	47	17%	230	83%
55-59	33	13%	212	87%
60-64	105	13%	713	87%
65-69	57	10%	530	90%

Other factors affecting pass rates

A score on a placement test is only one measure by which success in a course can be predicted. Research indicates that other demographic and student-level factors may predict success in a course[8]. Using logistic regression, the following variables were used to predict success of passing each course: gender, race/ethnicity, age, previous term cumulative GPA, and placement test score. Initial results indicated that gender was not a significant predictor (p< .95) so it was removed from further analysis. When using the eight race/ethnicity categories, some showed as significant and others did not. Further analysis revealed that pass rates by ethnicity were bimodal so ethnicity was recoded into two categories with ethnicities with similar pass rates in each category. (Ethnicity 0 contained Black, Hispanic, American Indian/Alaska Native, and Pacific Islander; Ethnicity 1 contained White, Unspecified, Nonresident Alien, and Asian.)

Logistic regression was performed for each course and placement test used to place students into that course with the other variables. Tables of regression coefficients and significant variables are below. Ethnicity and age vary in their usefulness as a predictive factor. For every regression, previous term GPA was a significant predictor. Placement test was significant in all but three analyses. A further investigation of standardized coefficients for Math 1010 and Math 1050 predictors showed that previous term cumulative GPA was two times more predictive than placement test score.

Math 1010 Logistic Regression Results

Predictors	β	SE β	Wald's X^2	df	p	Odds Ratio
Constant	-5.944	.486	149.621	1	.000	.003
Age	.071	.016	19.935	1	.000	1.074
Ethnicity (2 groups)	-.059	.106	.306	1	.580	.943
Cum GPA (prev. term)	1.090	.061	317.079	1	.000	2.974
ACT Math	.117	.015	64.653	1	.000	1.124

Predictors	β	SE β	Wald's X^2	df	p	Odds Ratio
Constant	-5.622	.634	78.767	1	.000	.004
Age	.012	.009	1.791	1	.181	1.012
Ethnicity (2 groups)	.594	.167	12.628	1	.000	1.811
Cum GPA (prev. term)	1.317	.166	63.322	1	.000	3.734
Arithmetic Accuplacer	.015	.004	11.231	1	.001	1.015

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[8] Fong, K., Melguizo, T., and Prather, G. (2015). Increasing Success Rates in Developmental Math: The Complementary Role of Individual and Institutional Characteristics. *Research in Higher Education.* (56), 719-749.

Predictors	β	SE β	Wald's X^2	df	p	Odds Ratio
Constant	-4.419	.196	510.655	1	.000	.012
Age	.020	.004	27.143	1	.000	1.020
Ethnicity (2 groups)	.384	.069	31.034	1	.000	1.468
Cum GPA (prev. term)	.970	.039	628.996	1	.000	2.639
Elementary Algebra Accuplacer	.017	.001	147.048	1	.000	1.018

Predictors	β	SE β	Wald's X^2	df	p	Odds Ratio
Constant	-2.851	.300	90.104	1	.000	.058
Age	.017	.007	5.234	1	.022	1.017
Ethnicity (2 groups)	.557	.119	21.773	1	.000	1.745
Cum GPA (prev. term)	.830	.057	213.584	1	.000	2.294
College Level Math Accuplacer	.027	.004	47.822	1	.000	1.027

Math 1010 Placement Test	ACT Math	Arithmetic Accuplacer	Elementary Algebra Accuplacer	College Level Math Accuplacer
Sample Size	3,817	845	7,992	4,051

Math 1030 Logistic Regression Results[9]

Predictors	β	SE β	Wald's X^2	df	p	Odds Ratio
Constant	-4.774	1.793	7.087	1	.008	.008
Age	.019	.047	.171	1	.679	1.019
Ethnicity (2 groups)	.792	.501	2.497	1	.114	2.207
Cum GPA (prev. term)	1.794	.263	46.429	1	.000	6.016
ACT Math	.017	.045	.142	1	.707	1.017

Predictors	β	SE β	Wald's X^2	df	p	Odds Ratio
Constant	-5.868	2.275	6.653	1	.010	.003
Age	.043	.044	.982	1	.322	1.044
Ethnicity (2 groups)	1.054	.762	1.915	1	.166	2.870
Cum GPA (prev. term)	1.309	.528	6.139	1	.013	3.704
Elementary Algebra Accuplacer	.022	.019	1.422	1	.233	1.023

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[9] Sample sizes for Math 1030 are much lower than for other courses. Thus interpretations should be made with that in mind.

Predictors	β	SE β	Wald's X^2	df	p	Odds Ratio
Constant	-10.462	3.119	11.254	1	.001	.000
Age	.145	.071	4.235	1	.040	1.156
Ethnicity (2 groups)	1.813	.777	5.443	1	.020	6.127
Cum GPA (prev. term)	1.310	.550	5.665	1	.017	3.705
College Level Math Accuplacer	.063	.030	4.590	1	.032	1.065

Math 1030 Placement Test	ACT Math	Elementary Algebra Accuplacer	College Level Math Accuplacer
Sample Size	417	76	118

Math/Stat 1040 Logistic Regression Results

Predictors	β	SE β	Wald's X^2	df	p	Odds Ratio
Constant	-12.439	2.583	23.188	1	.000	.000
Age	.324	.116	7.839	1	.005	1.382
Ethnicity (2 groups)	-.112	.534	.044	1	.834	.894
Cum GPA (prev. term)	1.375	.226	37.159	1	.000	3.957
ACT Math	.152	.041	13.549	1	.000	1.165

Predictors	β	SE β	Wald's X^2	df	p	Odds Ratio
Constant	-6.291	.746	71.160	1	.000	.002
Age	.017	.012	1.951	1	.162	1.017
Ethnicity (2 groups)	-.039	.268	.021	1	.885	.962
Cum GPA (prev. term)	1.624	.139	136.825	1	.000	5.071
Elementary Algebra Accuplacer	.024	.006	17.891	1	.000	1.025

Predictors	β	SE β	Wald's X^2	df	p	Odds Ratio
Constant	-6.925	1.465	22.330	1	.000	.001
Age	-.011	.026	.169	1	.681	.989
Ethnicity (2 groups)	.430	.584	.541	1	.462	1.537
Cum GPA (prev. term)	1.912	.290	43.418	1	.000	6.763
College Level Math Accuplacer	.042	.014	9.159	1	.002	1.043

Math/Stat 1040 Placement Test	ACT Math	Elementary Algebra Accuplacer	College Level Math Accuplacer
Sample Size	474	1.393	351

Math 1050 Logistic Regression Results

Predictors	β	SE β	Wald's X^2	df	p	Odds Ratio
Constant	-7.493	.964	60.464	1	.000	.001
Age	.074	.032	5.423	1	.020	1.077
Ethnicity (2 groups)	-.063	.208	.092	1	.762	.939
Cum GPA (prev. term)	1.238	.085	213.689	1	.000	3.450
ACT Math	.150	.023	43.484	1	.000	1.161

Predictors	β	SE β	Wald's X^2	df	p	Odds Ratio
Constant	-4.811	.996	23.319	1	.000	.008
Age	.014	.026	.304	1	.582	1.014
Ethnicity (2 groups)	.830	.372	4.966	1	.026	2.293
Cum GPA (prev. term)	1.375	.230	35.744	1	.000	3.956
Elementary Algebra Accuplacer	.007	.006	1.362	1	.243	1.007

Predictors	β	SE β	Wald's X^2	df	p	Odds Ratio
Constant	-4.527	.646	49.175	1	.000	.011
Age	.025	.016	2.428	1	.119	1.025
Ethnicity (2 groups)	.298	.263	1.281	1	.258	1.347
Cum GPA (prev. term)	1.145	.101	127.788	1	.000	3.142
College Level Math Accuplacer	.030	.005	32.271	1	.000	1.030

Math 1050 Placement Test	ACT Math	Elementary Algebra Accuplacer	College Level Math Accuplacer
Sample Size	2,933	406	1,690

Recommendations

- Use multiple measures to place students into quantitative literacy courses, in particular GPA in combination with a placement exam
- Consider adjusting ACT Math cut scores based on current pass rates, especially if using multiple measures
- Adjust how Accuplacer tests are used to place students into math classes
    - Utilize Elementary Algebra for placement into quantitative literacy courses
    - Utilize multiple measures available within the Accuplacer product, in particular cumulative GPA

UTAH SYSTEM OF
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Building a Stronger State of Minds℠

Math Placement Scores:
Predicting Probability for Success
March 2016

Following the completion of the study "Math Placement Scores: Validating Math ACT and Accuplacer for Placement", USHE completed a subsequent analysis looking at the predicted probability of success (i.e. earned a C or better) in first math class taken.

Study Variables

This study looks at all students, regardless of registration status[1], whose first math class was Math 1010, Math/Stat 1040, or Math 1050 between Summer 2012-Spring 2015[2] at any of the eight USHE institutions.

Student-level variables collected included:
- Course grade
- Race/ethnicity split into two groups based on analysis of pass rates by race/ethnicity
    - Ethnicity 1: Black, Hispanic, Native American, Pacific Islander (64% pass rate, N=6,317)
    - Ethnicity 2: Asian, Nonresident Alien, Unknown, White (78% pass rate, N=47,346)
- Previous term cumulative GPA
- Math ACT
- Accuplacer test score:
    - Accuplacer Arithmetic (ART)
    - Accuplacer Elementary Algebra (EA)
    - Accuplacer College-Level Math (CLM)

Students for each class were placed into one of four groups depending on which exam was used for their placement. Determination of which placement test was used was based on which scores were available for the student. The assumptions are detailed below.
- If College-Level Math score was provided, CLM was used to place the student.
- If no CLM score was provided and an Elementary Algebra score was, EA was used to place the student.
- If no CLM and no EA score was provided and an Arithmetic score was provided, ART was used to place.
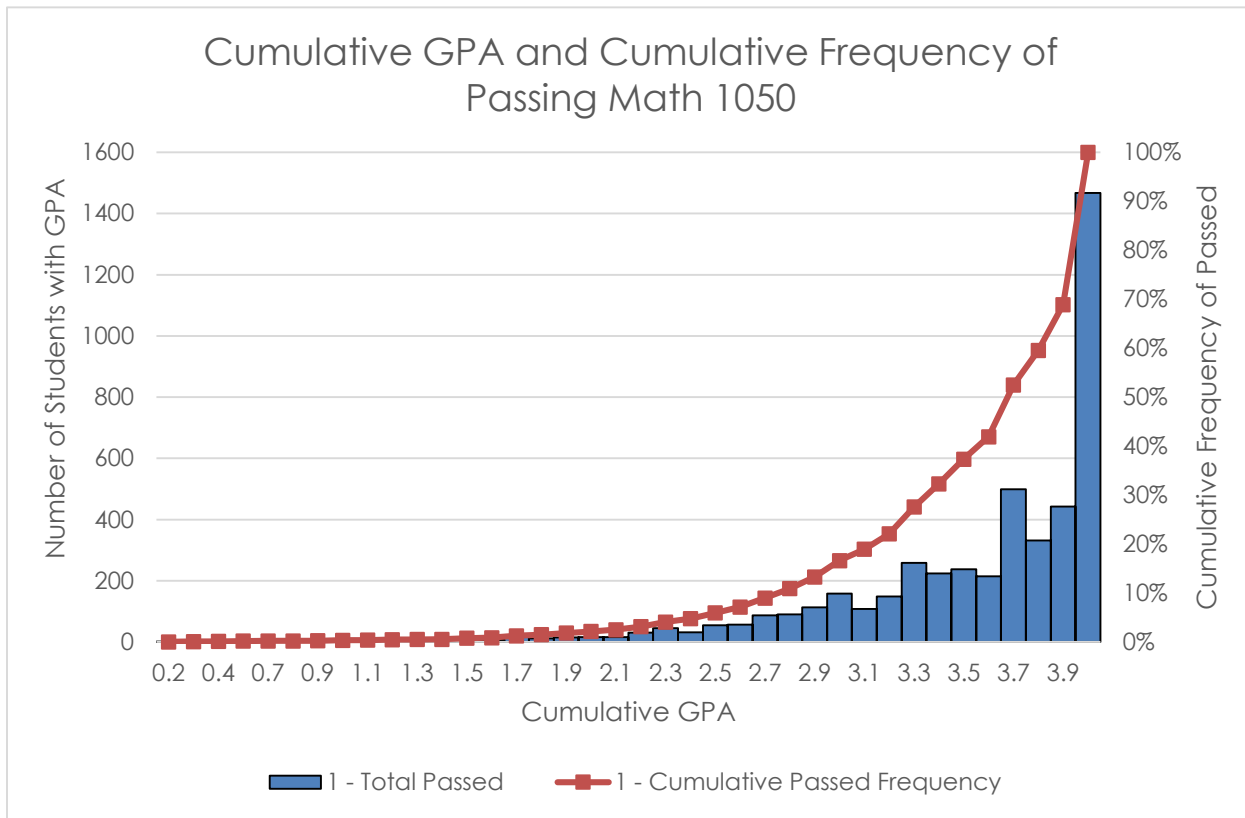- If no Accuplacer score was provided, ACT Math was used to place.

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[1] For example, students may take their first math course as a high school student in concurrent enrollment or as continuing student with senior class standing.
[2] For Utah State University, data was provided for Spring 2013 through Fall 2015.

Grade Point Average within Courses and Placement Tests

Ogive graphs were constructed for each course to determine the previous term cumulative GPA at which 50% of the students in the sample earned a C or better in the math class. Based on those graphs, a previous term cumulative GPA of 3.4 for Math 1010, 3.5 for Math/Stat 1040, and a 3.7 for Math 1050 fell at the 50% cumulative frequency mark.


Cumulative GPA and Cumulative Frequency of Passing Math 1010

Cumulative GPA and Cumulative Frequency of Passing Math/Stat 1040

Cumulative GPA and Cumulative Frequency of Passing Math 1050
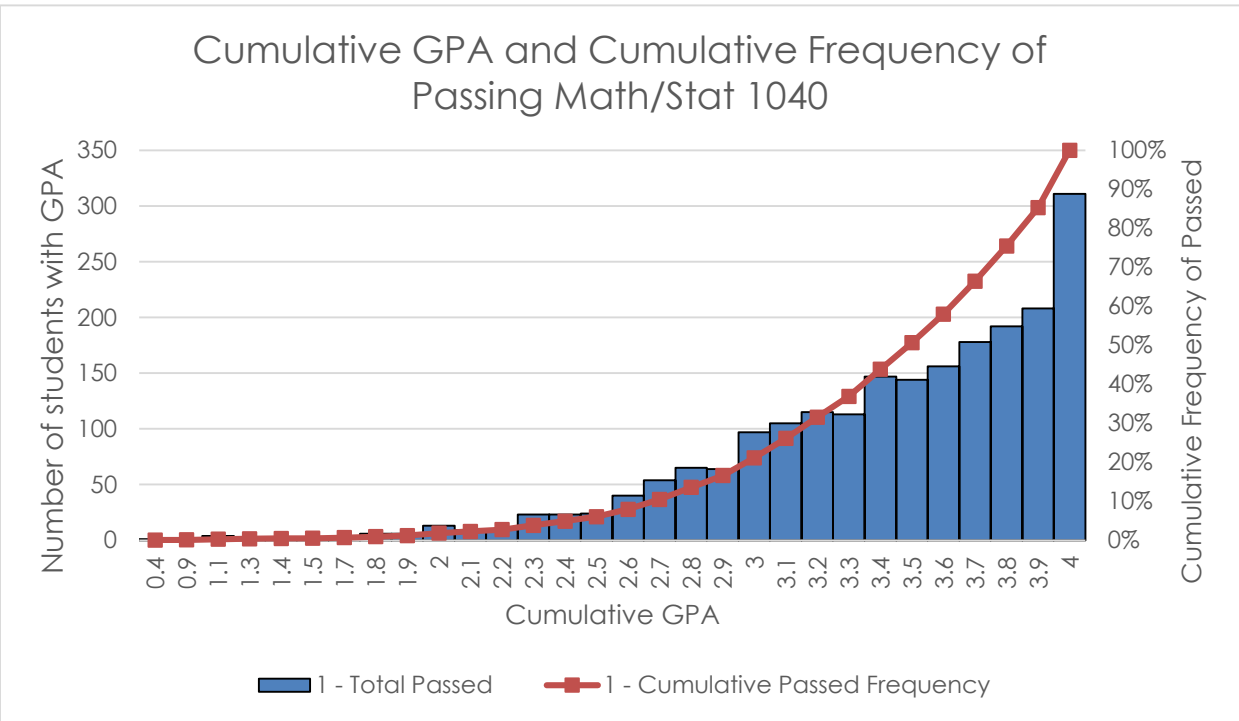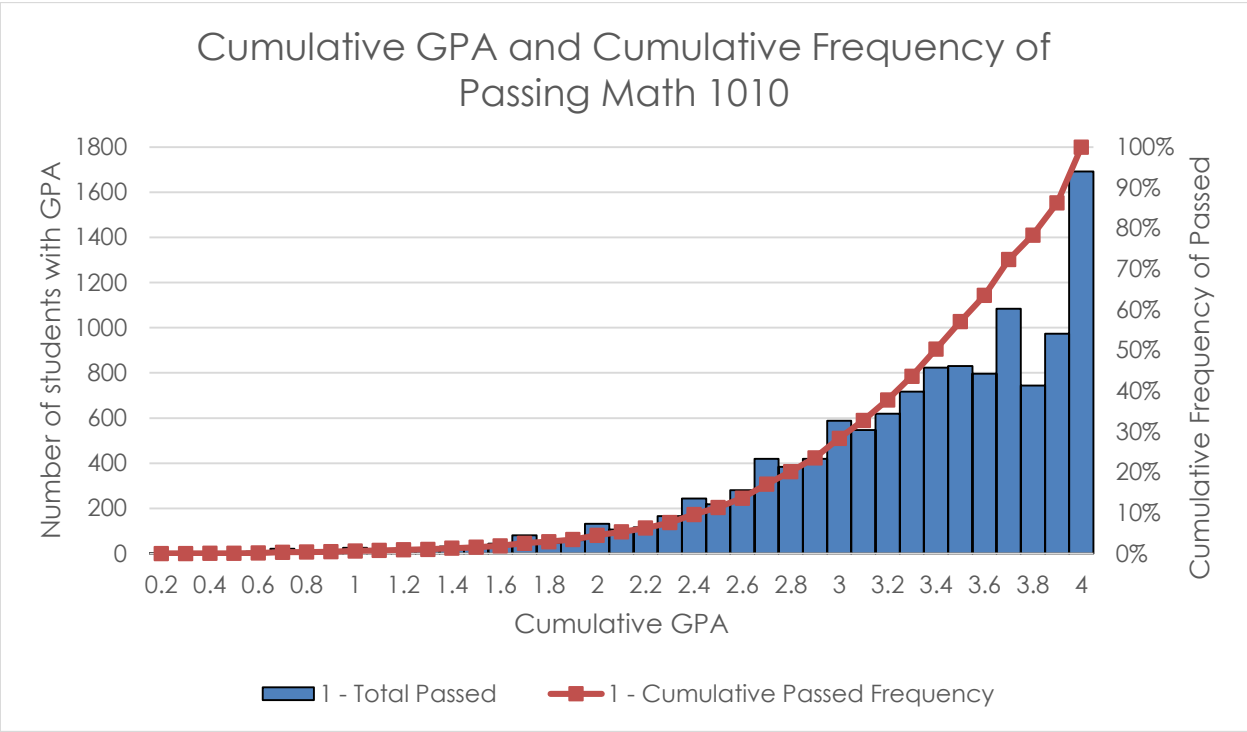
Predicted Probability Analysis

Utilizing the information on GPA and pass rate, two ideal types were created for each course and mode of placement. One type was set at the 50% cumulative frequency of passing (3.4 for Math 1010 and Math/Stat 1040 and 3.7 for Math 1050); the other type was set one standard deviation below the 50% cumulative frequency mark for that course and placement model. The other two elements of the model – Ethnicity and Age – were held constant at the group mean. Three example graphs shown below indicate the predicted probability of each type of student successfully passing the course with a C or better and various scores on the placement exam.

Predicted Probabilities for Passing Math 1010 for Students who Tested into Math 1010 using ACT Math by ACT Math Subscore
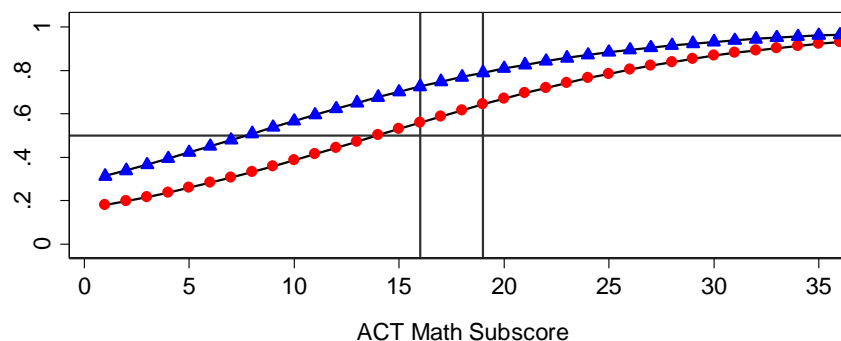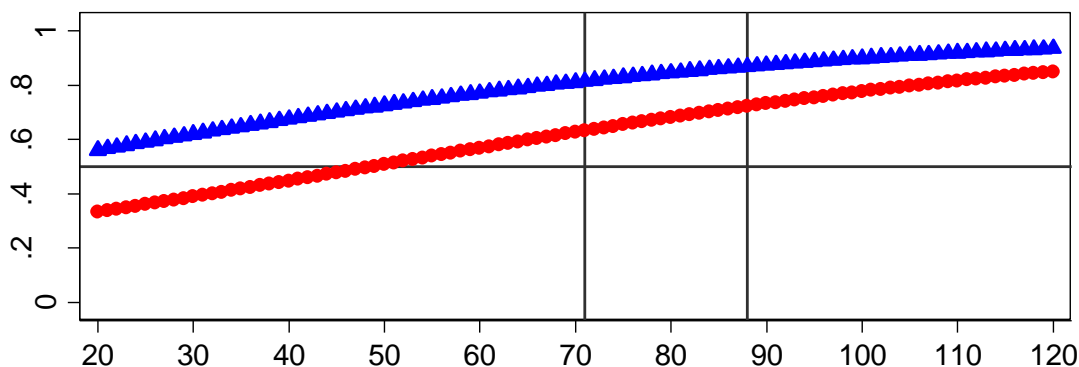
Other model variables:

- Ethnicity set at .85
- Age set at 19.5

Percent in model passed math (C or better): 72.1%
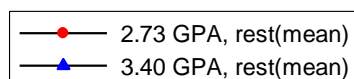
For example, for Math 1010, students with an ACT of 19 and a 3.4 GPA have an 80% probability of passing the course. At an ACT of 16, students with a 3.4 GPA have a 70% probability of passing the course. Students with a 2.73 GPA have lower probabilities (60% at a 19 and 55% at a 16).
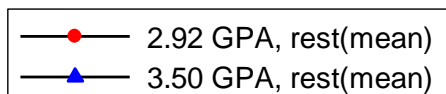
Predicted Probabilities for Passing Math 1040 for Students who Tested into Math 1040 using the Elementary Algebra Accuplacer by Elementary Algebra Accuplacer Subscore
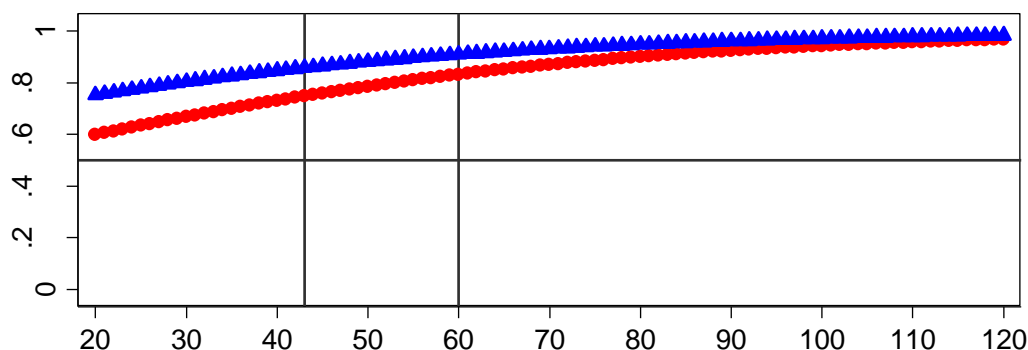

Accuplacer Elementary Algebra Subscore

Other model variables:

- Ethnicity set at .92
- Age set at 24.5

Percent in model passed math (C or better): 80.3%

Legend:
- 2.92 GPA, rest(mean)
- 3.50 GPA, rest(mean)

For Math/Stat 1040, students with a 3.5 GPA and even the lowest score on the Elementary Algebra Accuplacer have over a 50% probability of passing. Current cut scores, typically between 80 and 90, show an 80% probability or higher with a student at a 3.5 GPA. A student with an EA score of 89 and 2.92 GPA has a 70% probability of passing the course with a C or better.
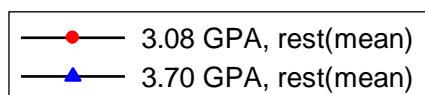
Predicted Probabilities for Passing Math 1050 for Students who Tested into Math 1050 using the College Level Math Accuplacer by College Level Math Accuplacer Subscore

Accuplacer College Level Math Subscore

Other model variables:

- Ethnicity set at .93
- Age set at 21.3

Percent in model passed math (C or better): 85.3%

Legend:
- 3.08 GPA, rest(mean)
- 3.70 GPA, rest(mean)

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Finally, with Math 1050, students with a 3.7 GPA and even the lowest score on the College Level Math Accuplacer have nearly an 80% probability of passing. A student with a 3.08 GPA and score of 43 on the CLM has a 70% probability of passing.

Conclusions

This analysis further supports recommendations made in the previous study that cumulative GPA significantly predicts student success in Quantitative Literacy courses and that the Elementary Algebra exam may be the most appropriate Accuplacer placement instrument for QL courses in USHE.