CO-REQUISITE MATHEMATICS REMEDIATION: IS IT WORKING?

DATA RESULTS FROM A FOUR YEAR PUBLIC INSTITUTION

ANNIE CHILDERS, UA LITTLE ROCK, ABCHILDERS@UALR.EDU

Background

Pre-Core program (I, II, III, IV), Fall 2012- Spring 2016

- ALEKS
- Modularized (10 modules)
- Emporium model (met twice a week, 50 min)
- Mastery (80%)
- Content and Learning Objectives that must be learned before moving on to the next set of skills

Pre-Core Mathematics Pathways

PRE-CORE MATH I → *PRE-CORE MATH II* → *PRE-CORE MATH III* → *PRE-CORE MATH IV*
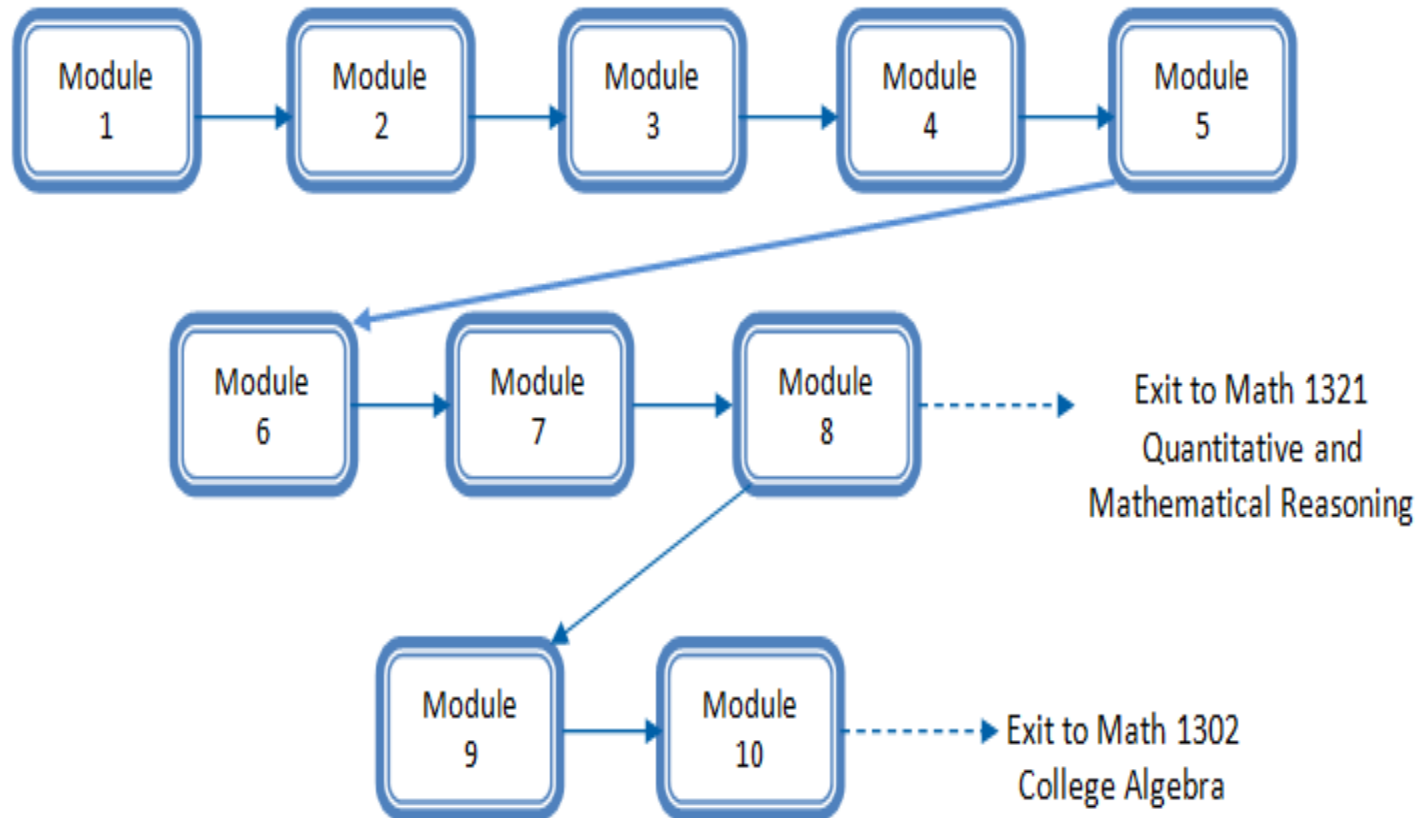
Data (Fall 2012 – Spring 2014)

- First time entering freshman

- ACTMath < 21; SATMath < 500; COMPASS Math < 45

- Enrolled in at least one Pre-Core Math class

Four Cohorts (Total n=753)

- Fall 2012, Spring 2013, Fall 2013, Spring 2014

- Studied each the length of two academic years (including summer)

- Analyzed Quantitatively using SPSS (descriptive and inferential stats)

Results

Completion Rate: 33.3% (AQ or AA grade)

- Average Time of Completion: 1.8 semesters

- Students who had higher ACTMath tended to complete Pre-Core program in shorter amount of time

- Caucasian and Asian-Pacific students had higher rates of completion

- Out of Completers (33.3%):
  - 56% passed CA (*n=181*)
  - 60% passed QMR (*n=75*)

    Note: Students who completed Pre-Core in one semester had highest grades in CA and QMR

"Students enrolled in co-requisite gateway math courses that were aligned with their chosen programs of study saw results __five to six times__ the success rates of traditional remedial math sequences" Complete College America

"Co-requisite remediation is more than a remedial education technique; it is a fundamental redesign of the system of support for academically underprepared students." Bruce Vandal, 2015

Co-Requisite Model

Two tracks: College Algebra and QMR ('Gateway')

Co-requisite (middle range)

Foundations (lower range)

Co-Requisite Classes (3 + 1 hours)

- Students enroll in a 3 hour core math + separate 1 hour support lab for remediation

- All students are in Co-Req classes together

- Same teacher. Same grade.

- Must enroll in both during same semester

- Middle range test scores

- Aligned review topics with core course content

- Co-Req College Algebra and Co-Req QMR

Foundations Classes (3 hours)

- Lower testing scores, high needs students

- Foundations of College Algebra

- Foundations of Quantitative Mathematical Reasoning

- Upon completion with A*, B*, or C*, enroll in Co-Req course aligned with the correct track

Mathematics Remediation Placement

Quantitative and Mathematical Reasoning Track

ACT Math < 16 OR SAT Math < 430 OR COMPASS < 41 OR ACCUPLACER Elem Alg < 59	ACT Math 16-18 OR SAT Math 430-479 OR COMPASS 41-43 OR ACCUPLACER Elem Alg 60 - 76	ACT Math 19+ OR SAT Math 480+ OR COMPASS 44+ OR ACCUPLACER Elem Alg 77+
MATH 0330 Foundations of Quant and Math Reasoning	**MATH 0121** Quant and Math Reasoning Lab **AND MATH 1321** Quant and Math Reasoning	**MATH 1321** Quant and Math Reasoning

Upon A, B, or C grade in MATH 0330, student enrolls in
MATH 0121 Quant and Math Reasoning Lab
AND MATH 1321 Quant and Math Reasoning

College Algebra Track

ACT Math < 18 OR SAT Math < 450 OR COMPASS < 43 OR ACCUPLACER Elem Alg < 69	ACT Math 18-20 OR SAT Math 450-499 OR COMPASS 43-44 OR ACCUPLACER Elem Alg 70 -79	ACT Math 21+ OR SAT Math 500+ OR COMPASS 45+ OR ACCUPLACER Elem Alg 80+
MATH 0332 Foundations of College Algebra	**MATH 0102** College Algebra Lab **AND MATH 1302** College Algebra	**MATH 1302** College Algebra

Upon A, B, or C grade in MATH 0332, student enrolls in
MATH 0102 College Algebra Lab
AND MATH 1302 College Algebra

IS IT WORKING?

Questions….

What are the pass rates?

What are the completion rates for the sequences?

Are any academic factors indicators of performance?

Is demographic information an indicator of performance?

Data

Control: students in gateway college-level mathematics class

Three cohorts;
- **Cohort 1**: students who enrolled in a foundations class
- **Cohort 2** : students who passed a foundations class, then enrolled in a co-requisite class
- **Cohort 3** : students who enrolled directly in a co-requisite class

The control group and cohorts were further divided into groups who took College Algebra and those who took QMR classes

Pass Rates: Summer 2016–Fall 2017

Foundations Classes:

Foundations of QMR   N = 101, 47.5% pass rate (A, B, C)

Foundations of CA   N = 362, 62.2% pass rate (A, B, C)

Foundations to Co-Req Classes:

Fnd to Co-Req QMR   N = 18,   94.4% pass rate of Co-Req (A, B, C, D)

Fnd to Co-Req CA   N = 149, 77.2% pass rate of Co-Req (A, B, C, D)

Co-Requisite Classes:

Co-Requisite QMR   N = 154, 75.3% pass rate (A, B, C, D)

Co-Requisite CA   N = 385, 74.3% pass rate (A, B, C, D)

Length of Time to Earn Credit

Students who began in gateway mathematics course took on average <u>1.05 semesters</u> to earn credit

Students who began in a foundational mathematics course and earned their gateway credit took on average <u>2.31 semesters</u>*

Students who began in a corequisite mathematics course took on average <u>1.03 semesters</u> to complete earn their math credits

71.5% of students who began in a foundations math class had not earned their math credit as of fall 2017.

Significant Factors, College Algebra

Gender: Control ($p = 0.0018$), Cohort 3 ($p = 0.0021$), and Aggregate ($p = 0.0009$) indicate **higher female pass rate**

Race: Control ($p = 0.0004$), Cohort 3 ($p = 0.0143$), and Aggregate ($p < 0.0001$) indicate **higher Caucasian, Two or more, and Other pass rates**

Attendance Status: Control ($p < 0.0001$), Cohort 3 ($p = 0.0071$), and Aggregate ($p < 0.0001$) indicate **higher full time student pass rates**

Enrollment Status: Control ($p = 0.0002$), Cohort 1 ($p < 0.0001$), Cohort 3 ($p = 0.0231$), and Aggregate ($p < 0.0001$) **indicate higher pass rates for students outside their first two years of enrollment**

Significant Factor, QMR

Enrollment Status: Cohort 1 ($p = 0.0005$), Cohort 3 ($p = 0.0057$), and Aggregate ($p = 0.002$) indicate **higher pass rates for students outside their first two years of enrollment**

Significant Factor, High School GPA

	Passing Students	Non-passing Students	Significance
CA	3.15	2.69	$p < 0.0001$
QMR	3.06	2.73	$p = 0.008$
Fnd CA	2.77	2.52	$p = 0.0005$
Coreq CA	3.11	2.67	$p < 0.0001$
Coreq QMR	2.95	2.59	$p = 0.002$

Challenges and Successes

CHALLENGES

- Students still getting lost in 'pipeline' of foundations to co-requisite courses

- While improved, Foundations pass rate not as high as had hoped

- Registration issues (manual overrides required)

- Instructor course load

SUCCESSES

- Co-Req courses doing just as well, if not better than gateway math course

- More students are earning college credit for math in one semester, which would otherwise not be possible

- More students are enrolled in our Co-req/Fnds than with our previous model

Co-requisite Math Remediation:
IS IT WORKING?

We say YES!

HOWEVER!

Students who begin in a foundations of math course are not still not completing the 'pipeline' to earn gateway math credit (71.5% as of fall 2017)
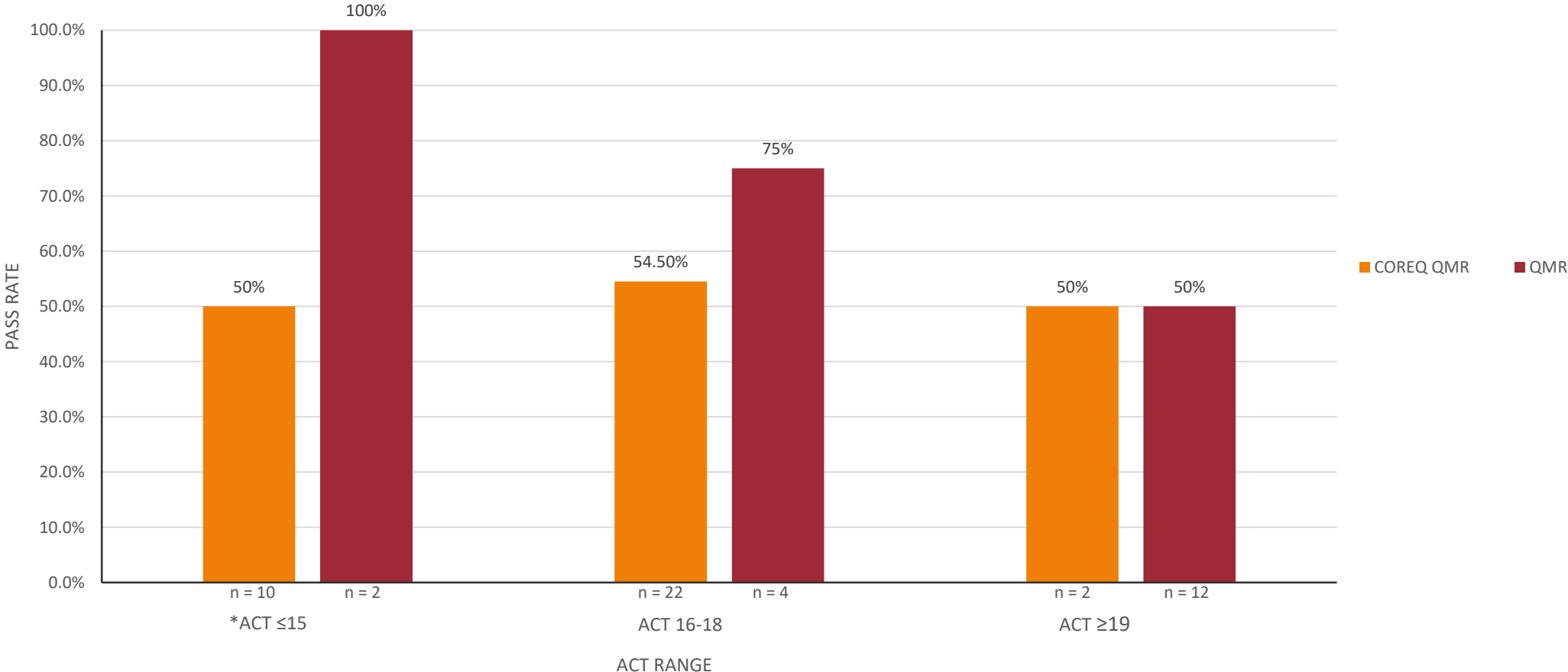
Pilot Study, Spring 2019

Pilot #1. Allow ALL students who place into Foundations of QMR into co-requisite QMR (Students whose ACT is less than or equal to 15).
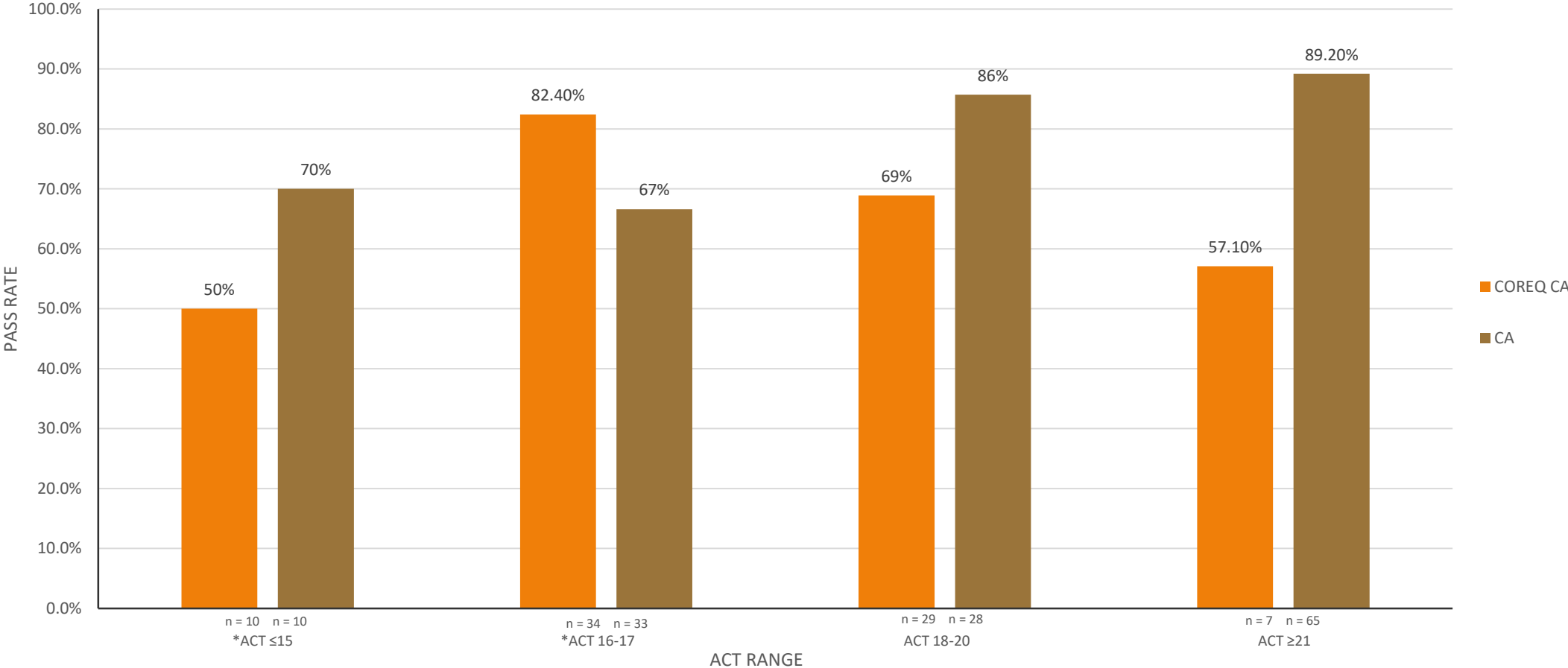
Pilot #2. Allow students with MATH ACT 16-17 into co-requisite College Algebra.

Pilot #3. Allow any student whose high school GPA is 3.0 or higher into co-requisite courses regardless of lower test score.

Results: Pilot #1

Results: Pilot #2

Bar chart titled PASS RATE (y-axis) versus ACT RANGE (x-axis), comparing COREQ CA (orange) and CA (brown).

- *ACT ≤15: COREQ CA 50% (n = 10), CA 70% (n = 10)
- *ACT 16-17: COREQ CA 82.40% (n = 34), CA 67% (n = 33)
- ACT 18-20: COREQ CA 69% (n = 29), CA 86% (n = 28)
- ACT ≥21: COREQ CA 57.10% (n = 7), CA 89.20% (n = 65)

Results: Pilot #3

It was not clear enough which students were placed based on GPA.

A lot of the time, ACT or other scores determined the placement, not GPA. In the cases where it looked like the GPA was the reason for placement, there was not enough data to overall make any conclusions, however, it did appear those did well.

TEST SCORE PLACEMENT GUIDE

Effective Fall 2018

MATHEMATICS

Note: 1.) All UA Little Rock students are eligible to take placements tests.

2.) If a student places into MATH 1321 or MATH 1302, the student may also enroll in the connected courses, if desired.

|	Quantitative and Mathematical Reasoning Track			College Algebra Track				
	MATH 0330, Fundamentals of Quantitative & Mathematical Reasoning Upon earning a grade of A, B, or C in MATH 0330, enroll in MATH 1321 *and* MATH 0121 (lab)	**MATH 1321** Quantitative & Mathematical Reasoning *and* **MATH 0121,** lab co-requisite	**MATH 1321,** Quantitative Mathematical Reasoning	**MATH 0332,** Foundations of College Algebra	**MATH 1302,** College Algebra *and* **MATH 0102,** lab co-requisite	**MATH 1302,** College Algebra *or the* **Accuplacer College-level Math Placement Test**	**MATH 1303,** Trigonometry *or* **MATH 1342,** Pre-Calculus *or* **MATH 1401,** Applied Calculus	**MATH 1451,** Calculus I
ACT Math	15 or less	16-18	19+	17 or less	18-20	21+	24+	
ACCUPLACER Classic Elementary Algebra	59 or less	60-76	77+	69 or less	70-79	80+		
ACCUPLACER Classic College-Level Math		42+	47+		45+	50+	63+	103+
ACCUPLACER Nxt-Gen Quantitative Reasoning, Algebra & Statistics	236 or less	237-249	250+	245 or less	246-255	256+		
ACCUPLACER Nxt-Gen Advanced Algebra	210 or less	211-236	237+	219 or less	220-249	250-262	263-275	276+
COMPASS Algebra	40 or less	41-43	44+	42 or less	43-44	45+		
COMPASS College Algebra						50+	67+	
COMPASS Trigonometry								46+
SAT Old Math	429 or less	430-479	480+	449 or less	450-499	500+	560+	
SAT New Math	469 or less	470-514	515+	489 or less	490-529	530+	580+	

Math Placement Index (MPI)

- One score calculated for each student regardless of type of test score

- Simplifies the long placement chart

- Allows addition of High School GPA (and later on possibly other) as a placement factor

- More accurately place students

Conversion Formulas

The Math Index consists of conversion formulas based on linear interpolations (Lagrange Polynomials) of current placement scores.

$ACT: MI = (-1100 + 100 * ACT) + ((HSGPA - n) * 66.7)$

$Accuplacer\ College\ Level\ Math\ (ACLM): MI = (-6459.46576635599 + 288.706743357159 * ACLM - 3.52874354943539 * ACLM^2 + 0.0144234531081199 * ACLM^3) + ((HSGPA -$

*ACT/MI
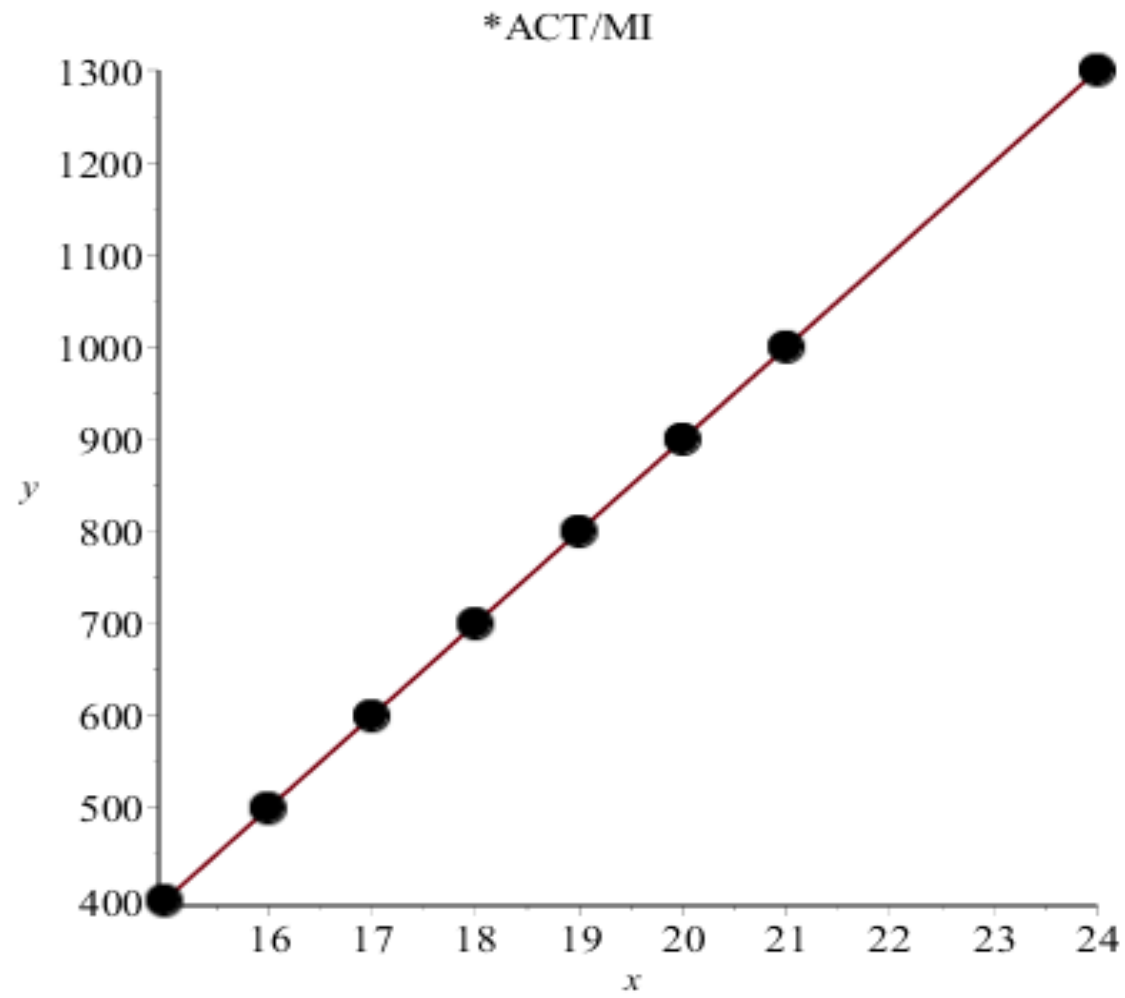
$$y = -1100 + 100x$$

Course	Math Index
MATH 0330 (Fnds of QMR)	Less than 500
MATH 1321/0121 (QMR and Lab)	500-799
MATH 0332 (Fnds of CA)	Less than 700
MATH 1302/0102 (College Algebra and Lab)	700-999
MATH 1321 (QMR)	800+
MATH 1302 (College Algebra)	1000+
MATH 1303, 1342, or 1401 (Trig, Pre-Calc, Applied Calc)	1300+
MATH 1451 (Calculus I)	1600+

Example

$$ACT: \boldsymbol{MI = (-1100 + 100 * ACT) + ((HSGPA - n) * 66.7)}$$

The average High School GPA of a student that just graduated from high school when applying for admission to UA Little Rock is, for example, 3.0. If their ACT score is 19 and they just graduated high school, then

$MI = (-1100 + 100 * 19) + ((3.0 - \mathbf{0}) * 66.7)) = \mathbf{1000.1}$**=>eligible for CA OR QMR**

If it has been two years since they graduated high school, then

$MI = (-1100 + 100 * 19) + ((3.0 - \mathbf{2}) * 66.7)) = \mathbf{866.7}$**=>eligible for QMR OR Co-Req CA**

[Link to excel spreadsheet](#)

Work in Progress

- Still working with administration on implementation

- plan on suspending our Foundations of QMR class effective fall 2020

- Gathering more data on expanding the 'bubble' of co-requisite College Algebra

ALWAYS A WORK IN PROGRESS!!!

Questions?!

THANK YOU!!!

ANNIE CHILDERS, ABCHILDERS@UALR.EDU