



Relative Rates of Success of Calculus 1 Students

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What is Calculus 1 (MATH 1220)?

Main Topic	Skills/Procedures	Big Concepts/Theoretical	Applications
Limits	<p>Reading Limit and continuity from a graph</p> <p>Calculating Limits</p> <ul style="list-style-type: none">• Factoring out common term• Multiplying by the conjugate• Finding limits as “x” approaches $\pm\infty$• Finding limits as “x” approaches a vertical asymptote	<p>Using δ-ϵ definition to prove a function has a limit at “x” = a</p> <p>Intermediate Value Theorem</p> <p>Squeeze Theorem</p>	<ul style="list-style-type: none">• Examining end behavior of a function• Examining behavior of functions at discontinuities• Determining continuity, and making functions continuous• Using the Squeeze Theorem to find limits of functions indirectly

What is Calculus 1 (MATH 1220)?

Main Topic	Skills/Procedures	Big Concepts/Theoretical	Applications
Derivatives	<p>Calculating Derivatives</p> <ul style="list-style-type: none">• Power Rule• Sum/Difference Rule• Product/Quotient Rule• Chain Rule• Trig/Inverse Trig Functions• Exponential and Logarithmic Functions• Implicit Differentiation <p>Read from a graph where a derivative is positive, negative, or undefined</p> <p>Determine critical/inflection point(s) using the first/second derivative</p>	<p>Using limit definition of a derivative to find the derivative of a function</p> <p>Extreme Value Theorem</p> <p>Mean Value Theorem</p> <p>What information can be read off of a graph of the original function, first derivative, and second derivative.</p>	<ul style="list-style-type: none">• Implicit Differentiation• Logarithmic Differentiation• Related Rates• Optimization• Reading derivative from graph of a function• Relationship of Position, Velocity/Speed, and Acceleration• Curve Sketching• Determining location of Roots<ul style="list-style-type: none">• Newton's Method• Approximating value of a function<ul style="list-style-type: none">• Linearization

What is Calculus 1 (MATH 1220)?

Main Topic	Skills/Procedures	Big Concepts/Theoretical	Applications
Integrals	<p>Finding antiderivatives or indefinite integrals</p> <p>Evaluating definite integrals</p> <p>Working with summation $\{\Sigma\}$ notation</p> <p>Working with integration rules</p> <ul style="list-style-type: none">• Power Rule• “u” substitution	<p>Creating a Riemann Sum to approximate the value of a definite integral</p> <p>Explaining the connection between the integral and the derivative</p> <p>Explaining how the antiderivative is used to find the value of the definite integral</p>	<ul style="list-style-type: none">• Solving a differential equation given an initial value• Finding the area beneath the curve• Finding the area between two curves

Why Are We Interested?

- Gateway course
 - High Enrollment
 - Foundational for majors
 - High DWFI rate
 - Drop, Withdraw, Fail, Incomplete
- As of the spring 2015 semester, approximately 40% of students that enrolled in MATH 1220 were unsuccessful in completing the course with at least a “C” and being able to move on to the next course



What Have We Done?

- ALEKS (Assessment and LEarning in Knowledge Spaces)
 - Initial Assessment
 - Mastery 1
- Mastery 2
 - Taken on Paper
- Learning Assistants
- Coordination
 - Exams, Grading Rubrics, Mid-Term Grades



Possible Causes



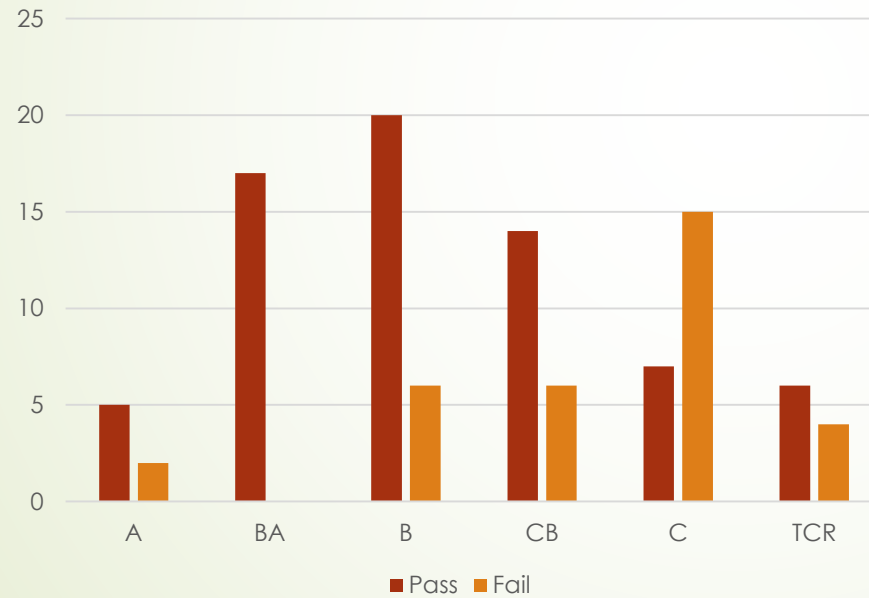
- Too Many Credits
- Work
- Family
- Life in General

- Placement
 - Math 1180
 - ACT
 - Advisor override
- Student knowledge of their progress
 - Initial Assessment
 - Mid-term Grade
 - Mastery Grades
- Time gap in knowledge
 - No Gap
 - Less than 1 year
 - More than 1 year

Placement-MATH 1180

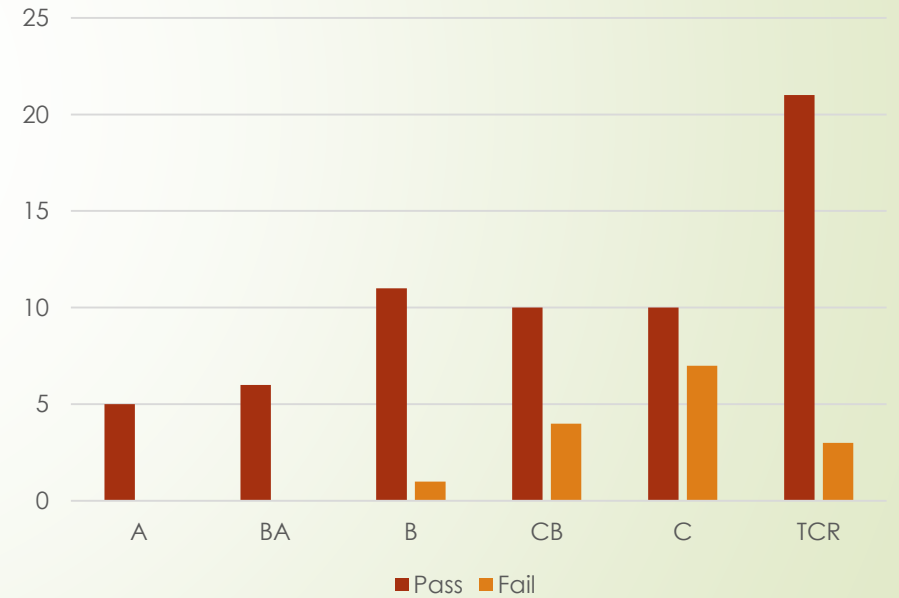
Spring 2016

Combined MATH 1180 Spring 2016



Fall 2016

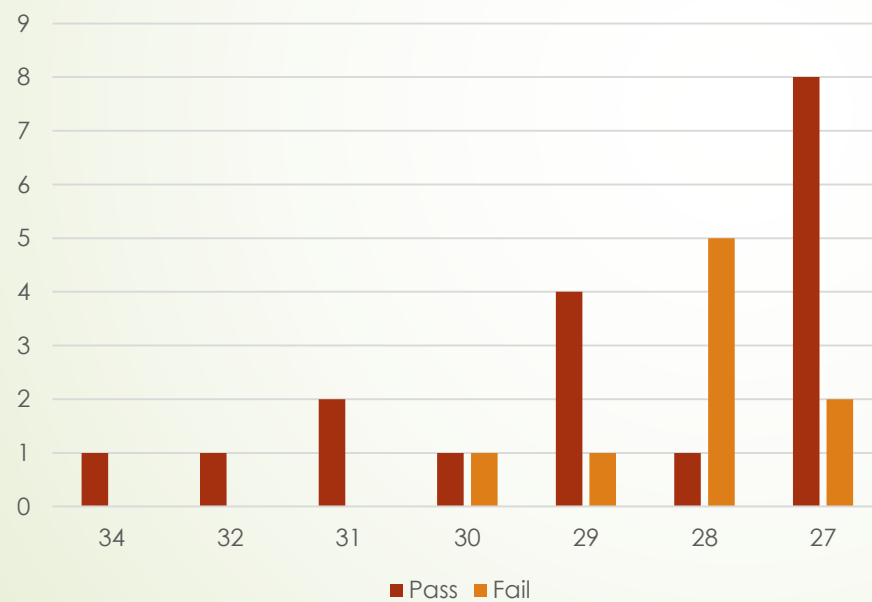
Combined MATH 1180 Fall 2016



Placement-ACT

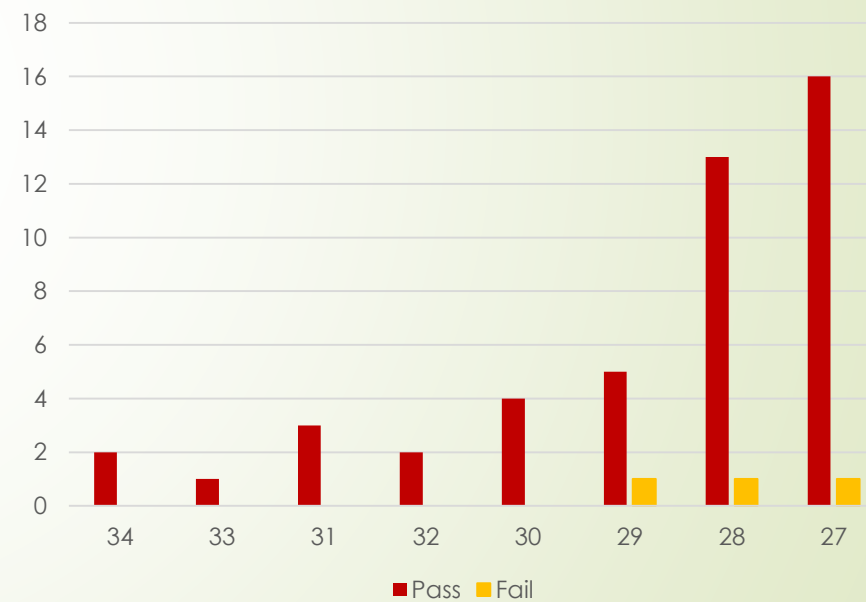
Spring 2016

Combined ACT Spring 2016



Fall 2016

Combined ACT Fall 2016





Placement-Advisor Override

Spring 2016

Pass	Fail
3	4

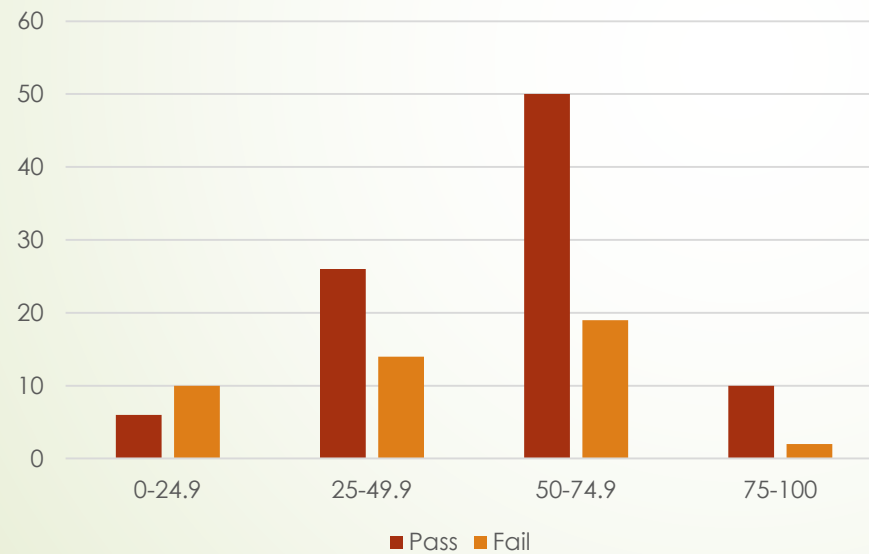
Fall 2016

Pass	Fail
14	1

Progression-Initial Assessment

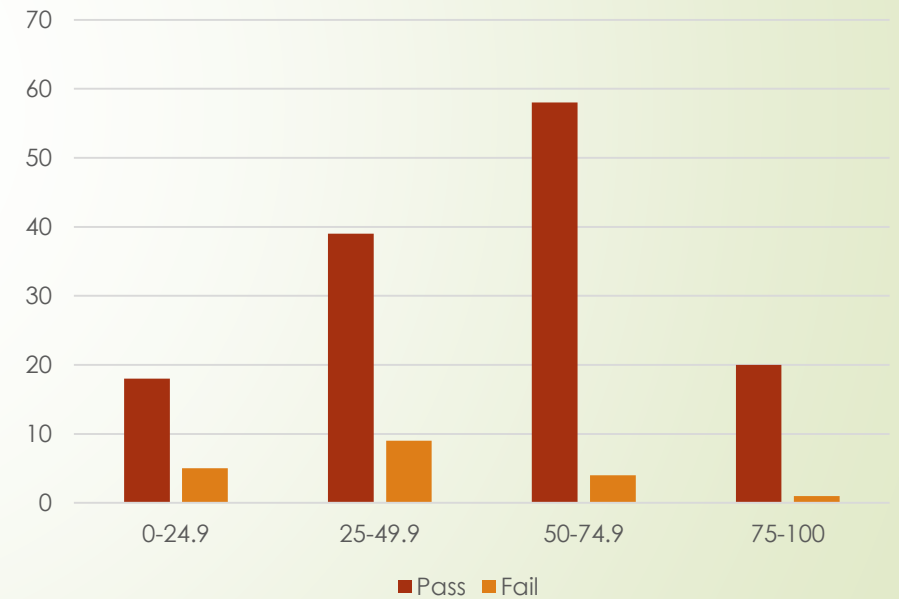
Spring 2016

Combined Spring 2016 Initial Assessment



Fall 2016

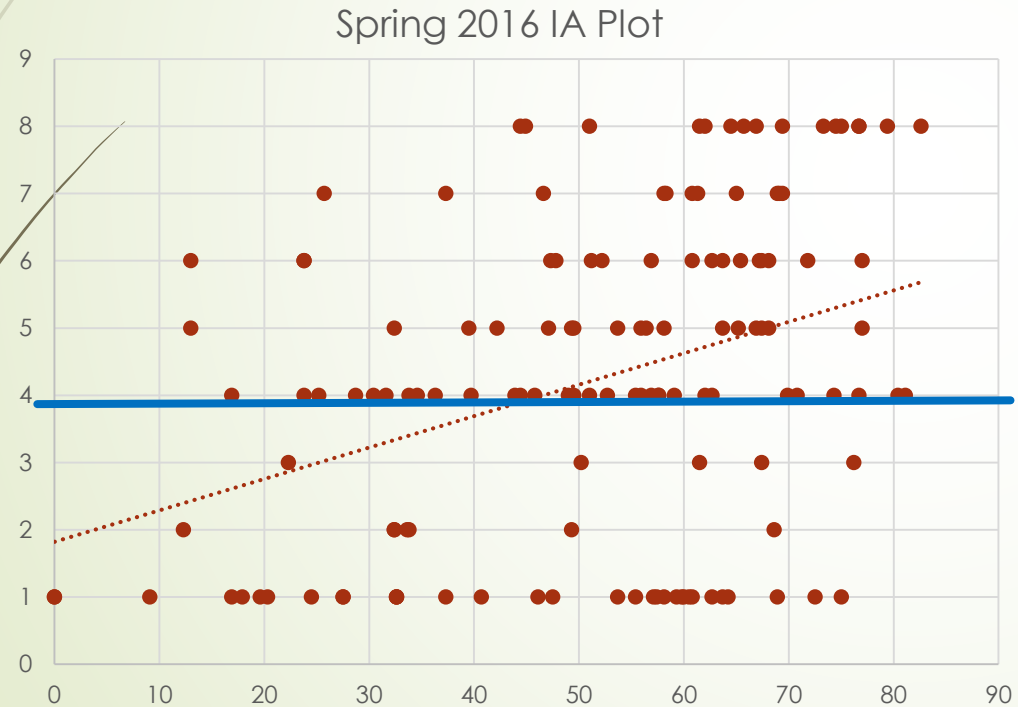
Combined Fall 2016 Initial Assessment



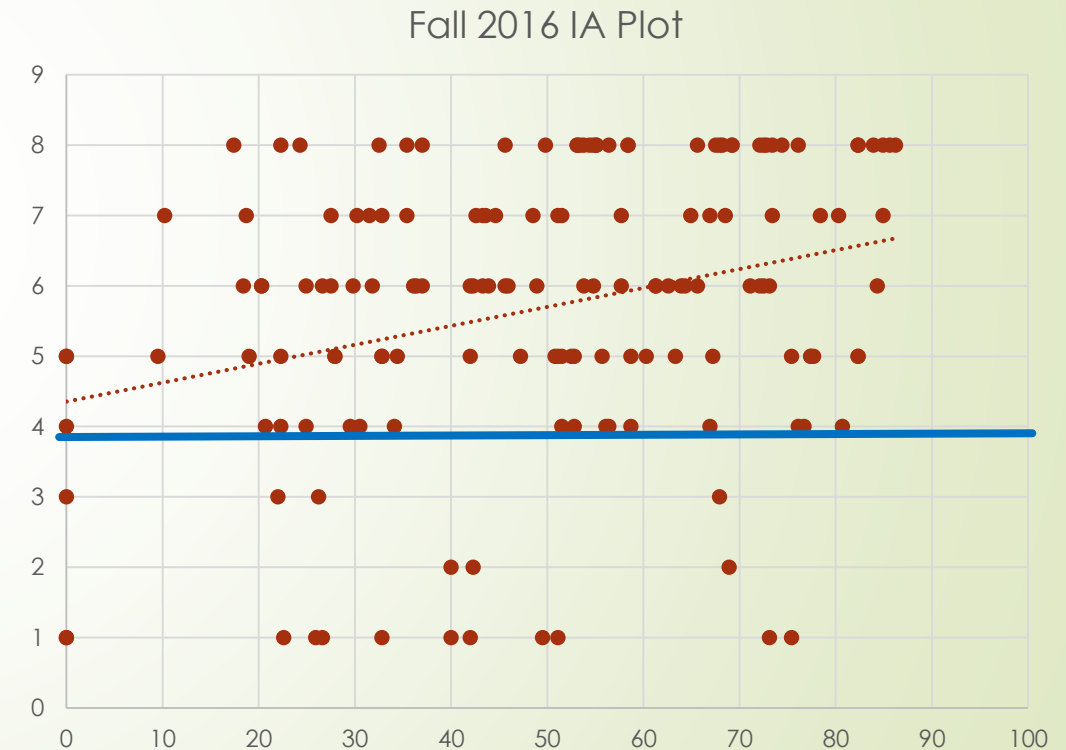
Progression-Initial Assessment (cont.)

A	8
BA	7
B	6
CB	5
C	4
DC	3
D	2
E/X	1

Spring 2017



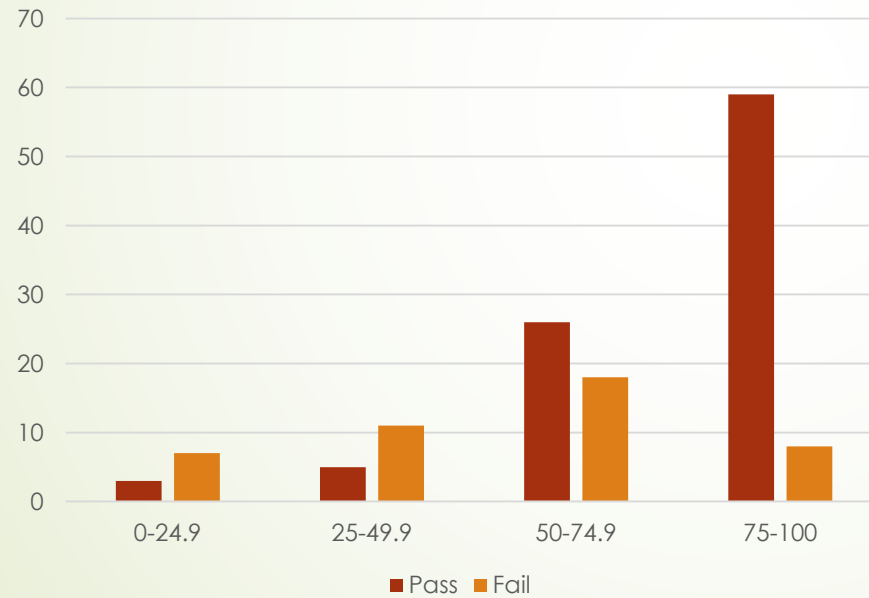
Fall 2017



Progression-Mastery 1

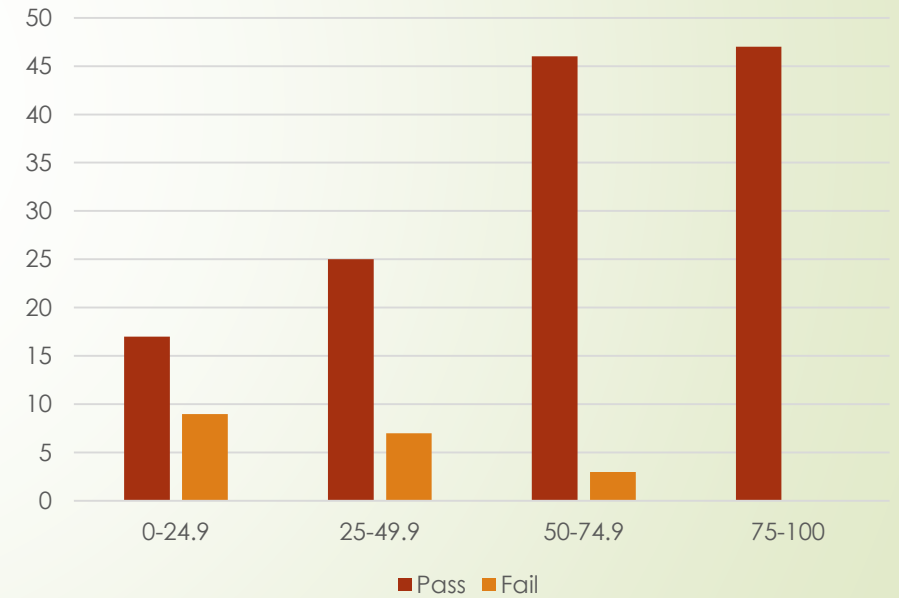
Spring 2016

Combined Mastery 1 Spring 2016



Fall 2016

Combined Mastery 1 Fall 2016

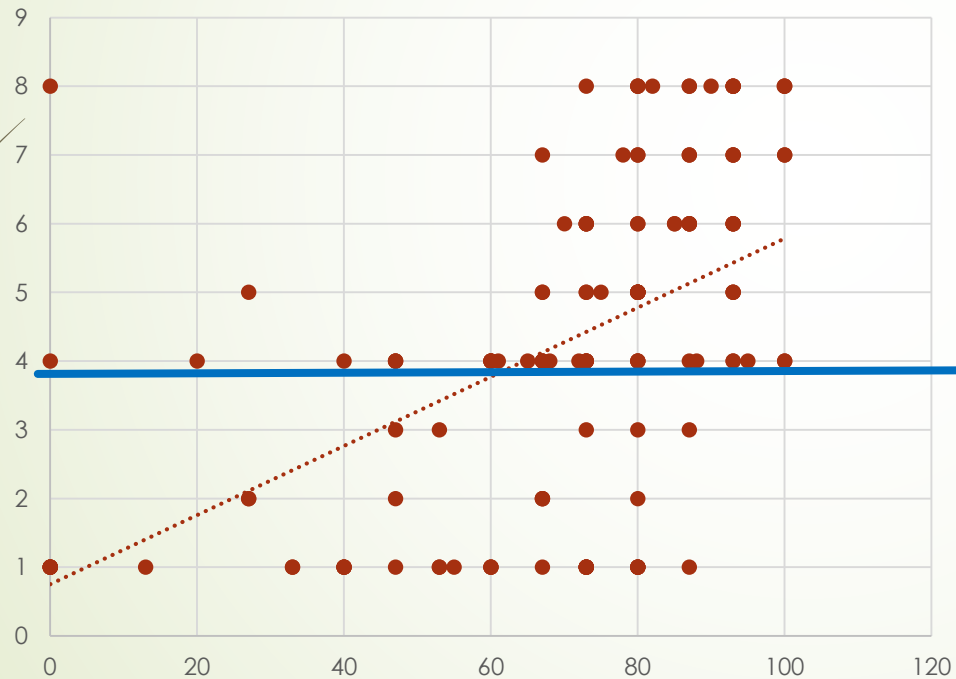


Progression-Mastery 1 (cont.)

A	8
BA	7
B	6
CB	5
C	4
DC	3
D	2
E/X	1

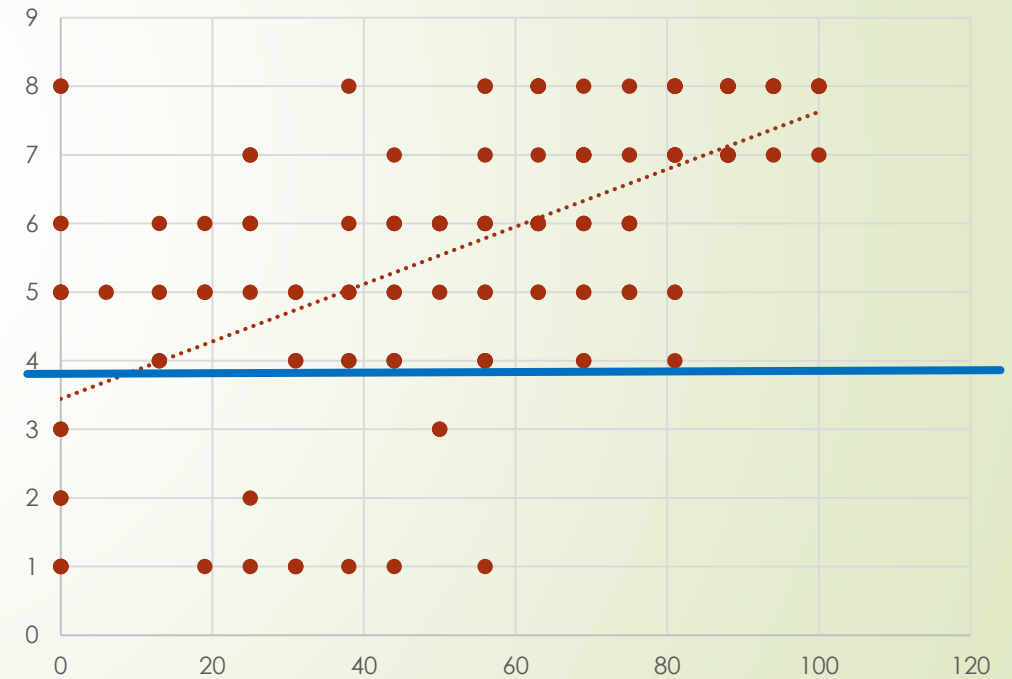
Spring 2016

Spring 2016 Plot Mastery 1



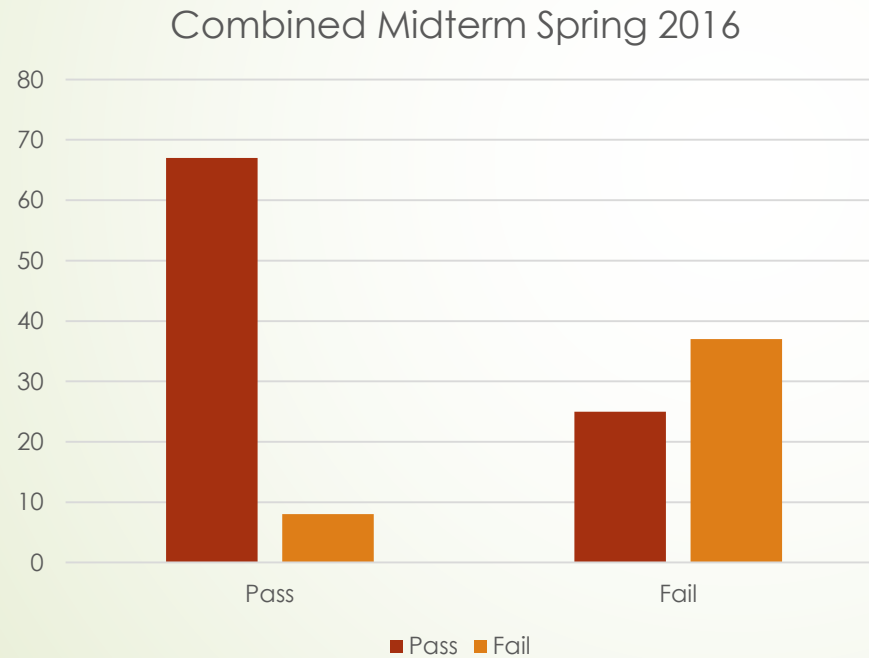
Fall 2016

Fall 2016 Plot Mastery 1

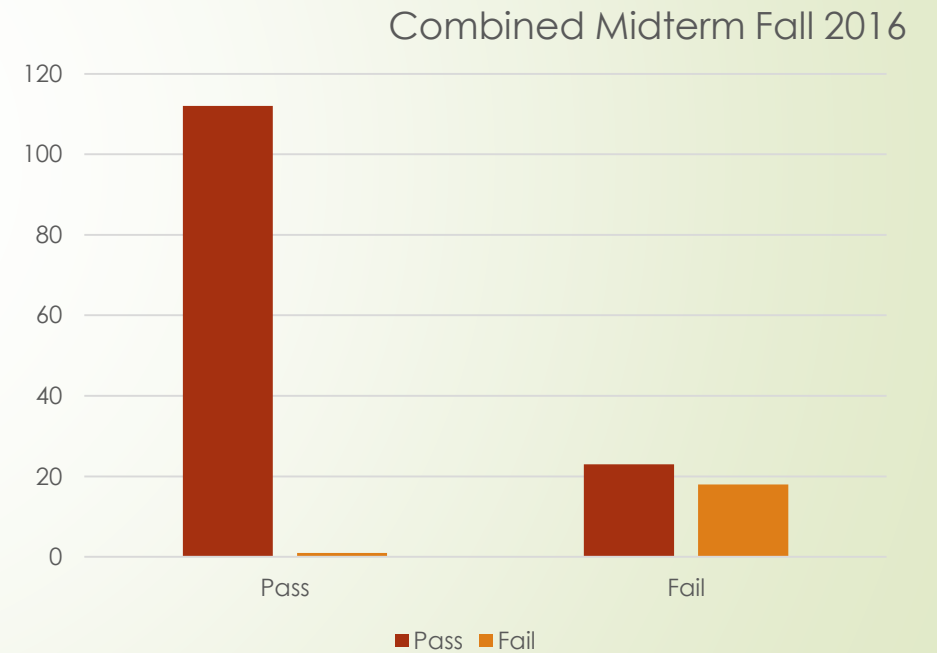


Progression-Midterm Grades to Final Grades

Spring 2016



Fall 2016



Progression- Historical Mid-Term Grades

Spring 2014	Mid-Term Grade Released?	% unsuccessful
Instructor 1	Yes	44
Instructor 2	No	47
Instructor 3	Yes	15
Instructor 4	Yes	26

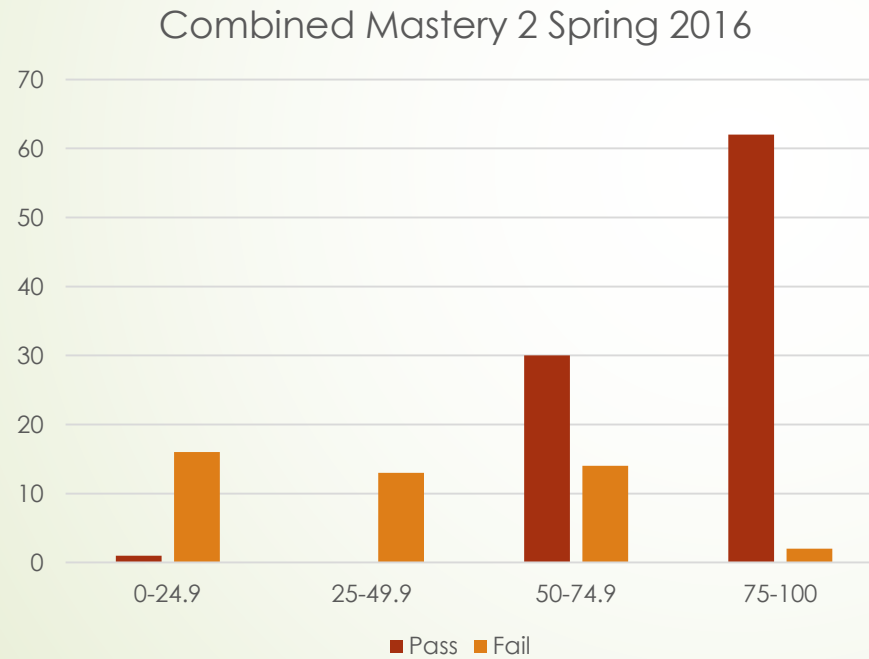
Fall 2014	Mid-Term Grade Released?	% unsuccessful
Instructor 1	No	36
Instructor 2	No	41
Instructor 3 HC	No	12
Instructor 4	Yes	22
Instructor 5	Yes	50
Instructor 6 HC	Yes	13

Spring 2015	Mid-Term Grade Released?	% unsuccessful
Instructor 1	Yes	50
Instructor 2	yes	26
Instructor 3	Yes	61
Instructor 4	Yes	31
Instructor 5	Yes	36

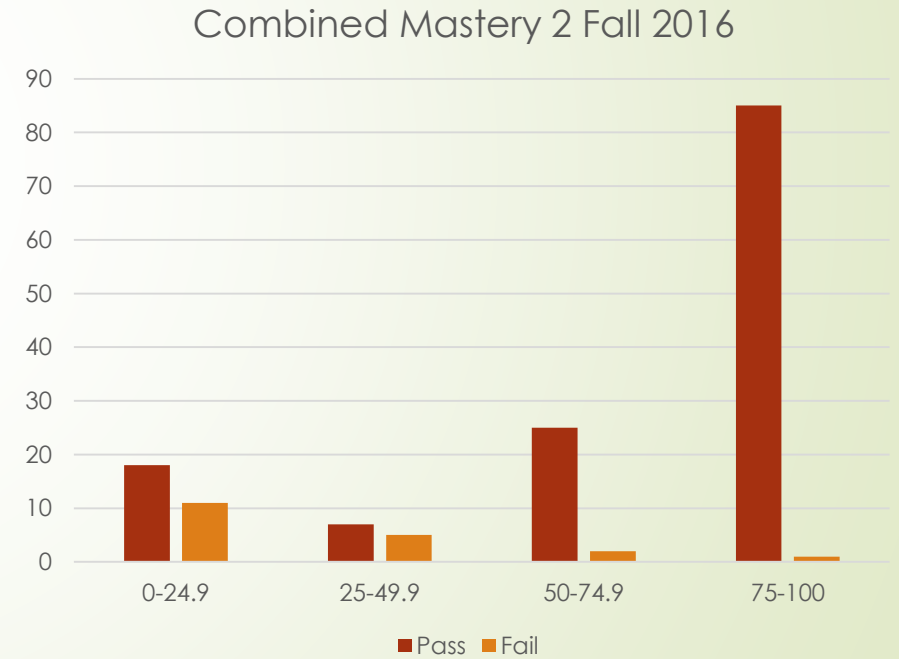
Fall 2015	Mid-Term Grade Released?	% unsuccessful
Instructor 1	Yes	23
Instructor 2	No	37
Instructor 3 HC	Yes	19
Instructor 4	Yes	34
Instructor 5	Yes	74
Instructor 6 HC	Yes	8

Progression-Mastery 2

Spring 2016



Fall 2016

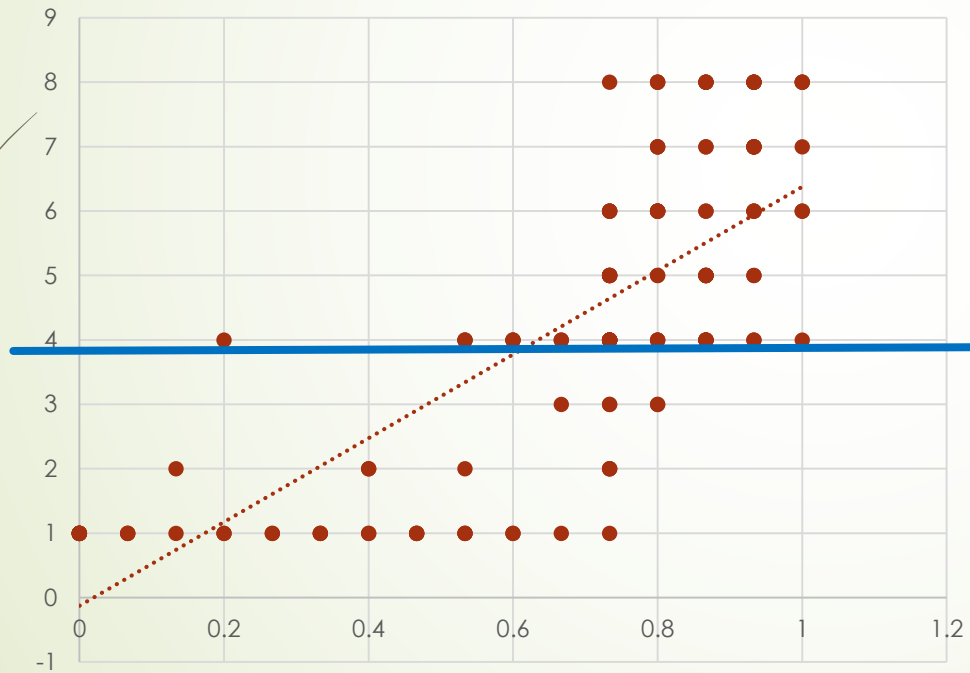


Progression-Mastery 2 (cont.)

A	8
BA	7
B	6
CB	5
C	4
DC	3
D	2
E/X	1

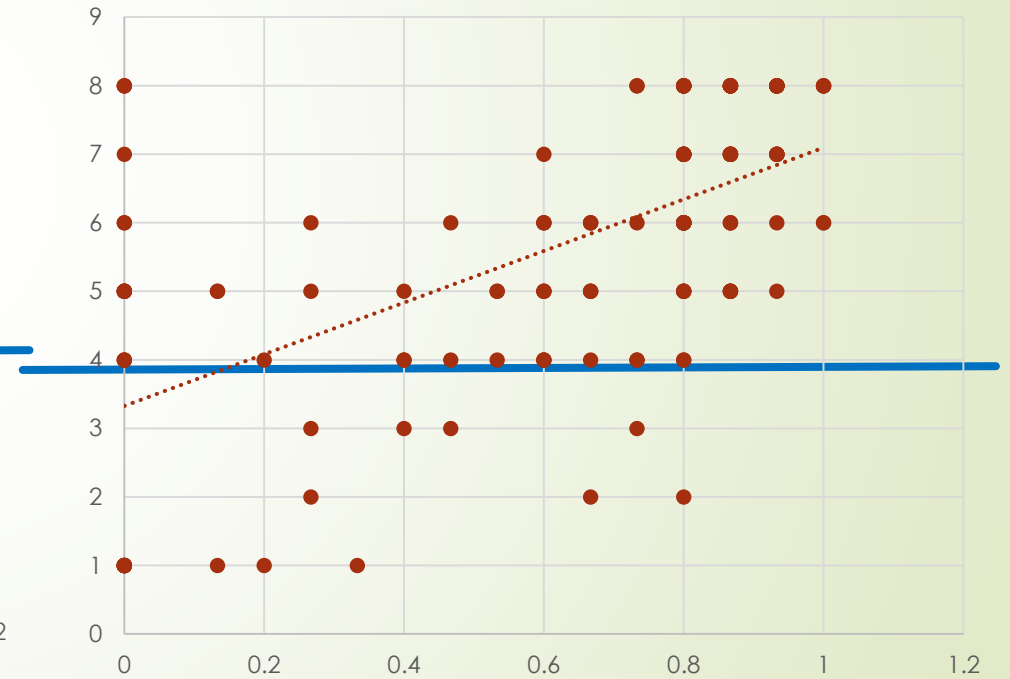
Spring 2016

Spring 2016 Plot Mastery 2



Fall 2016

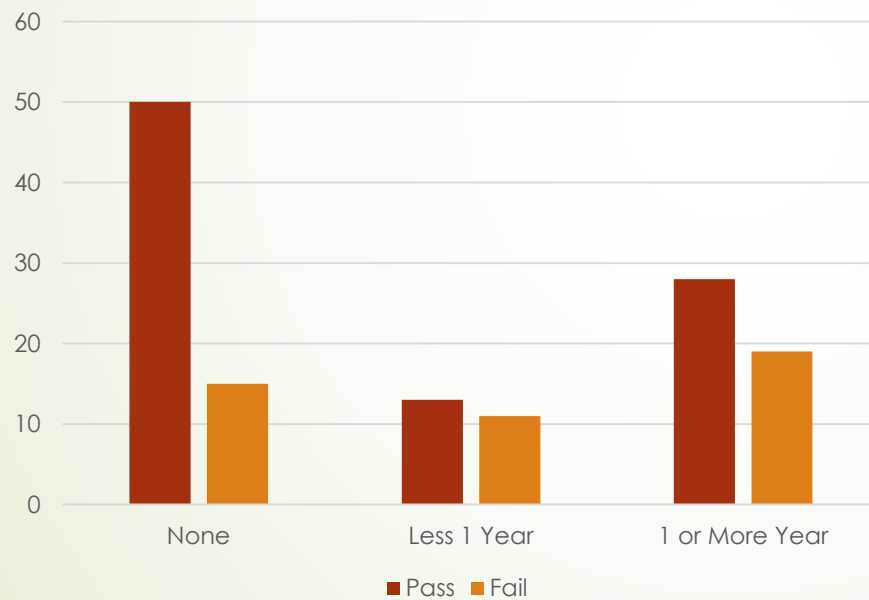
Fall 2016 Plot Mastery 2



Time Gap

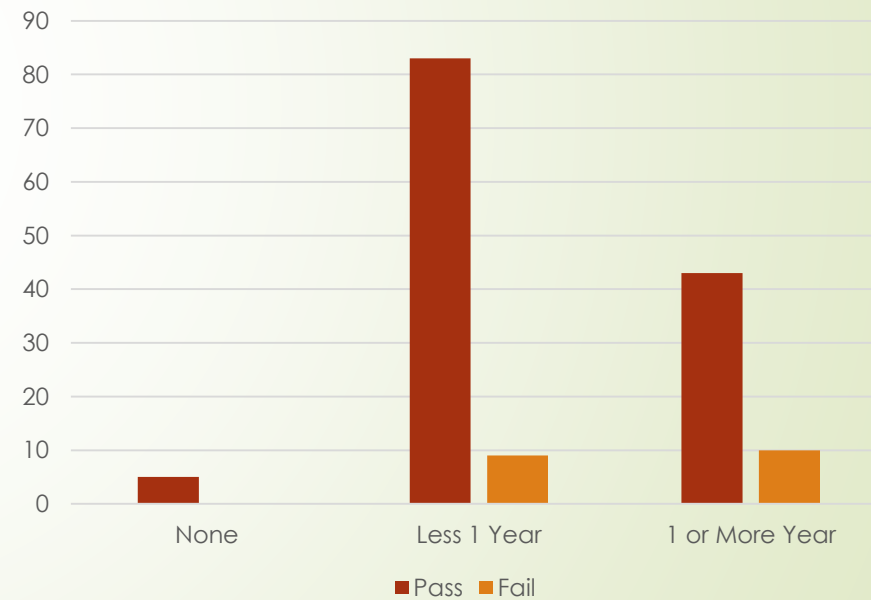
Spring 2016

Spring 2016 Combined Gap



Fall 2016

Fall 2016 Combined Gap



Time Gap Influence on Pre-Requisite Knowledge

Mastery 1 Averages			
Spring 2016	Males (%)	Females (%)	Combined (%)
No Gap	77.5	76.6	77.34
Less 1 Year	70.8	80.4	72.53
1 or More Year	60.3	73.2	62.62

Initial Assessment Averages			
Spring 2016	Males (%)	Females (%)	Combined (%)
No Gap	54.3	57.6	54.89
Less 1 Year	49.2	54.7	50.19
1 or More Year	46.4	50.9	38.05

Mastery 1 Averages			
Fall 2016	Males (%)	Females (%)	Combined (%)
No Gap	48	19	41.92
Less 1 Year	59	65.1	60.28
1 or More Year	46.2	52	47.42

Initial Assessment Averages			
Fall 2016	Males (%)	Females (%)	Combined (%)
No Gap	48	42	46.74
Less 1 Year	52.5	53.6	52.73
1 or More Year	45.7	42.5	45.03



What does all of this mean?

- Placement Is Key
 - Consistent preparation from MATH 1180
 - No ACTion needed from ACT scores
 - Reduce A.O
- Progression Through Course
 - Initial Assessment is not a good indicator
 - Mastery 1&2 show clear trends
 - Helpfulness of mid-term grades
- “Mind The Gap”
 - The longer a gap exists between classes, the less likely the student will be successful in MATH 1220



Thank You!