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Applying Mathematics to the Future  
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# Comparing Traditional and Accelerated PreCalculus Courses

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# Eastern Connecticut State University

## Traditional

### **MAT 155 – PreCalculus Mathematics**

#### **Course Description**

- Topics include the study of functions, domain and range, building new functions through algebraic operations, composition of functions, and inverse functions.
- The course will also include the study of families of functions such as polynomial, rational, radical, exponential, logarithmic, and trigonometric functions. Specifically, students are expected to gain an understanding of algebraic notation, expressions, equations, inequalities and their use in describing and interpreting relationships, functions and function notation, proportional and inversely proportional relationships, and applications of periodic phenomena and trigonometric identities.
- The use and mastery of graphing technology is an essential aspect of the course.
- This course is designed for students majoring in STEM disciplines. May also be useful to other quantitative disciplines.

## Accelerated

### **MAT 155P – PreCalculus Mathematics Plus**

#### **Course Description**

- **Integrated just-in-time Intermediate through college algebra support.**
- Topics include the study of functions, domain and range, building new functions through algebraic operations, composition of functions, and inverse functions.
- The course will also include the study of families of functions such as polynomial, rational, radical, exponential, logarithmic, and trigonometric functions. Specifically, students are expected to gain an understanding of algebraic notation, expressions, equations, inequalities and their use in describing and interpreting relationships, functions and function notation, proportional and inversely proportional relationships, and applications of periodic phenomena and trigonometric identities.
- The use and mastery of graphing technology is an essential aspect of the course.
- The course is designed for students majoring in STEM disciplines. May also be useful to other quantitative disciplines.

## Traditional

### **MAT 155 – PreCalculus Mathematics**

**Four-credit course** (of which all credits are applied toward graduation)

**Enrollment Cap:** 30

**SAT Math Range:** 570-610

**ACT Range:** 22 – 23

**Accuplacer Results:** Elementary Algebra – At least 75 and College Math - less than 60

### **Common Materials**

Has Resources Webpage

Textbook

Course Syllabi

Course Chapter

Course Formulas (formulas folder)

Final Exam Common Portion with 155P (10 questions)

## Accelerated

### **MAT 155P – PreCalculus Mathematics Plus**

**Five-credit course** (of which all credits are applied toward graduation)

**Enrollment Cap:** 25

**SAT Math Range:** 510-560

**ACT Range:** 18 - 21

**Accuplacer Results:** Elementary Algebra – At least 45 and less than 75

### **Common Materials**

Has Resources Webpage

Textbook - OER

Course Syllabi

Course Chapter & Content

Course Formulas (formulas folder)

Homework – Software (MyOpenMath)

Graphing calculator assignments - software

Required 18 hours in the MAC

Summary of Practice Exercises

Provide Chapter Summaries

Instructor Summary Information

Final Exam (30 questions)

The **Course Grading Scale** is as follows:

94	-	100	A
90	-	93	A-
87	-	89	B+
84	-	86	B
80	-	83	B-
77	-	79	C+
74	-	76	C
70	-	73	C-
65	-	69	D+
60	-	64	D
0	-	59	F

## Classification Summary

<i>Term</i>	<i>Year</i>	<i>Course</i>	<i>#sections</i>	<i>#enrolled</i>	<i>%FR</i>	<i>%SO</i>	<i>%JR</i>	<i>%SR</i>	<i>%GR</i>
<i>Spring</i>	2016	155P	2	51	82%	12%	0%	6%	0%
<i>Spring</i>	2016	155	3	49	53%	20%	12%	14%	0%
<i>Fall</i>	2016	155P	4	102	87%	10%	5%	0%	0%
<i>Fall</i>	2016	155	4	119	78%	6%	9%	7%	0%
<i>Spring</i>	2017	155P	3	76	89%	7%	3%	1%	0%
<i>Spring</i>	2017	155	2	47	55%	30%	9%	4%	2%
<i>Fall</i>	2017	155P	4	102	79%	17%	3%	1%	0%
<i>Fall</i>	2017	155	4	116	70%	20%	9%	1%	0%

## MAC Midterm Hours Summary

<i>Term</i>	<i>Year</i>	<i>Course</i>	<i>#sections</i>	<i>#enrolled</i>	<i>≥9</i>	<i>0</i>	<i>&lt;9</i>
<i>Spring</i>	2016	155P	2	51	71%	10%	20%
<i>Fall</i>	2016	155P	4	102	57%	10%	33%
<i>Spring</i>	2017	155P	3	76	58%	3%	39%
<i>Fall</i>	2017	155P	4	102	62%	9%	29%

## Midterm Grades Summary

		<i>Pass Rate(≥D)</i>		<i>Success Rate(≥C)</i>	
		<b>MAT155</b>	<b>MAT155P</b>	<b>MAT155</b>	<b>MAT155P</b>
<i>Spring</i>	<b>2016</b>	92%	88%	69%	76%
<i>Fall</i>	<b>2016</b>	79%	78%	67%	65%
<i>Spring</i>	<b>2017</b>	83%	87%	62%	74%
<i>Fall</i>	<b>2017</b>	81%	78%	72%	69%

## MAC Final Hours Summary

<i>Term</i>	<i>Year</i>	<i>Course</i>	<i>#sections</i>	<i>#enrolled</i>	<i>≥18</i>	<i>0</i>	<i>&lt;18</i>
<i>Spring</i>	2016	155P	2	51	73%	6%	22%
<i>Fall</i>	2016	155P	4	102	51%	6%	43%
<i>Spring</i>	2017	155P	3	76	55%	1%	43%
<i>Fall</i>	2017	155P	4	102	55%	4%	42%

## Common Final Exams Grades Summary

		<i>Pass Rate(≥D)</i>		<i>Success Rate(≥C)</i>	
		<b>MAT155</b>	<b>MAT155P</b>	<b>MAT155</b>	<b>MAT155P</b>
<i>Spring</i>	<b>2016</b>	61%	19%	43%	11%
<i>Fall</i>	<b>2016</b>	56%	39%	40%	22%
<i>Spring</i>	<b>2017</b>	59%	24%	46%	16%
<i>Fall</i>	<b>2017</b>	61%	29%	43%	18%

## Final Course Grade Summary

		<i>Pass Rate(≥D)</i>		<i>Success Rate(≥C)</i>	
		<b>MAT155</b>	<b>MAT155P</b>	<b>MAT155</b>	<b>MAT155P</b>
<i>Spring</i>	<b>2016</b>	80%	84%	73%	63%
<i>Fall</i>	<b>2016</b>	79%	75%	66%	58%
<i>Spring</i>	<b>2017</b>	83%	78%	79%	55%
<i>Fall</i>	<b>2017</b>	81%	76%	68%	60%

## Average GPA and Average Credit Hours Attempted/Earned Summary

		<i>Average GPA</i>		<i>Ratio of Average Credits Hours Earned to Credits Hours Attempted</i>	
		<b>MAT155</b>	<b>MAT155P</b>	<b>MAT155</b>	<b>MAT155P</b>
<i>Spring</i>	<b>2016</b>	2.62	2.37	82%	86%
<i>Fall</i>	<b>2016</b>	2.88	2.64	90%	86%
<i>Spring</i>	<b>2017</b>	2.62	2.51	85%	87%
<i>Fall</i>	<b>2017</b>	2.72	2.54	87%	86%

## INSTRUCTIONS FOR MAT 155P AND MAT 155 COMMON FINAL EXAM

1. Your common final exam has 10 questions.
2. Use the following calculation to determine the common final exam grade:

Problems 1 – 10 are show your work, each worth five points for a total of **50 points**

$$\left( \frac{\text{number of points earned}}{50 \text{ possible points}} \right) \times 100$$

**Report the scores as both a fraction and a percentage (for example  $\frac{29}{50} = 58\%$  )**

**We will round the scores to the nearest integer. (i.e. 86.5 rounds to 87 and 86.4 rounds to 86)**

3. Students will write their answers on their copy of the exam.
4. Students are allowed to use the common formulas which are to be provided by the instructor.
5. Students are allowed to use their calculators
6. Students **are not** allowed to use notes or textbooks.
7. All scratch paper should be collected and discarded in the secretary's office, Ms. Lebeau, Science 168.
8. In order to maintain the integrity of the final exams and data collection, I will be collecting them after you are finished scoring and recording them. Please bind each set of exams with a rubber band (**along with the completed orange cover sheet provided with these instructions and the answer key**) and return them to the box provided in the secretary's office.
9. There will be a box in secretary's office for you to place your **students' exams, the completed orange cover sheet and the answer key.**
10. Please contact me if you have any questions.



**INSTRUCTOR**  
**SEMESTER & TERM**  
**Math 155 Section #**

<b>Report of Scores For</b> <b>COMMON FINAL EXAM PORTION ONLY</b>	
<b>Grade</b>	<b>Number of students</b>
A	
B	
C	
D	
F	
No Shows	
<b>TOTAL</b>	

**INSTRUCTOR**  
**SEMESTER & TERM**  
**Math 155P Section #**

<b>Report of Scores For MAT 155P COMMON FINAL EXAM PORTION ONLY</b>	
<b>Grade</b>	<b>Number of students</b>
A	
B	
C	
D	
F	
No Shows	
<b>TOTAL</b>	

<b>Report of Scores For MAT 155P and MAT 155 COMMON FINAL EXAM PORTION ONLY</b>	
<b>Grade</b>	<b>Number of students</b>
A	
B	
C	
D	
F	
No Shows	
<b>TOTAL</b>	

<b>Report of Scores For MAT 155P Overall COMMON FINAL EXAM PORTION ONLY</b>	
<b>Grade</b>	<b>Number of students</b>
A	
B	
C	
D	
F	
No Shows	
<b>TOTAL</b>	

## Description of Questions on Common Portion of Final Exam

Algebra	Trigonometric
Q1. Find and simplify a difference quotient	Q8. Solve a right triangle
Q2. Find the composition of a linear and radical function	Q9. Verify a trigonometric identity
Q3. Find the inverse of a rational function	Q10. Solve a trigonometric equation
Q4. Find the slope of a line passing through two points and find the equation of a line passing through a point whose slope is parallel/perpendicular to a given line.	
Q5. Solve a quadratic equation with complex solutions	
Q6. Solve an exponential equation	
Q7. Solve a logarithmic equation	

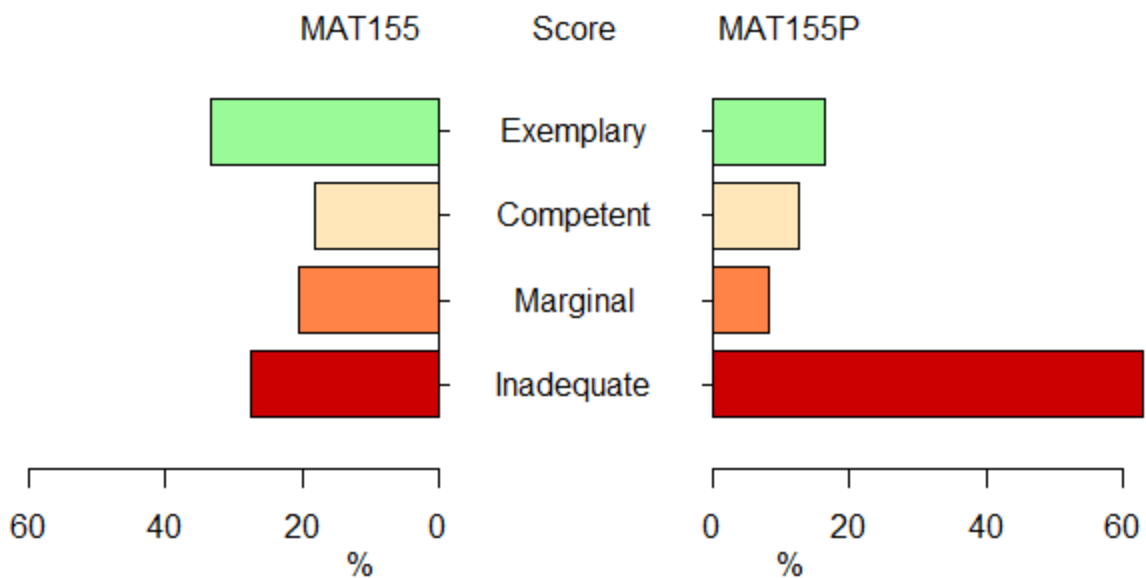
## Comparison of MAT 155 and 155P Students Performance on Common Portion of Final Exam

	Exemplary (5 pts.)		Competent (3 - 4 pts.)		Marginal (2 pts.)		Inadequate (0 - 1 pt.)	
	MAT155	MAT155P	MAT155	MAT155P	MAT155	MAT155P	MAT155	MAT155P
<b>Q1</b>	34%	17%	18%	13%	20%	8%	28%	63%
<b>Q2</b>	21%	23%	50%	23%	4%	9%	25%	44%
<b>Q3</b>	41%	13%	18%	9%	17%	21%	24%	58%
<b>Q4</b>	65%	45%	18%	23%	10%	19%	7%	13%
<b>Q5</b>	28%	25%	51%	36%	6%	7%	15%	31%
<b>Q6</b>	73%	52%	8%	6%	6%	2%	13%	41%
<b>Q7</b>	25%	10%	35%	13%	17%	4%	23%	73%
<b>Q8</b>	46%	35%	18%	16%	12%	13%	24%	36%
<b>Q9</b>	32%	28%	8%	5%	11%	5%	49%	62%
<b>Q10</b>	23%	34%	20%	8%	14%	6%	44%	52%

## Specific Questions on Common Portion of Final Exam

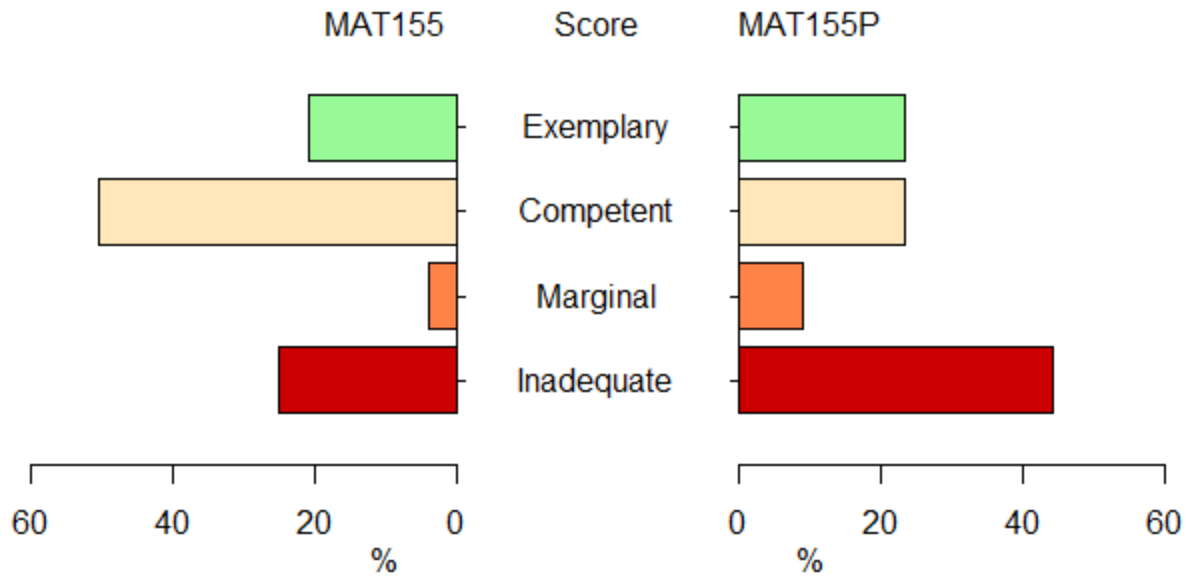
1) Summary of Academic Performance on this specific type of question below. See page 11 for question description.

	<b><i>MAT 155 (traditional)</i></b>	<b><i>MAT155P (accelerated)</i></b>
<i>Exemplary</i>	34%	17%
<i>Competent</i>	18%	13%
<i>Marginal</i>	20%	8%
<i>Inadequate</i>	28%	63%



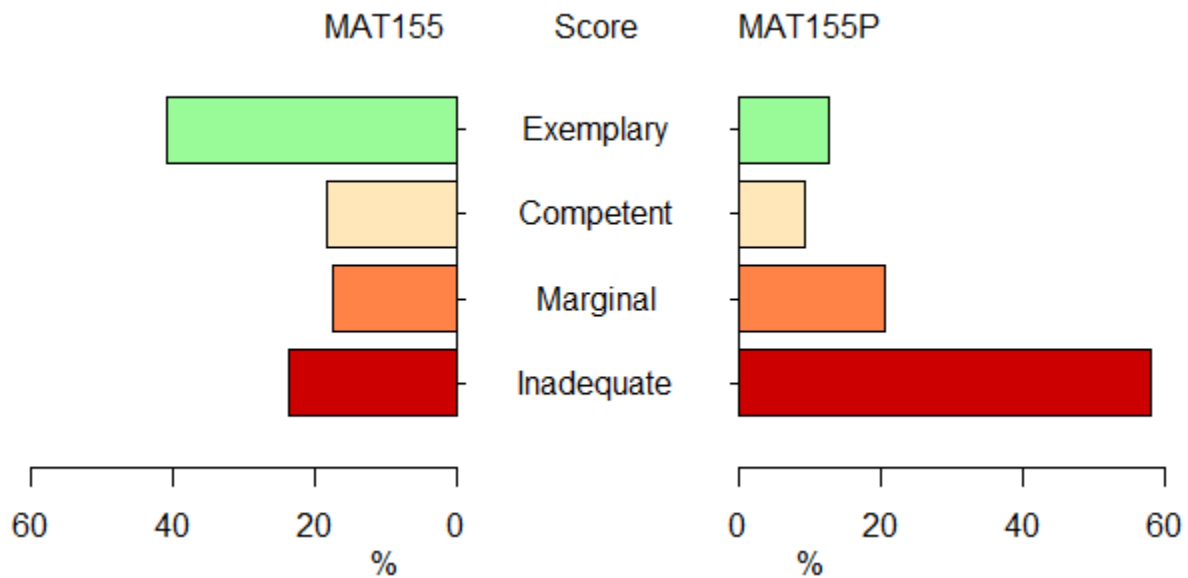
2) Summary of Academic Performance on this specific type of question below. See page 11 for question description.

	<b><i>MAT 155 (traditional)</i></b>	<b><i>MAT155P (accelerated)</i></b>
<i>Exemplary</i>	21%	23%
<i>Competent</i>	50%	23%
<i>Marginal</i>	4%	9%
<i>Inadequate</i>	25%	44%



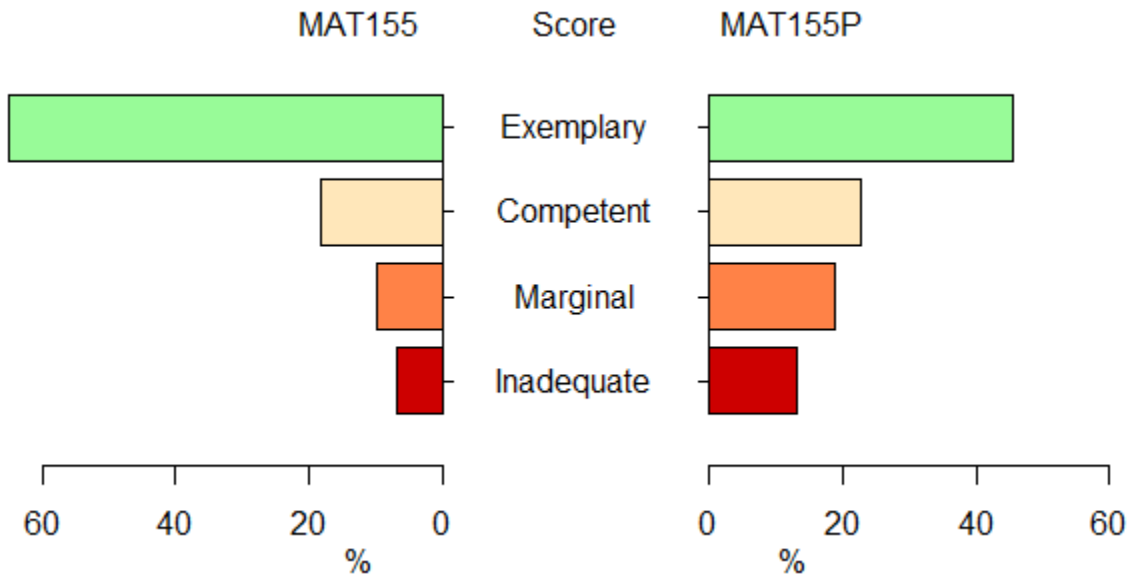
3) Summary of Academic Performance on this specific type of question below. See page 11 for question description.

	<b>MAT 155 (traditional)</b>	<b>MAT155P (accelerated)</b>
<i>Exemplary</i>	41%	13%
<i>Competent</i>	18%	9%
<i>Marginal</i>	17%	21%
<i>Inadequate</i>	24%	58%



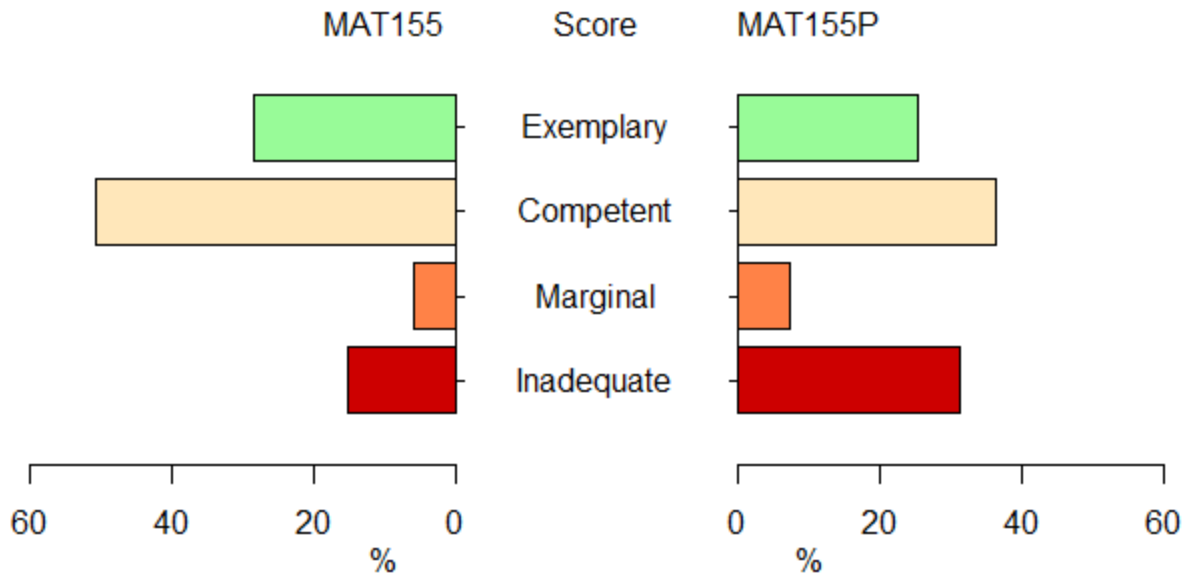
4) Summary of Academic Performance on this specific type of question below. See page 11 for question description.

	<b><i>MAT 155 (traditional)</i></b>	<b><i>MAT155P (accelerated)</i></b>
<i>Exemplary</i>	65%	45%
<i>Competent</i>	18%	23%
<i>Marginal</i>	10%	19%
<i>Inadequate</i>	7%	13%



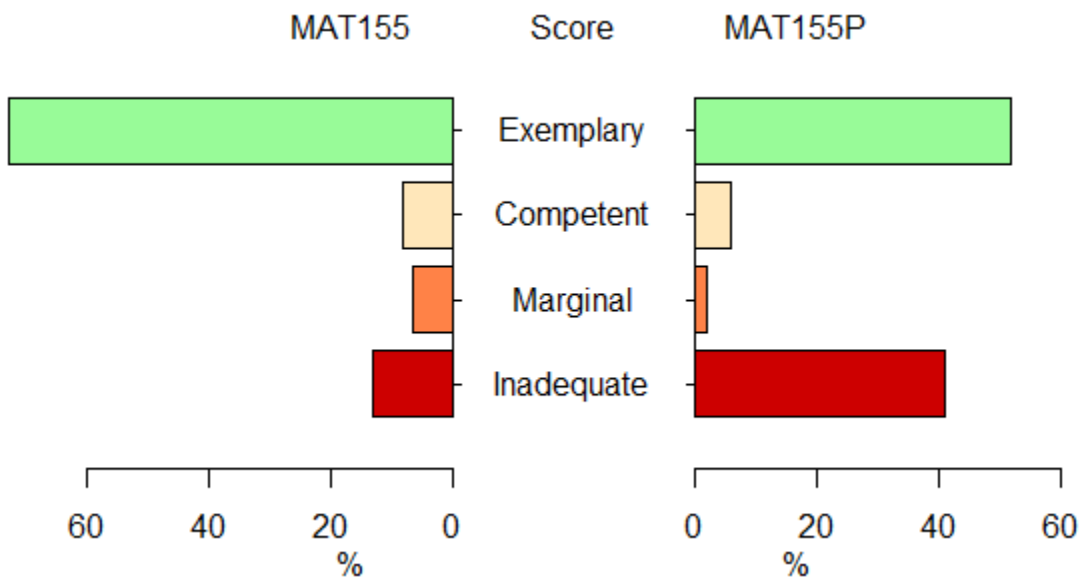
5) Summary of Academic Performance on this specific type of question below. See page 11 for question description.

	<b><i>MAT 155 (traditional)</i></b>	<b><i>MAT155P (accelerated)</i></b>
<i>Exemplary</i>	28%	25%
<i>Competent</i>	51%	36%
<i>Marginal</i>	6%	7%
<i>Inadequate</i>	15%	31%



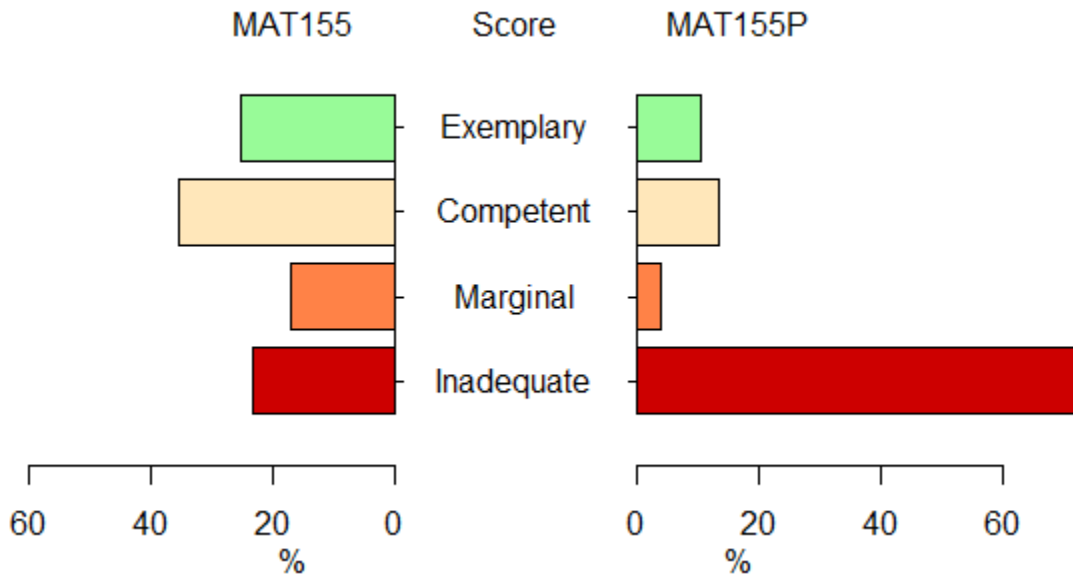
6) Summary of Academic Performance on this specific type of question below. See page 11 for question description.

	<b>MAT 155 (traditional)</b>	<b>MAT155P (accelerated)</b>
<i>Exemplary</i>	73%	52%
<i>Competent</i>	8%	6%
<i>Marginal</i>	6%	2%
<i>Inadequate</i>	13%	41%



7) Summary of Academic Performance on this specific type of question below. See page 11 for question description.

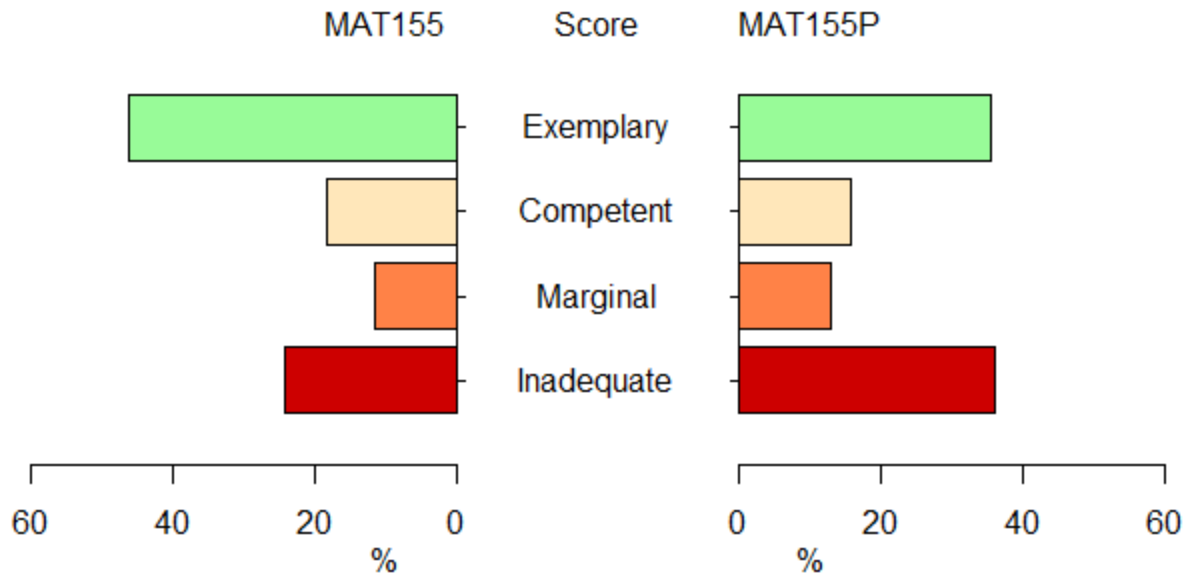
	<b>MAT 155 (traditional)</b>	<b>MAT155P (accelerated)</b>
<i>Exemplary</i>	25%	10%
<i>Competent</i>	35%	13%
<i>Marginal</i>	17%	4%
<i>Inadequate</i>	23%	73%



8) Summary of Academic Performance on this specific type of question below. See page 11 for question description.

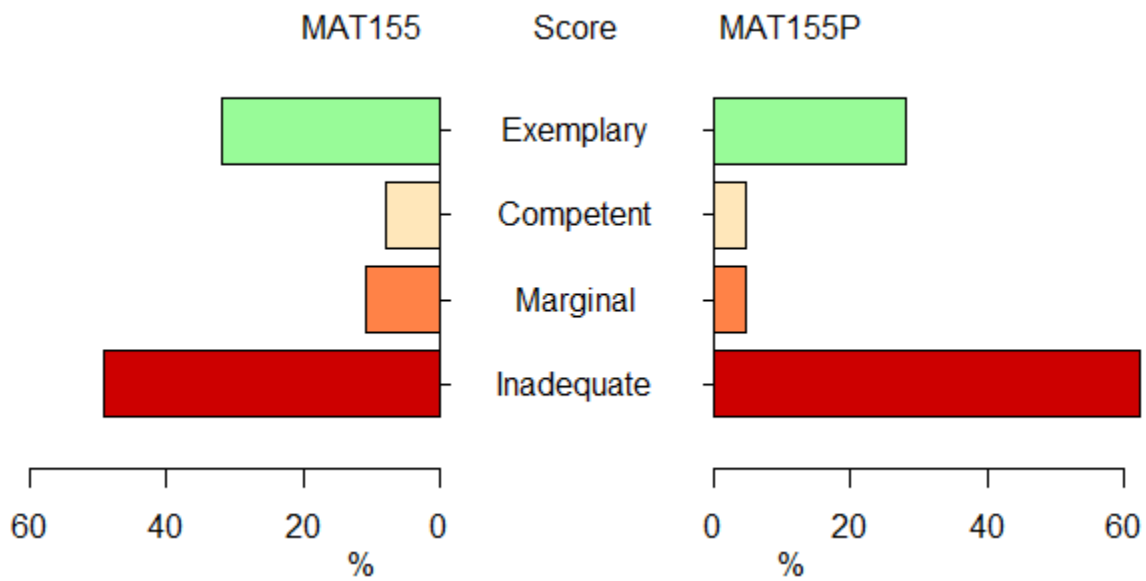
	<b>MAT 155 (traditional)</b>	<b>MAT155P (accelerated)</b>
<i>Exemplary</i>	46%	35%
<i>Competent</i>	18%	16%
<i>Marginal</i>	12%	13%
<i>Inadequate</i>	24%	36%





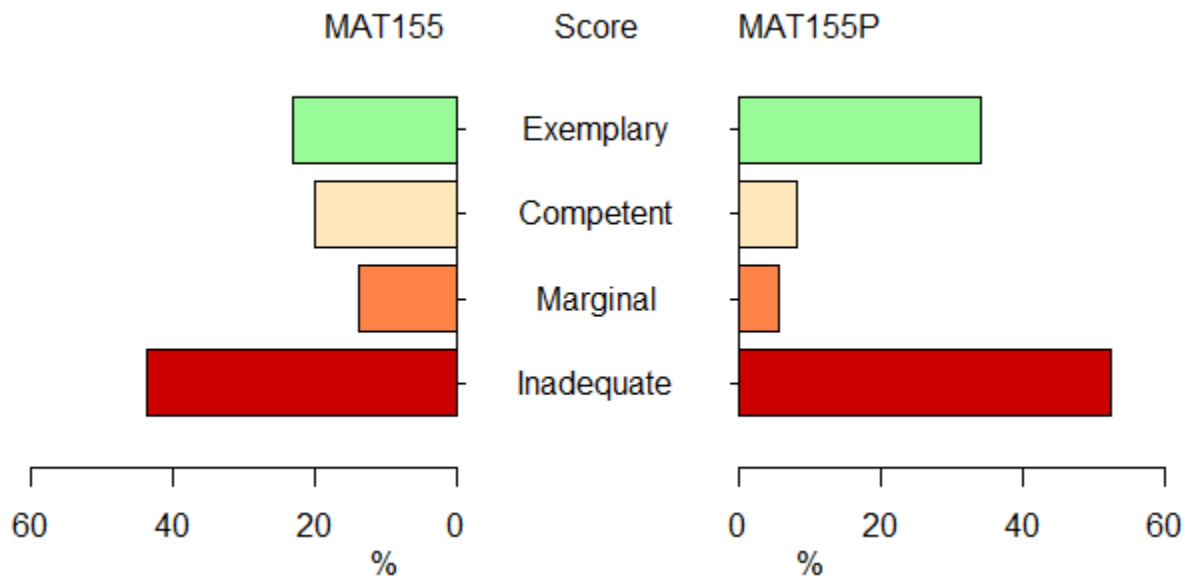
9) Summary of Academic Performance on this specific type of question below. See page 11 for question description.

	<b>MAT 155 (traditional)</b>	<b>MAT155P (accelerated)</b>
<i>Exemplary</i>	32%	28%
<i>Competent</i>	8%	5%
<i>Marginal</i>	11%	5%
<i>Inadequate</i>	49%	62%



10) Summary of Academic Performance on this specific type of question below. See page 11 for question description.

	<b><i>MAT 155 (traditional)</i></b>	<b><i>MAT155P (accelerated)</i></b>
<i>Exemplary</i>	23%	34%
<i>Competent</i>	20%	8%
<i>Marginal</i>	14%	6%
<i>Inadequate</i>	44%	52%



## Informative Eastern Math Websites

### Math Foundations Program Information

<http://www.easterntc.edu/mathematics/math-foundations-program/>

### Mathematics Placement Information

<http://www.easterntc.edu/mathematics/math-placement-information-commencing-summer-2014/>

### MAT 155P Resources Page

<http://www.easterntc.edu/mathematics/math-155p-precalculus-mathematics-plus/>

### MAT 155 Resources Page

<http://www.easterntc.edu/mathematics/math-155-precalculus-mathematics/>

## Future/Work in Progress

1. Obtain accurate percentages for final course grades (%A, B, C, D, F, CR, NC, AU)
2. Focus on closing the academic performance gap on the common portion of the final exam
3. Track students' performance in subsequent math course (MAT 243 and/or 216)
4. Perform a learning analytics and predictive modeling investigation of real-world student data to model the interplay between students' academic practices and performance.