

# A Calculus II Diagnostic that Identifies Gaps in Pre-requisite Knowledge

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# Motivation

## **MATH 101**

- is *Integral Calculus with Applications to Physical Sciences and Engineering*
- is offered in Term 2
- is a “Calculus II” (C2) course
- its only pre-requisite is: any “Calculus I” (C1) course

## **Project Goals**

- develop a formative assessment that identifies C1 knowledge gaps and predicts C2 success

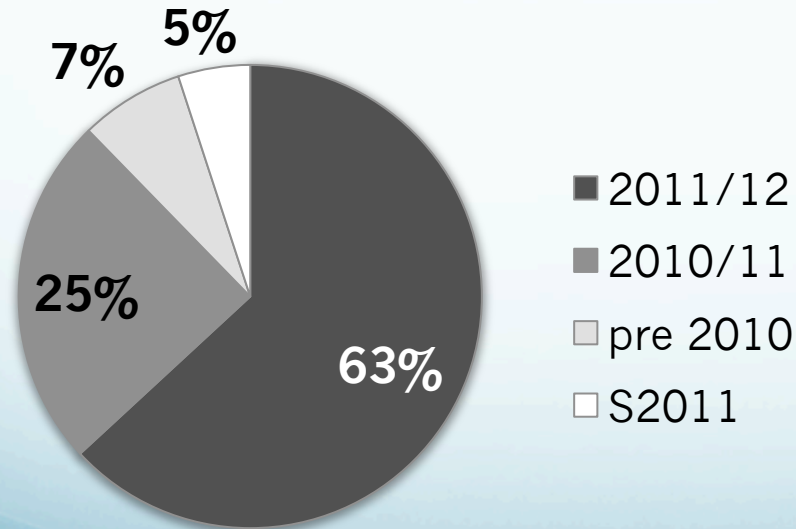
# The Diagnostic

- An in-class diagnostic test was administered
  - in one section of MATH 101,
  - in early January 2012.
- The diagnostic
  - asked students when they took C1,
  - asked students which C1 course they took,
  - contained 9 questions on C1 concepts,
  - contained multiple-choice and short answer questions, and
  - contained conceptual and computational questions

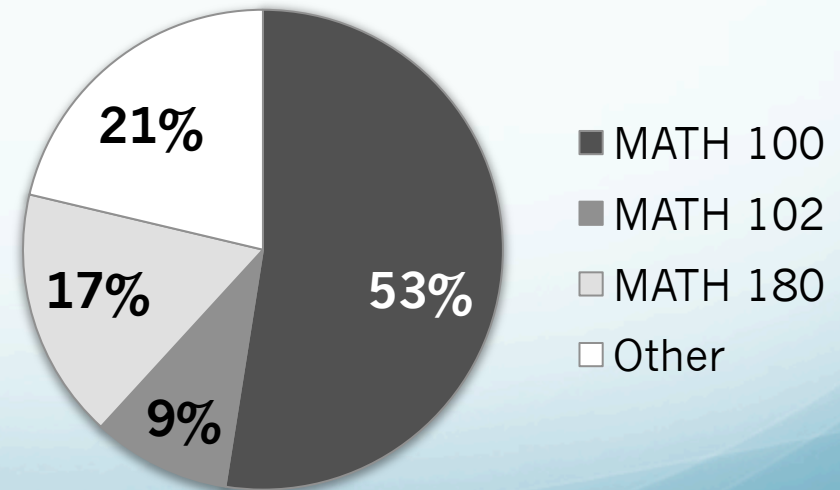
# Diagnostic Results

- 183 students wrote diagnostic
- Only 63% of students completed C1 in previous semester (2011/12)

## C1 Completion Dates



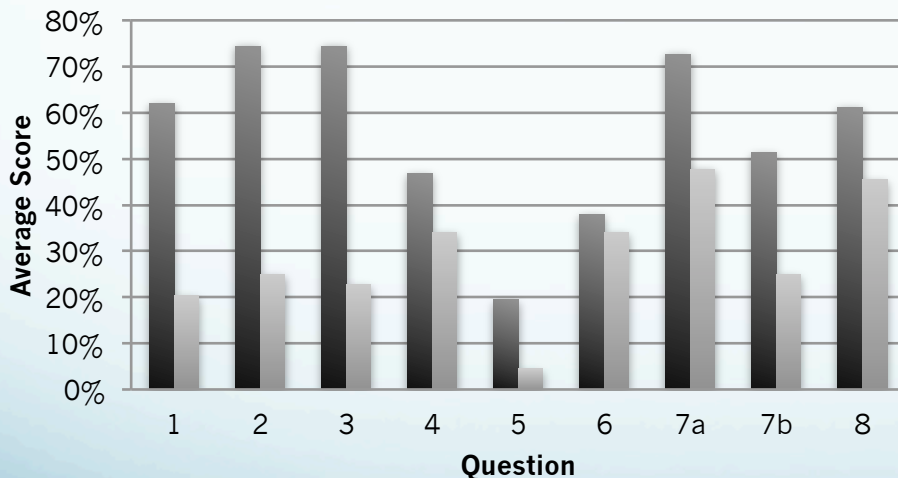
## C1 Course Distribution



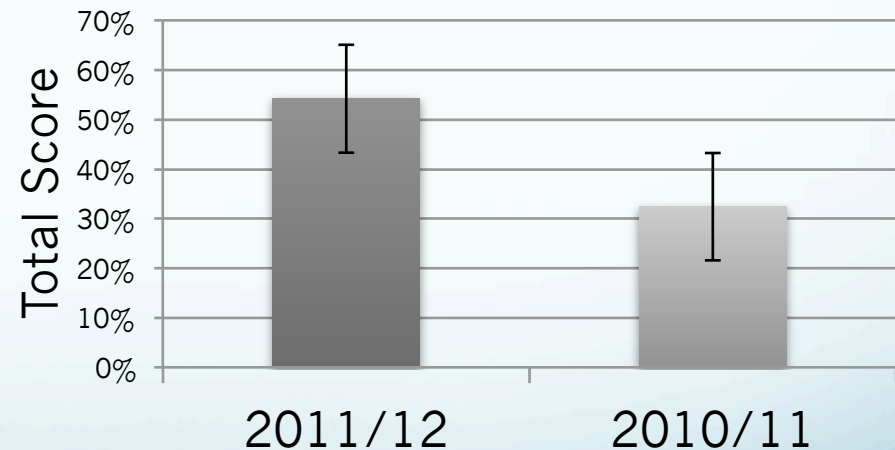
# Diagnostic Scores

- Students that completed C1 recently out-performed their peers
- Areas where students struggle identified
- Were some diagnostic questions too difficult?

## Average Score Per Question



## Total Scores on Diagnostic



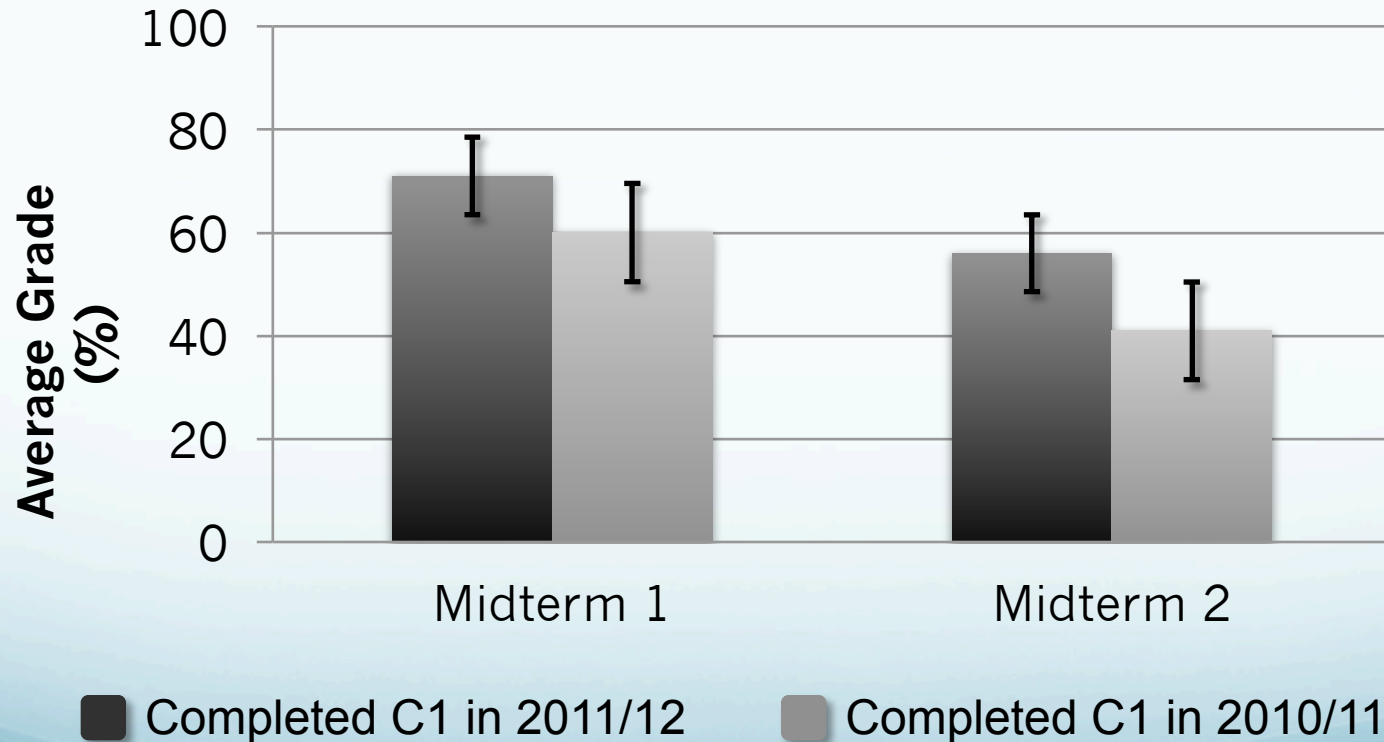
■ Completed C1 in 2011/12

■ Completed C1 in 2010/11

Difference in diagnostic total scores significant, *t*-test,  $p < 0.0002$

# Midterm Grades

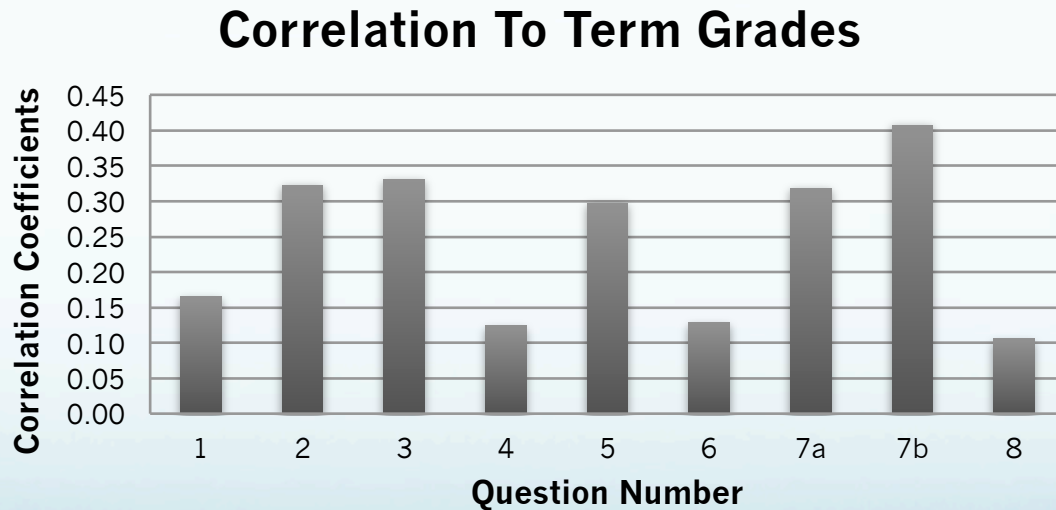
- Midterm grades higher among those that completed C1 in 2011/12
- Do 2010/11 students need additional support?



Differences significant on both midterms, *t*-test,  $p < 0.0002$

# Midterm/Diagnostic Correlations

- individual diagnostic question scores and midterm scores correlated (point-biserial coefficient)
- identified some questions that predict student success in MATH 101



# Future Work

- Further analysis with MATH 101 final grades
- Refinement of diagnostic questions for future C2 courses
- Development of learning module and assessment that address identified knowledge gaps

# Acknowledgements

Warren Code and Costanza Piccolo are gratefully acknowledged for their help with this project