The Utilization of the ETS Mathematics Major Field Test at Pittsburg State University

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History of the ETS Major Field Test at PSU

- We have been administering the paper-and-pencil based MFT to all of our seniors in our capstone course each semester since the spring of 2005
- We have data on 126 students in 15 cohorts ranging in size from 5 to 14
- All of our students (BS and BSE) are aggregated together
- We do not provided incentive for performance on the exam

History of the ETS Major Field Test at PSU

- We utilize the results for
  - Program assessment and improvement
  - Internal and external assessment report data
  - Institutional Program Review data
- To this point, we have only used the data sparingly to guide change, we really felt that we needed a large sample to be meaningful

Academic Areas for the MFT (from ets.org)

- **Exams are offered in the following disciplines [year instituted by ETS]**

Biology [1989]
Chemistry [1989]
Computer Science [1989]
Criminal Justice [2001]
Economics [1989]
Literature in English [1989]
Mathematics [1989]
Music [1989]
Physics [1989]
Political Science [1989]
Psychology [1989]
Sociology [1989]

- **And for the following programs**

Associate Degree in Business [2007]
Bachelor's Degree in Business [1990]
Master of Business Administration [2002]

Format for the MFT (from ets.org)

- **Major Field Tests offers flexible options**
  - **There are no preset test administration dates**
  - **You can customize the Major Field Tests content by adding up to 50 locally authored test questions for tests administered on campus**
  - **You can choose between paper-and-pencil and online testing**

Format for the MFT (from ets.org)

- The Major Field Test consists of multiple choice questions ranging from 50 for Math to 150 each for Biology, Criminal Justice , and English Literature
- The questions are drawn from the courses of study most commonly offered as part of an undergraduate curricula or the MBA
- Programs can choose when and where to administer the tests

Format for the MFT (from ets.org)

- The tests are designed to take two hours and may be split into two sessions
- The tests must be given by a proctor
- Most areas (including math) state that mathematical operations do not require the use of a calculator
- There is only one version of each test and it is revised every 4-5 years

Costs (from ets.org)

Number of Tests Ordered	Price per Each Subject Test
Undergraduate Online Tests	
1–99	$25
100 or more (single orders)	$24
Undergraduate Paper-based Tests	
1–99	$27
100 or more (single orders)	$26
MBA Tests – Online Tests	
1–99	$30
100 or more (single orders)	$25
MBA Paper-based Tests	
1–99	$31
100 or more	$26

Pricing for Special Reports (from ets.org)

- **ETS offers special data reports through a subscription service**

Special Reports	Duration	Pricing
Premium Report Package	One Year Subscription	$700
Item Information Report	One Year Subscription	$350 (a la carte)
Design Your Own Analysis	One Year Subscription	$150 (a la carte)
Subgroup Report	One Year Subscription	$200 (a la carte)
Custom Comparative Data Report	One Year Subscription	$300 (a la carte)

Data from the MFT (from ets.org)

- **Total Score**
  - Reported for each student and summarized
- **Assessment Indicators**
  - Average percent of correct answers, in a particular subject area
  - Reported only for groups of students
  - A minimum of 5 per group is required
- **Subscores**
  - Reported for each student and summarized
  - Subscores are not available for all tests

Data from the MFT (from ets.org)

- **Areas with subscores**
  - Biology
  - Chemistry
  - Economics
  - Literature in English
  - Master of Business Administration
  - Music
  - Physics
  - Political Science
  - Psychology
  - Sociology
- **Areas without subscores**
  - Associate Degree in Business
  - Bachelor's Degree in Business
  - Computer Science
  - Mathematics
  - Criminal Justice

Math Topics Covered (from ets.org)

- Calculus (~30%)
  - Single-variable calculus
  - Multivariable calculus
  - Separable differential equations
- Algebra (~30%)
  - Linear Algebra
  - Abstract Algebra

Math Topics Covered (from ets.org)

- **Additional Topics (~40%)**
  - Complex analysis
  - Differential equations
  - Discrete mathematics (including graph theory and combinatorics)
  - Foundations (including logic, proofs, sets, functions and relations)
  - Geometry
  - Point-set topology
  - Probability and statistics

Literature in English Topics Covered

- British Literature Pre-1660 (20–25%)
- British Literature 1660–1900 (20–25%)
- American Literature to 1900 (20–25%)
- British and American Literature 1901–1945 (15–20%)
- Literature in English since 1945 (15–20%)
- Literary Sources and Influences (Classical, Biblical, Continental and Comparative) (5–10%)

Criminal Justice Topics Covered

- The Law (~20%)
- Law Enforcement (~20%)
- Corrections (~20%)
- The Court System in the United States (~20%)
- Theories of Criminal Behavior (~20%)

Criminal Justice also has two other overlapping categories

Criminal Justice Topics Covered

- **Critical Thinking (overlapping and drawn from all content areas) requires students to:**
  - **Draw inferences from theories and data**
  - **Recognize unstated assumptions**
  - **Deduce conclusions from information presented**
  - **Interpret and weigh evidence**
  - **Evaluate the strengths of comparative arguments**
  - **Apply knowledge to new problems**
  - **Read and interpret tables of data and graphs**
  - **Recognize the strengths and limitations of both quantitative and qualitative data**
  - **Compare and contrast subjects and ideas**

Criminal Justice Topics Covered

- **Research Methodology and Statistics (overlapping and drawn from all content areas) requires students to understand:**
  - **Quantitative and qualitative methods**
  - **Research design (including basic and applied approaches and ethics in research)**
  - **Statistics with application to criminal justice subject matter**
  - **Sampling**
  - **Statistical software**
  - **Hypothesis testing**

Math Assessment Indicators (from ets.org)

- Reported for the group* only
  - Calculus (15)
  - Algebra (15)
  - Routine (27–28)
  - Nonroutine (12–13)
  - Applied (10)

Numbers in parentheses are the approximate number of questions in each category

*A minimum of five (5) students is required for assessment indicators to be reported

Psychology Assessment Indicators

- **Reported for the group* only**
  - **Memory and Cognition (19)**
  - **Perception/Sensation/Physiology (22)**
  - **Developmental (15)**
  - **Clinical/Abnormal (15)**
  - **Social (16)**
  - **Measurement and Methodology (29)**

Numbers in parentheses are the approximate number of questions in each category

***A minimum of five (5) students is required for assessment indicators to be reported**

Sociology Assessment Indicators

- **Reported for the group* only**
  - **General Theory (21)**
  - **Methodology and Statistics (21)**
  - **Criminology and Deviance (15)**
  - **Social Stratification (15)**
  - **Race, Ethnicity, Gender (15)**
  - **Social Institutions (15)**
  - **Social Psychology (11)**
  - **Gender (15)**
  - **Global (13)**

Subscores (from ets.org)

- **Some are just an aggregation of Assessment Indicators as with Physics**

Assessment Indicators	Subscores
Classical Mechanics and Relativity (13)	Introductory Physics (38)
Electromagnetism (12)	
Optics and Waves; Thermodynamics and Statistical Mechanics (13)	
Quantum Mechanics and Atomic Physics (16)	Advanced Physics (32)
Special Topics (12)	

Subscores (from ets.org)

- **Others are unrelated as with Political Science**

Assessment Indicators	Subscores
Comparative Government and Politics (22–30)	Analytical and Critical Thinking (20–26)
International Relations (22–30)	Methodology (7–14)
United States Government and Politics (48–56)	Political Thought (11–20)

Math Sample Questions (from ets.org)

1. On a questionnaire, a respondent must choose 3 of the 5 questions presented. How many different combinations of 3 questions can the respondent possibly choose?

   (A) 10
   (B) 15
   (C) 20
   (D) 30
   (E) 60

Math Sample Questions (from ets.org)

7. A portion of the graph of a continuous nonnegative function $y = \psi(x)$ is shown above, where $\psi(0) = 0$ and $\psi\left(\frac{1}{n}\right) = 0$ for each positive integer n. If the graph of $y = \psi(x)$ between $x = \frac{1}{n+1}$ and $x = \frac{1}{n}$ consists of the congruent sides of an isosceles triangle of height 1 for each positive integer n, then $\int_0^1 \psi(x)\,dx =$

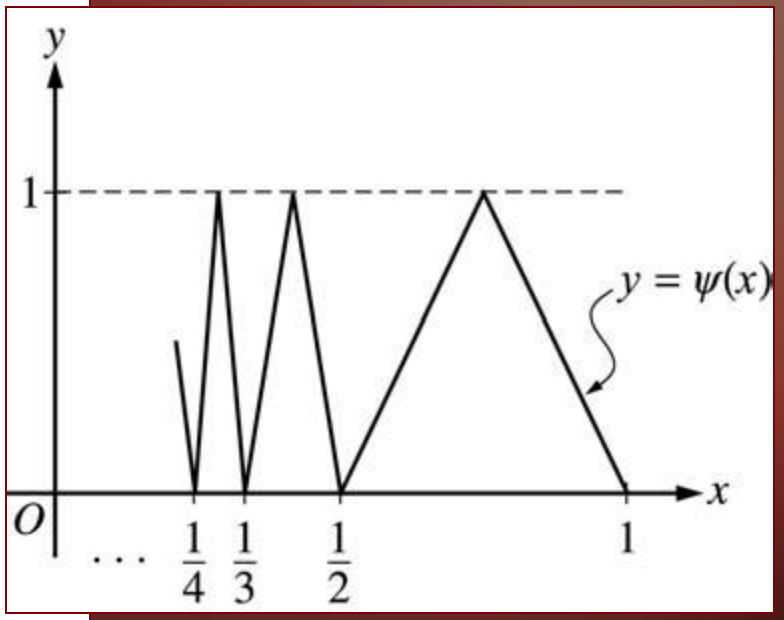
(A) $\frac{1}{2}$

(B) $\frac{1}{4}$

(C) $\frac{1}{\pi}$

(D) $\frac{1}{e}$

(E) $\frac{2}{e}$



Math Sample Questions (from ets.org)

10. If V_n is the real vector space of all n-tuples of real numbers for each $n > 1$, which of the following must be true?

    I. Every basis of V_n contains exactly n vectors.
    II. Every basis of V_n is an orthogonal set of vectors.
    III. Every set of $n + 1$ vectors of V_n is a linearly dependent set.

    (A) I only
    (B) II only
    (C) I and II
    (D) I and III
    (E) II and III

Biology Sample Question (from ets.org)

8. The membranes of mitochondria, chloroplasts, and bacteria are all directly involved with all of the following EXCEPT

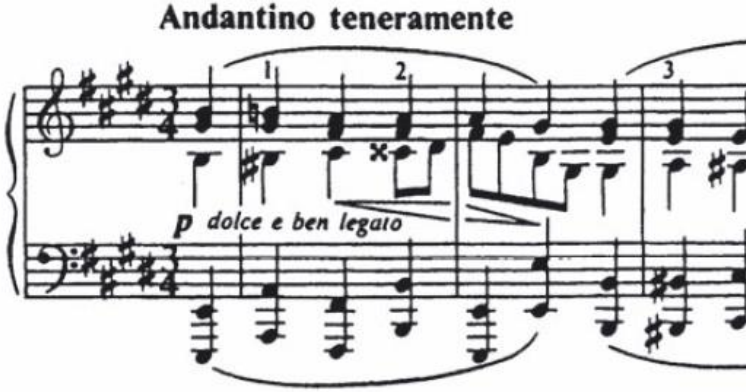
(A) generation of ATP
(B) generation of chemical gradients
(C) generation of electrical potentials
(D) pumping ions against concentration gradients
(E) catalyzing the reactions of the Krebs cycle

Business Sample Question (from ets.org)

9. Within the context of the capital asset pricing model (CAPM), the risk measure known as beta is often computed by regressing the return of the company's stock against the

   (A) return on the company's bonds
   (B) return on the market portfolio
   (C) change in the gross domestic product
   (D) change in the consumer price index

Music Sample Question (from ets.org)



5. Above the first staff, five beats are labeled 1 through 5. The interval of a diminished octave is found at the beat labeled

(A) 1
(B) 2
(C) 3
(D) 4
(E) 5

Individual Student Report

ETS

Major Field Tests

Mathematics

Form Code 4AMF

STUDENT SCORE REPORT

Name :	**ISAAC NEWTON**	**Student Id :**	**0000001**
Test Date :	**4/12/1657**	**Authorization Number :**	**0001**

Scaled score 143 **Overall SEM= 8.8***

The Scale range for the total score is 120-200 and for subscores is 20-100.

Individual Student Report

*SEM is the Standard Error of Measurement that reflects the inherent error that is a part of any testing process. Each SEM provided is based upon a large sample of test takers. Subtracting the SEM from your score twice to obtain a minimum and then adding the SEM to your score twice to obtain a maximum will provide a range of scores. If you were to take any number of tests equivalent to the one you have just completed, your score would fall within this range with a statistical confidence level of 95%.

For example, if the given SEM for a score was 2.5, and the achieved score was 150, then 150 minus 5 equals 145 and 150 plus 5 equals 155 (where 5 is equal to 2.5 times 2). This means that 95% of the time if you took a test that was equivalent to the test that you just took you would score within the range of 145 to 155.

To compare your score with the current national comparative data, go to the MFT Comparative Data Guide on the web at www.ets.org/hea/mft/compare.html.

ETS protects the confidentiality of student data.

Assessment Indicator Report

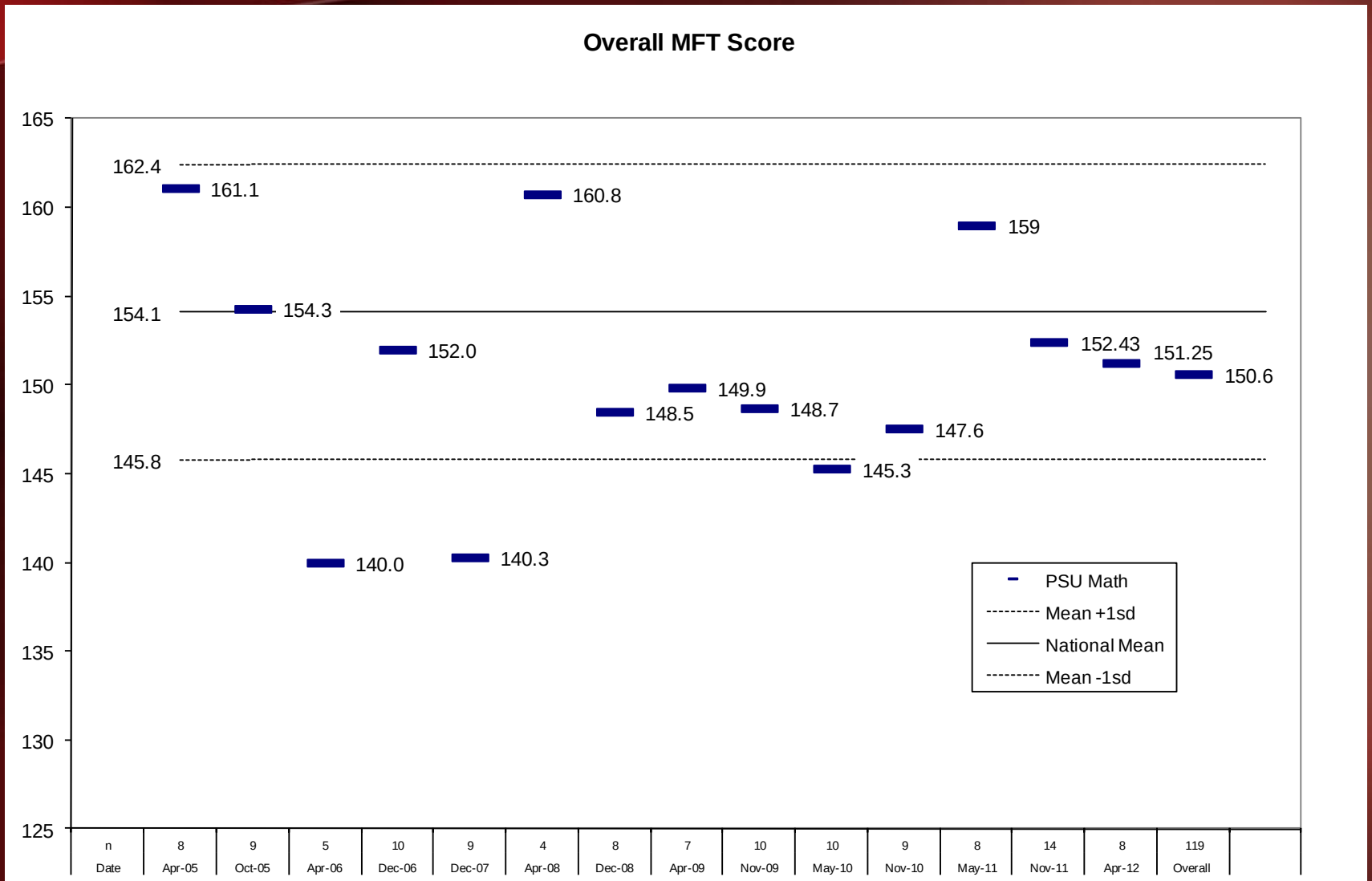
DEPARTMENTAL SUMMARY OF ASSESSMENT INDICATORS

Test: Mathematics
Form Code: 4AMF
Institution: Pittsburg State University
Cohort: Combined
Closed on: Combined

Assessment Indicator Number	Assessment Indicator Title	Mean Percent Correct
1	Calculus	27
2	Algebra	34
3	Routine	30
4	Nonroutine	21
5	Applied	34

Students responding to less than 50% of the questions: **0**
Students in frequency distribution: **7**
Students tested: **7**

How We Track and Report the Data



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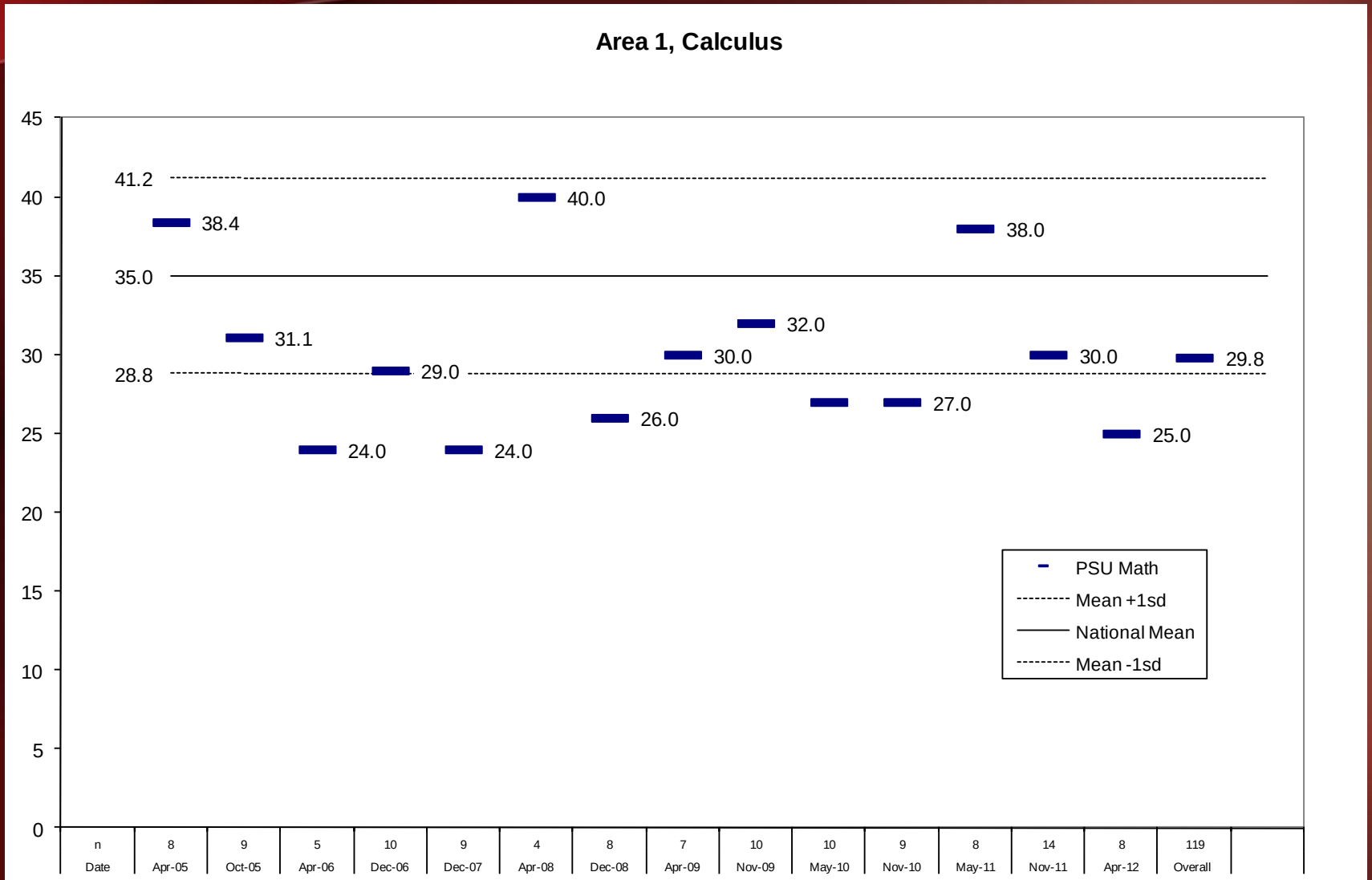

Thank You!

- **Questions**

- **Contact information**
  - *Tim Flood*
  - *Math Department*
  - *Pittsburg State University*
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