

April 2003

Minutes April 14, 2003

Follow this and additional works at: https://opencommons.uconn.edu/senate_minutes

Recommended Citation

"Minutes April 14, 2003" (2003). *Minutes*. 17.

https://opencommons.uconn.edu/senate_minutes/17

MINUTES OF A MEETING OF THE UNIVERSITY SENATE

Ms. Spiggle, Moderator, officially called the regular meeting of the University Senate of April 14, 2003 to order at 4:06 p.m. in Room 3, Bishop Center.

1. The Minutes of the regular meeting of the University Senate on March 10, 2003 were approved as distributed.
2. Report of the President

President Austin reported on the following items:

- UCPEA has agreed to a one-year pay freeze similar to the AAUP agreement. These agreements reflect positively on the University and our staff and faculty.
- He thanked those who participated in the University events regarding the war in Iraq.
- He offered special thanks to John DeWolf and the Substance Abuse Task Force for their efforts and praised their efforts.
- He announced that John Martin has accepted the position of President of the UConn Foundation. Mr. Martin is an experienced administrator from the University of Maryland.
- He congratulated the following faculty, honored as Board of Trustees' Distinguished Professors: Gary English, Deborah Fein, Debra Kendall, Philip Marcus, and Robert Weiss.

Ronald Taylor, Vice Provost for Multicultural Affairs clarified that upcoming Diversity Training Workshop is not for faculty. A faculty-focused workshop will be scheduled soon.

3. The Report of the Senate Executive Committee was presented by Mr. Faustman.
(See Attachment #31)
4. The Annual Report of the University Budget Committee was presented by Mr. Smith
(See Attachment #32)

Mr. Schaefer requested the results of the survey included in the report be made available once they are compiled.

5. The Report of the Nominating Committee was presented by Senator Hiskes.
(See Attachment #33)

The report contained recommendations for the chairpersons and members of the several standing committees, to be moved for adoption at the May meeting.

6. The Report of the Curricula and Courses Committee was presented by Mr. Frank.
(See Attachment #34)

He moved the approval of a new 100-level course:

PHYS 105 - Inquiry-Based Physics

The motion passed.

7. The Report of the Senate Ad Hoc Committee on Q was presented by Mr. Frank.
(See Attachment #35)

He described the Committee's charge and reviewed major issues.

He moved the following on behalf of the Curricula and Courses Committee:

That the Senate receive the Report of the Senate Ad Hoc Committee on Q and authorize the Co-Chairs of the Senate Ad Hoc Committee on Q to proceed with implementation.

The motion passed.

8. Unfinished Business - None

9. New Business

- a. A Special meeting of the University Senate will be held on May 5th at 4 p.m. in the Bishop Center, Room 3, and will be devoted to discussion of the Report of the General Education Oversight Committee.

10. It was moved to adjourn.

The motion to adjourn was approved by a standing vote.

The meeting adjourned at 4:59 p.m.

Respectfully submitted,

Kim Chambers, Co-Secretary

The following members and alternates were absent from the April 14, 2003 Senate meeting:

Albert Alissi
Larry Armstrong
Lorraine Aronson
Larry Bowman
Pamela Bramble
Boris Bravo-Ureta
Sandra Bushmich
Adam Finkelstein
Hedley Freake
Jean Givens
Paul Goodwin
Larry Gramling
Janet Greger

Paul Hallwood
George Householder
Mohammed Hussein
Faquir Jain
Donna Korbel
Joel Kupperman
Philip Mannheim
Carl Maresh
Jean Marsden
Deborah Muirhead
Kenneth Neubeck
Michael Nichols
David Palmer

Jeremy Paul
Jerry Phillips
Jason Purzycki
Sally Reis
Stephen Ross
Tim Saternow
Vicky Triponey
Katharina Von
Hammerstein
David Wagner
Steven Wisensale
David Woods

ATTACHMENT #31

Report of the Senate Executive Committee

Presented at a regular meeting of the University of Connecticut Senate
April 14, 2003

Since the March 10th meeting of the University Senate, the SEC gathered for 2 regularly scheduled meetings, and also met on three different occasions to review applications and perform interviews for the Administrative Services Specialist position in the University Senate Office.

In addition to reports from the Chairs of the Senate Standing Committees:

1. The SEC discussed the issue of committee and sub-committee reporting structure that developed during the March 10th Senate meeting. As a point of clarification, the SEC would like to state that a sub-committee always reports to its parent committee and provides a recommendation. The parent committee then has the responsibility to consider that sub-committee's recommendation along with any other reports/materials and render a recommendation to the University Senate. If there is a lack of consensus, members of the sub-committee or committee may express their concern during discussion of any motions that result from the committee report – the discussion should be about the substance of the issue at hand. A committee chair has the authority to delegate the responsibility for providing a committee or sub-committee report to any individual that they deem qualified. The SEC endorsed this policy by a vote of 8 for and 0 against.
2. President Austin agreed to facilitate the construction of a "free speech podium" that will be available to individuals and student groups in support of the free expression of ideas so critical to the academic mission of any college or university. The SEC suggested that the podium be located in the area immediately to the north and west of the Babbidge Library. Vice President Aronson and Vice Chancellor Dreyfuss will implement the proposal.
3. The SEC reviewed 11 applications and interviewed 6 candidates for the position currently occupied by Ms. Arlene Michaud. Ms. Tammy Gifford has accepted the position and will begin working on April 18th in the University Senate office. Ms. Gifford will be introduced at the next Senate meeting.
4. The SEC reaffirmed its support for ongoing diversity training and has asked Vice Chancellor Taylor to clarify the role of the most recent training workshops that have been taking place, primarily on an audience-specific basis.
5. The GEOC will have a considerable number of items to address before semester's end and the SEC has authorized an additional meeting of the Senate on May 5th to deal exclusively with GEOC-related business.
6. The SEC received, reviewed and approved the report of the Senate Ad Hoc Committee on Q. The SEC members wish to inform the Senate that we believe the document represents a thorough consideration of the Q requirement concept and applaud the efforts of the committee's co-chairs and membership.
7. A memo from the SEC was forwarded to Vice-Chancellor Greger, Chancellor Petersen and President Austin expressing concern over the potential loss and/or change in the health insurance fringe benefit provided to graduate student assistants.

Respectfully submitted,

Cameron Faustman, SEC Chair
Gregory Anderson
Rajeev Bansal
Pamela Bramble
John DeWolf

Jane Goldman
Scott Kennedy
Jason Purzycki
Sally Reis
C. Ernesto Zirakzadeh

ATTACHMENT #32

ANNUAL REPORT OF THE UNIVERSITY SENATE BUDGET COMMITTEE

Much of the effort of the Senate Budget Committee this year was devoted to the request from the Senate Executive Committee to do a cost estimate on the incremental costs of implementing the new General Education Requirements passed by the Senate last Spring. In this effort, we have kept the General Education Advisory Committee (GEOC) fully informed.

The Budget Committee decided to survey all of the department heads in the University (*copy of survey questionnaire attached*), with particular attention to finding out how each department would adjust to the plan to have every student take at least one 200-level W course in his/her major taught by a faculty member. We got responses from 35 out of 59 departments. We assume that those with the most urgent incremental needs have responded, though we have made some allowance for those not responding. Aggregating the replies of the 35 depts., we foresee the need for at least 20 new 200 W sections *each semester* including an estimate from the non-responding depts. The yearly estimate is thus at least 40 new 200W sections. This number is only an estimate of the incremental number assuming no major changes in the W requirements of individual schools and colleges beyond Gen. Ed. Some colleges (notably CLAS) are warning that the present number of W courses is already inadequate to provide satisfactory service to the students and to give them reasonable choice. To put this number in context, the total number of 200W sections (including some laboratory sections) listed at the University is in excess of 425 for the 2001-2002 academic year.

Using numbers for the average faculty salary (Storrs and regionals - all ranks) plus fringe benefits, we divide this number by 4 (assuming a typical 2-2 course load). This leads to an annual incremental cost for 40 sections of about \$1.2million. On the other hand, *hypothetically*, if all 40 new W sections were taught by graduate TA's at half their average annual salary plus fringe, the incremental cost would be about \$375,000. To these numbers, must be added the yearly incremental cost of the W center upgrade of \$375K/yr plus \$196K/yr for the Q center upgrade. The W and Q center numbers are those that were provided to Vice Chancellor Maryanski by the organizers of these centers. The calculations have been checked with the Director of University's Budget Office, who is a member of our Committee. We emphasize that the numbers depend critically on the assumed number new 200W sections added, which is very uncertain until implementation of the Gen. Ed. changes is actually underway.

We now consider three hypothetical scenarios, once the proposed Gen. Ed. program has been fully implemented, based on these preliminary estimates:

Scenario I (probable upper limit -all new sections taught directly by faculty, plus the W and Q center upgrades) -- Total = \$1.77 Million/yr, approximately.

Scenario II (probable lower limit -all new sections taught only by TA's, plus the W and Q center upgrades) -- Total = \$0.94 Million/yr.

Scenario III (50-50 mixture of I and II - half the faculty cost and half the TA cost) -- Total = \$1.36 Million/yr. This scenario would approximate the incremental cost of W courses taught by TA's under the supervision of a faculty member of record. No incremental cost for the administration of the GEOC (Oversight Committee) has been included, so far.

While the total number of General Education courses required under the new plan has been reduced from 8 to 6-7 (depending on whether or not there is "double-dipping" on the diversity requirement), *the total number of credits required for graduation remains fixed at the present number*. Thus, if some current Gen. Ed. courses are replaced with specialized 200's level courses in the major or a related subject (fewer megacourses), faculty demand may increase and the cost could go up. Alternatively, if students replace smaller Gen. Ed. courses taught by faculty with large lecture courses or other courses requiring more TAs, the cost could go down. A mix of these two is probable, and it is too early to tell the details here, so we estimate the reduction in the number of required Gen. Ed. courses to be *almost revenue neutral*. If some of the W and Q center costs are not actually incremental (e.g. if a director's salary is already being paid or some administrative support is already provided), these cost estimates could be slightly reduced. We note, however, that some *excess capacity* will always be needed so that students have flexibility in scheduling and making choices on their Gen. Ed. courses (preventing gridlock during registration). Student members of the Committee have told us this has often been a problem under the *current* system.

Since we are in a period of severe budget constraint, the Budget Committee believes that the incremental costs of implementing these parts of the new Gen. Ed. requirements, especially the one required 200's W course for all majors (if taught fully by faculty) are quite significant and will broadly impact the implementation of the Gen. Ed. changes passed by the Senate. We expect and hope departments and schools will make adjustments to consolidate some existing sections or eliminate some courses, which could further reduce the net number of new sections and thus reduce the cost of implementing the new Gen. Ed. requirements, which we believe are generally based on sound educational principles.

Respectfully submitted,

University Senate Budget Committee
Winthrop Smith, Chair
Thomas Anderson
Tracie Borden
Bruce DeTora
Dale Dreyfuss
Sam Gager
Lawrence Gramling

Mohammed Hussein
Philip Mannheim
Debra Kendall
Katherina von Hammerstein
David Woods
Kathleen Sanner
John Ireland
Tuuli Hakala

=====

APPENDIX:

Final DRAFT for Email distribution to All University Dept. Heads

Subject Line for email: **Dept. Head Questionnaire relating to the Budget Impact of the New General Ed. Requirements}**

11/19/02

Dear Department Head:

The Senate Budget Committee has been mandated by the Senate to help assess the budgetary impact of the new General Education requirements. As a first step, the Budget Committee in cooperation with the Chancellor's Office is requesting your response now to the questions below. In particular, we foresee that the requirement for each student to take at least one 200 level W course in his/her major could impact the staffing needs of departments. The present proposal passed by the Senate is for *all* GRE courses to be taught by regular faculty, where feasible (not TA's), with a cap of 25 students per section on the W courses.

We are attempting to focus on the incremental changes to be expected under the new requirements. We are asking you or the appropriate person in your department to fill out the attached questionnaire by email, containing the above Subject Line. Please supply your best reasonable estimates under each question below. If a particular question is not applicable to your department, please so indicate. We hope this task will not be an undue burden. Reliable estimates for budget purposes are needed now, recognizing that the target dates for implementing the new Gen. Ed. program would be Fall 2004 at the earliest. The information obtained will be shared (at least on a statistical basis) with the GEOC (General Education Oversight Committee). *To assure accuracy and fairness, we ask you to please answer the following questions as completely and factually as possible and make your response by email to <winthrop.smith@uconn.edu>, with a cc. to <fred.maryanski@uconn.edu> using the above subject line, no later than December 10, 2002.* If you have questions about how to answer or how this survey will be used, feel free to contact one of us.

For Questions 1 & 2 below, please give your best approximation if exact numbers are not available and label the answer as an approximation (e.g. with the symbol ~). The answers to Questions 1 and 2 are helpful but not as important as the subsequent questions. If the information is not readily available for Questions 1 & 2, or if you prefer not to answer, respond with an "X" to questions 1 & 2 -- we will seek the information from OIR or elsewhere.)

1) How many students did you graduate with majors in your department in the 2001-2002 academic year? _____ How many do you anticipate (best estimate) will graduate in academic years 2003? _____ 2004? _____ 2005? _____

2) How many of those majors are double majors for the current year 2001-2002? _____

3) What 200 level W and P (partial writing) courses do you currently offer (specify W or P, and how many P courses are equivalent to one W course)? [For a guide, see the current academic year enrollment spreadsheets attached below.] If a course has multiple sections please answer all questions with respect to each section. _____ What is the current enrollment? _____ What proportion are students with majors in your department? _____ How do you staff each of these (e.g. faculty, teaching assistant, adjunct)? _____ {*Insert appropriate text here and after the other questions*} _____

3a) Are the courses referred to in Question 3, open to anyone or just to majors? _____ {*insert details if applicable*}; Which courses referred to in Question 3 are open to sophomores?

4) What 200 level J (=Q+W), S (=C+W), and Z (=C+Q+W) courses do you currently offer? If a course has multiple sections please answer all questions with respect to each section. What is the current enrollment of each course? What proportion are students with majors in your department? How do you staff these (e.g. faculty, teaching assistant, adjunct, etc.)? _____

5) Does your department now have plans for new 200's level Gen. Ed. courses in the major? (Give examples or number of new sections of 25 expected and how you would teach them.)

6) Following up #5 above, do you expect the new Gen. Ed. W requirements specifically to increase or decrease the number of courses or sections in your department? If you expect a major change, please give details. _____

7a) Does your department currently provide a W course for each "major" ("Plan" in PeopleSoft terminology) associated with the department? _____ Which of these W courses are open to sophomores? _____ Are any of these courses also open to: non-majors within your school or college? (specify the specific courses) _____ Are any of these courses open to any student in the University after majors are accommodated? (specify the specific courses) _____

7b) Does your department propose to use 200's level Gen. Ed. W courses in *another department or school* to fulfill the 200's W course requirement in the major because of staffing or other limitations? If so, for each "Plan" or "major", specify the other department or school and the courses if possible. _____

8) If your department does not now offer 200-level W courses in the major, will it be feasible to offer the one new mandated 200's level W course (taught by faculty) for each of your majors in the future? _____ Are there problems either with the content of such a course or with sufficient teaching staff (faculty, not TA's) for you to implement this new planned Gen. Ed. requirement? _____

9) Does your department expect to introduce *other (non-W)* new Gen. Ed. courses under the new plan? _____ Estimate the number of new courses/sections and give examples where possible.

10) Under the new Gen. Ed. rules, students may take fewer Gen. Ed. courses than before (e.g. 6-7 courses rather than 8, if one or 2 are "double-dipped" serving both a content area course and the

diversity requirement simultaneously). a) How will this affect enrollment in the Gen. Ed. courses your department is currently teaching? _____

b) What types of courses do you think your majors will take in lieu of the Gen. Ed. courses they are no longer required to take. _____

c) Do you think mounting the additional (non Gen. Ed.) courses needed to fulfill the 120 credit graduation requirement will require additional net teaching resources in your department? Be as specific as possible. _____

Note: we are attaching a short file summarizing the differences between the new and old Gen. Ed. requirements. The exact wording of the regulations as passed by the Senate may be found on the Senate's Web site at <http://vm.uconn.edu/~wwwsenat/>.

We appreciate your valuable help!

Sincerely,

Fred Maryanski, (Vice Chancellor, U-2086, fred.maryanski@uconn.edu);

Winthrop Smith (Prof. Physics, U-3046, Ext. 6-3573, winthrop.smith@uconn.edu, Chair, University Senate Budget Committee)

ATTACHMENT #33
STANDING COMMITTEES 2003-2004

Curricula and Courses	Enrollment	Faculty Standards
*Robert Jeffers, Chair Michael Darre *Laurie Best Janice Clark Anthony DePalma *Anne Hiskes Dean Hanink *Robert Jeffers Steven Maxson *Judith Meyer *Stephen Ross *Jane Goldman *Peter Sacco *John Silander *Paul Goodwin *Carl Maresh *Phillip Gould *Shirley Roe *David Herzberger	*Suman Singha, Chair Lynn Allchin *Trudy Flanery *Deborah Muirhead Cecile Hurley Carol Mills Peter Stevens Maira Veiga *Michelle Williams *Edward Sembor *Karl Guillard *David Ouimette	*Lawrence Armstrong, Chair *Cameron Faustman *Pamela Bramble *Faquir Jain *Robert Miller *James O'Donnell *Samuel Pickering *Carol Polifroni David Wagner Andrew Moiseff *Michael Turvey *Susan Spiggle Pouran Faghri
Scholastic Standards	Student Welfare	University Budget
*John DeWolf, Chair Gerald Gianutsos *Scott Brown *Kent Holsinger Harold Reinhart *Stuart Sidney *Susan Porter Benson *Kenneth Neubeck Jeff vonMunkwitz-Smith Krista Rodin *Katharina von Hammerstein Kumar Venkitanarayanan *Carl Schaefer	*Michael Kurland, Chair *Gary English *Scott Kennedy *Kathleen Sanner *Donna Korbel Karen Bresciano Joseph Madaus Lisa-Marie Griffiths Rodney Rock Pamela Schipani *Robert Thorson *Charles Vinsonhaler *Wisensale, Steven Kim Chambers *Trudy Flanery	*Lawrence Gramling, Chair *Thomas Anderson Tracie Borden Lawrence Gramling *Debra Kendall *Philip Mannheim *Janine Caira *David Woods *Thomas Miller *Bruce DeTora *Nancy Humphreys *Neil Facchinetti *Winthrop Smith Ed Benson Nancy Bull Kathleen Holgerson Deborah Huntsman Patsy Johnson
Growth and Development		
*William Stwalley, Chair *Peter Miniutti *Marie Cantino *Margaret Breen Louis Edouard *Stephen Ross William Stwalley Salvatore Scalora *Joseph Smey Jeremy Paul *Philip Yeagle *Linda Strausbaugh		

*Senate Member 2003-2004

ATTACHMENT #34

UNIVERSITY SENATE CURRICULA AND COURSES COMMITTEE
Report to the Senate, April 14, 2003

I. The committee recommends approval of the following new 100-level course:

- **PHYS 105.** Inquiry-Based Physics.
 Second semester. Four credits. One class period and three 2-hour laboratory periods. Selected topics from physics, with an emphasis on a depth of understanding. Provides background for teaching physical science as a process of inquiry, and develops scientific literacy. Particularly for pre-service elementary school teachers.

II. For the information of the Senate

A. The committee approved adding skill designations to the following 200-level courses:

- **PHYS 2XXQ.** Astrophysics and Modern Cosmology
 Second semester. Three credits. Prerequisites: PHYS 209 or 242, 210 or 255, and 230, or with consent of the instructor.
 Basic principles of contemporary astrophysics; applications to stars, galaxies, and modern cosmology.
- **ARTH 210W.** Museums and the Interpretation of Culture.
 Open to art history and art majors; others with consent of instructor.
- **ARTH 211W.** Art History's Feminisms.
 Open to art history and art majors; others with consent of instructor.
- **ARTH 212W.** Women and Body Art.
 Open to art history and art majors; others with consent of instructor.
- **ARTH 220W.** Asian American Art and Visual Culture.
 Open to art history and art majors; others with consent of instructor.
- **PNB 230W.** Hormones and Behavior
 Content as for PNB 230 with addition of writing requirement and one additional discussion section to meet weekly.
- **PSYC 205W.** Introduction to Behavioral Genetics
 First semester. Three credits. Prerequisite: PSYC 132 or BIOL 102, 103, 107, or 108.
 Maxson
 Methods, concepts and findings of behavioral genetics in animals and humans.
- **INTD 2XYW.** Capstone Course
 Either semester. 3 credits. Consent required by the INTD department head. Prerequisites: Engl 110, 111 or 250; senior standing with an approved individualized major plan of study; and an approved placement, research or project.
 All students with an approved individualized major plan of study who are not earning a double major nor have another capstone course on their plan of study must register for this course during their last academic year. Students will integrate their interdisciplinary major through a capstone paper.

- **INTD 296W.** Senior Thesis
Either semester. 3-6 credits. Hours by arrangement. Consent required by instructor and INTD department head. Pre-requisites: English 110, 111 or 250 and senior standing with an approved individualized major plan of study. Students must have obtained a thesis advisor and have an approved thesis topic before registration. All honors and distinction students writing a thesis or distinction project for their individualized major plan of study must register for this course during their last academic year. Students must present their thesis to the Individualized Major Program.

B. The committee approved opening the following existing courses to Sophomores.

- **EKIN 239.** Therapeutic Modalities for Athletic Injuries
- **EKIN 250.** Clinical Instruction for Athletic Trainers I
- **EKIN 260.** Assessment of Athletic Injuries

C. The committee approved adding a skill code designation and opening the following course to Sophomores.

- **SOCI 245/245W.** Sociology of Sexualities
Either semester. Three credits. Open to Sophomores. No credit for students who have taken Soc 246 or 246W.
Explores the social organization, construction, and politics of sexualities; particular focus on lesbian, gay, bisexual, transgender, and queer experiences and the intersection of sexualities, gender, race, and class.

D. The committee approved changes in title and course description for the following 200-level course having a skill designation. The new catalog description is as follows:

- **SOCI 252/252W.** Sociology of Gender
Either semester. Three credits.
Explores processes contributing to social construction of gender; examines the theories used to explain the system of inequality in the United States with particular attention to the intersection of gender, race, ethnicity, sexuality, and class; and evaluates how men and women are differentially constituted in the family, in education, work, politics, and language.

E. The committee approved dropping the open to Sophomores and skill designations for the course:

- **SOCI 246/246W.** Human Sexuality. Course is being replaced by SOCI 245/245W.

Respectfully submitted,

Laurie Best, Janice Clark, Shannon Copeland, Michael Darre, Andrew DePalma, Gary English, Jane Goldman, Paul Goodwin, Dean Hanink, Robert Jeffers, Fred Maryanski (ex officio), Stephen Maxson, Judith Meyer, Robert Miller, Deborah Muirhead, James O'Donnell, John Silander,

Harry A. Frank (Chair)

Report of the Senate Ad Hoc Committee on Q

University of Connecticut

April 4, 2003

Harry A. Frank and Gerald Gianutsos, Co-chairs

Committee Members: Vicky Arnold, Antonius Cillessen, Michael Cutlip, David Gross, Douglas Hamilton, Cecile Hurley, James Hurley, Robert Jeffers, Jonna Kulikowich, David Ouimette, Jason Purzycki, Nalini Ravishanker, Gerald Sazama, Eric Soulsby, Jeffrey Tollefson, and Richard Watnick.

For copies and/or correspondence: Harry A. Frank, Department of Chemistry, University of Connecticut, Storrs, CT 06269-3060. Tel: 860-486-2844; Fax: 860-486-6558; E-mail: harry.frank@uconn.edu

Executive Summary

This report of the Senate *ad hoc* Committee on Q is the culmination of several months of deliberations involving many faculty and staff who either instruct in mathematics or quantitatively-oriented courses or are concerned with advising and supporting students who enroll in such courses. The report discusses the current manner in which incoming students are evaluated for quantitative skills, advised on the basis of that evaluation, and placed into courses commensurate with their abilities. The report makes recommendations for reform in all of these areas, and urges the administration to provide ongoing support for faculty and students engaged in quantitative studies.

The Committee was formed in the Fall of 2002 amid concerns over:

- The validity of the existing Q-course Readiness Test as an evaluative tool
- Student misrepresentation on the test
- Inadequate quantitative skills and high attrition levels of students in entry-level Q-courses
- The effectiveness of MATH 101 in preparing students for success in Q-courses

The report deals with four major components that are interdependent:

- Evaluation
- Advising
- Placement
- Support

A statistical analysis was carried out on student performance in nine entry-level Q-courses over the period 1995-2001. Correlations were sought between performance in these courses and scores from various evaluative indicators. These were the SAT1 (Math and Verbal), high school class rank, Q-course Readiness Test, and Calculus Readiness Test either singly or in combination with other variables, including when the Q-course was taken, and if MATH 101 was taken prior to the Q-course or not.

Two major findings of the Committee are:

- That the SAT1 Math score in combination with high school class rank provides the most significant and authentic predictor of success in entry-level Q-courses.
- That prior completion of MATH 101 does not enhance the probability of success in entry-level Q-courses.

Many detailed recommendations for reform of each of the four components are given in the report. For brevity, only a few of the most significant of these recommendations are given here.

Evaluation component - *Major Recommendations:*

- That the current on-line Q-course Readiness Test be retired from use.
- That the SAT1 Math score combined with high school class rank be used as primary evaluative tools for advising students in Q-course placement.
- That the results of the evaluation be used in an advisory manner for Q-course placement.

Advising component - *Major Recommendations:*

- That the advisors be better trained to assist students with Q-course selection using the newly developed “advising contour diagrams.”
- That students seriously at risk for failure in all quantitative courses be strongly encouraged to enroll in a revised MATH 101 (see below), or to wait a semester before taking their first Q-course while availing themselves of resources associated with a well-supported Q-component of the Learning Center.

Placement component – *Major Recommendations:*

- That along with retiring the current Q-course Readiness Test, Q-course prerequisites be changed accordingly to no longer require a passing score on the Q-course Readiness Test or MATH 101 prior to enrollment.
- That the MATH 101 syllabus be revised, but that it remain a non-college credit course.
- That the Mathematics Department lead a study to identify the key topics in various Q-courses that can be taught to a student at the basic algebra level, and then devise a strategy to present it effectively.
- That other departments develop strategies and extended course sequences that provide built-in remedial instruction.

Support component – *Major Recommendations:*

- That support for students enrolled in Q-courses be provided at least at the same level as that provided for students enrolled in W-courses.
- That more advisors be provided for one-on-one counseling for students, especially with regard to screening their quantitative abilities.
- That follow-up and supplemental diagnostic testing opportunities be provided.
- That the newly formed Learning Center be well-staffed and able to provide a variety of support for students experiencing difficulties with quantitative studies.
- That additional faculty and staff be provided to departments in Storrs and at the regional campuses to enhance the advising and placement components of those offering entry-level Q-courses.

If the recommendations set forth in this report are approved, numerous changes to course catalog descriptions will have to be made as well as a change in the language pertaining to entry expectations for quantitative skills in the new General Education guidelines. These will need Senate approval.

I. Introduction

All students graduating from the University of Connecticut should be proficient in quantitative reasoning and in the mathematical methods associated with it. Quantitative literacy is as essential in our world as verbal literacy. Our institution of higher education must fully endorse this concept and embrace quantitative literacy as a cornerstone of its curriculum. Well-developed quantitative skills are an absolute necessity for students seeking to become intellectual leaders in business, science, medicine, and engineering. It is our belief that these skills are also essential for students pursuing fields of study not traditionally thought of as primarily quantitative. It is our responsibility as educators to set standards for accomplishment in this area and to provide students with high-quality instruction and resources to prepare them for entry into our rapidly-evolving, quantitatively-oriented, technological society.

The present “Senate *ad hoc* Committee on Q” was formed in the Fall of 2002 amid concerns over the efficacy of the existing Q-course Readiness Test in regard to course placement and registration procedures, widespread student misrepresentation on this test and on the Calculus Readiness Test, inadequate quantitative skills of students entering calculus classes evidenced by poor scores on first-day-of-class quizzes in MATH 112Q (see Fig. 1), high attrition (failure/drop/withdrawal) in entry-level Q-courses, and questions regarding the effectiveness of MATH 101 for remedial work and preparation for entry into Q-courses. The Senate Executive Committee (SEC) asked Harry A. Frank, Chair of the Senate Committee on Curricula and Courses, and Gerald Gianutsos, Chair of the Senate Committee on Scholastic Standards, to convene an *ad hoc* committee with the following charges:

- To describe the current uses of the Q-course Readiness and Calculus Readiness Tests;
- To evaluate the substance, reliability, and validity of the tests for curricular placement purposes;
- To compare these tests with others that also measure quantitative skill competency (e.g., the SAT)
- To evaluate the effectiveness of courses (e.g., MATH 101) in providing remedial work for entry level Q-courses;
- To devise a plan for the future administration of the tests with particular attention to security issues;
- To report to the SEC and the Senate, in writing, proposed recommendations for reform.

The following members joined the Committee on Q in the Fall of 2002: Vicky Arnold (Associate Professor, Accounting), Antonius Cillessen (Associate Professor, Psychology), Michael Cutlip (Professor, Chemical Engineering), David Gross (Lecturer, Mathematics), Douglas Hamilton (Professor, Physics), Cecile Hurley (Lecturer, Chemistry), James Hurley (Professor, Mathematics), Robert Jeffers (Associate Professor, Mechanical Engineering), Jonna Kulikowich (Associate Professor, Educational Psychology), David Ouimette (Program Director, Undergraduate Education and Instruction), Jason Purzycki (Undergraduate Student), Nalini Ravishanker (Associate Professor, Statistics), Gerald Sazama (Associate Professor, Economics), Eric Soulsby (Special Assistant to the Vice-Provost, Undergraduate Education and Instruction & Lecturer, Electrical & Computer Engineering), Jeffrey Tollefson (Professor, Mathematics), and

Richard Watnick (Associate Professor, Mathematics, Stamford Campus). The committee met nine times as a whole, and several other times in smaller groups. In addition, during the Fall and Spring semesters of the 2002-3 academic year, the co-Chairs reported periodically on the progress of the report to the Committee on Advising and Retention in Q-courses chaired by Vice-Chancellor for Undergraduate Education and Instruction, Fred Maryanski.

1/8

Math 112 Algebra Test

The purpose of this test is to see if you are prepared for calculus and to assist your instructor in identifying areas to be emphasized in class.

- Solve for x : $8 - 6(4 + \frac{2}{3}x) = 12$
 $8 - 24 - \frac{12}{3}x = 12$
 $-16 - \frac{12}{3}x = 12$
 $-\frac{12}{3}x = 28$
 $x = -\frac{28}{4} = -7$
 $x = -7$
- Simplify $\frac{6 - 4(2^2 - 7)}{3}$
 $\frac{6 - 4(4 - 7)}{3}$
 $\frac{6 - 4(-3)}{3}$
 $\frac{6 + 12}{3} = \frac{18}{3} = 6$
 6
- Multiply and simplify $\sqrt{6}(\sqrt{6} - 4\sqrt{6})$
 $\sqrt{6}(\sqrt{6}) - \sqrt{6}(4\sqrt{6})$
 $6 - 24 = -18$
 -18
- Solve for x : $x^2 - 6x = 16$
 $x^2 - 6x - 16 = 0$
 $(x - 8)(x + 2) = 0$
 $x = 8$ or $x = -2$
 $x = 8$

Figure 1: Example of performance on the first half of an eight-question, first-day-of-class quiz, given to students enrolled in MATH 112Q. These are students who passed the Q-course Readiness Test.

The scores on this quiz for 260 students enrolled in 8 sections were as follows:

Score	Number of grades	
0	12	5%
1	15	6%
2	25	10%
3	39	15%
4	45 [†]	17%
5	45	16%
6	42	16%
7	16	6%
8	11	4%

[†]Median score

What follows is a report of the Committee on Q's deliberations as well as conclusions and recommendations for reform to four components of the current system:

- Evaluation
- Advising
- Placement
- Support

These topics will be dealt with in separate sections of this report, but the features of each are intertwined. Also, it is important to emphasize that the committee was not charged with studying standards for future Q-courses that will emerge from implementation of the newly adopted General Education Guidelines. This problem has been entrusted to the Q-subcommittee of the

General Education Oversight Committee (GEOC). Two of the present Committee on Q members, C. Hurley and N. Ravishanker, are also serving on the Q-subcommittee of the GEOC.

II. Components

A. *Evaluation of Q-skills of Entering Students*

The current system at the University of Connecticut for evaluation of students for quantitative readiness is summarized as follows:

All entering students who have not earned college credits in mathematics or statistics must take a test (the Q-course Readiness Test) in high school algebra before registering. Sample questions for the Q-course Readiness Test may be found in Appendix A. Students must pass the placement test or successfully complete MATH 101: *Basic Algebra with Applications*, a remedial course with no credit toward graduation, prior to enrolling in any Q-courses. A passing score on the Q-course Readiness Test is achieved by successfully answering at least 60% of the questions. The scores are further defined as follows:

High Pass: $grade \geq 20$
 Low Pass: $20 > grade \geq 15$
 Failure: $grade < 15$

Students who earn credit for quantitative course work via the UConn High School Cooperative program, or receive credit by their performance on Advanced Placement (AP) exams, or receive credit for mathematics or statistics in transfer from another institution, are not required to take the Q-course Readiness Test. An additional placement test, the Calculus Readiness Test, is required for students whose program of study requires them to take first-year calculus, unless they transfer in credit for a specific calculus course. Sample questions from the Calculus Readiness Test may be found in Appendix B.

The present Q-course Readiness Test was obtained from the Mathematical Association of America (MAA) in 1981. The exam consists of 25 multiple-choice questions that evaluate a student's algebraic manipulative skills. Up until 1999, the Q-course Readiness Test was administered in booklet form to students at sit-down, proctored, sessions during summer orientation or at other times prior to course registration. In 1999, the test was modified to be web-based and is now administered on-line. The test is taken prior to attending the summer Orientation sessions, with the results being used in course prerequisite checking during the registration processing that is part of Orientation. Two Q-courses are required of all students at the University of Connecticut to meet the General Education requirements. The General Education guidelines currently define a Q-course as "...one in any discipline in which the knowledge of and use of mathematics and/or statistics at the basic algebra level (or above) is a necessary and integral part of the course." A low pass ($20 > grade \geq 15$) also exempts students from MATH 101, but requires them to take at least one of their two required Q-courses in either the Mathematics or Statistics departments. A failure ($grade < 15$) requires students to take MATH 101 and subsequently at least one of their two required Q-courses in either Mathematics or Statistics.

The committee identified at least three problems with this system: (1) Math skills are necessary but not sufficient for success in Q-courses. Students with strong mathematical abilities tend to do better in Q-courses than students without such skills, but there are many other factors that affect performance in a Q-course, such as interest, attitude, enthusiasm, and study habits. Sometimes these other factors can compensate for lack of mathematical aptitude; (2) A student who fails the Q-course Readiness Test, and has no interest in pursuing a quantitatively rigorous degree program, is currently required to take three quantitatively-oriented courses, i.e., MATH 101 and two others (one of which must be either MATH or STAT); (3) Students with a low pass face a mandated MATH or STAT course. This reduces their freedom to construct a program of study according to their own interests, which could lead to a further reduction in motivation.

In 1999, the booklet version of the exam was converted into an electronic Web-based version (now given through WebCT) with no change in content (see <http://placement.uconn.edu>), and all students, except those exempted as described above, were required to take the exam on-line prior to registration. In this procedure, the student's identity is not authenticated, although passwords are provided so students can gain access to the exam after they have paid their deposit to the University. The pass/fail criteria and the mandated remedial and curricular requirements described above still apply. In a similar manner to the paper-based exam, students are allowed one re-take of the on-line exam if they are not satisfied with the outcome.

A finding worthy of note was that after the electronic, unauthenticated version of the Q-course Readiness Test came on-line in 1999, the percentage of students failing the exam dropped from 30% in the Fall of 1998 to 15% in the Fall of 2000. See Table 1. Directly comparing the pre-1999 sit-down environment, where it was thought that students arrived unprepared, and where few students requested re-takes, with the post-1999 online environment is difficult. Nevertheless, the improved rate of passing of the Q-course Readiness Test was not consistent with more students having a positive experience in their first Q-course. Instead, anecdotal evidence suggests that despite a perceived improvement in the quality of incoming students, as suggested by class rank and SAT scores, *students seem more unprepared than ever to manage successfully in many 100-level Q-courses*. The ability to re-take the exam, and perhaps do so with the aid of others, may be responsible for the higher pass rate. Several faculty members informally surveyed students in their Freshman courses and asked whether they “knew someone” who misrepresented their identity while taking the on-line Q-course Readiness Test, e.g., by working the exam with or for someone else. Many students freely admitted this was the case, and the student representative to the Committee agreed with this impression.

The Committee spent a considerable amount of time discussing why a student would be inclined to cheat on this exam, when the primary intent of the exam is to examine a student's readiness for entry into Q-courses. Part of the answer is found in the harsh language used in reporting to the student the results of the exam. Students with scores below 15 are told they have “failed”. If the test is for placement purposes only, how can a student “fail”? The “failure” requires a student to enroll in MATH 101, which does not carry college credit, stigmatizes him or her as being inadequate upon enrollment, and may delay progress in a lock-step curriculum. Thus, the primary incentives for students to cheat on the current Q-course Readiness Test appear

to be to get over a barrier, the subject (algebra) of which they believe they have mastered in high school, to avoid the stigma of MATH 101, and to avoid getting set back in their degree program. Apparently, some students would rather take their chances in a Q-course for which they may be inadequately prepared, than suffer the stigmatization associated with MATH 101.

Table 1: *Percentage of Freshman Achieving Particular Scores on the Q-course Readiness Test by Year. A score of 1-14 corresponds to failing, 15-19 corresponds to a low pass, and 20-25 corresponds to a high pass. Data taken from March 13, 2002, memo from Suman Singha to the Co-chairs of the Senate Curricula and Courses Committee.*

Q Score	Fall '95	Fall '96	Fall '97	Fall '98	Fall '99	Fall '00	Fall '01
1-14	24	27	27	30	23	15	14
15-19	29	29	31	30	34	31	36
20-25	47	44	42	40	43	54	50

The question has been raised, “If a student cheats and enrolls in a course that is over their head, and fails, is it not their own fault?” The Committee on Q believes that large failure/drop/withdrawal rates in introductory Q-courses have a profound negative effect on other students, course resources, time usage, and standards. The “pass/fail stigma” associated with the current placement procedure clearly seems to contribute to students placing themselves inappropriately in quantitative courses, regardless of whether misrepresentation occurs. The Committee believes that some students coming out of high school do not fully appreciate the seriousness of an evaluative exam and that the current “pass/fail” format exacerbates the problem. The Committee believes all entering students need our thoughtful guidance, not our recriminations.

The Calculus Readiness Test is also given on-line in the same manner as the Q-course Readiness Test, and can be found at <http://placement.uconn.edu>. (Sample questions are shown in Appendix B.) Students must take the Calculus Readiness Test before registering for calculus. The exam consists of 24 questions dealing with algebra and trigonometry. Similar to the Q-course Readiness Test, students who successfully complete 60% of the questions are eligible to enroll in MATH 115Q: *Calculus I* (the first of a two-course sequence, MATH 115Q-116Q, covering first-year calculus.) Students who score below a 14 on the test are eligible to enroll in MATH 112Q: *Introductory Calculus I* (the first of a three-course sequence, MATH 112Q-113Q-114Q, covering first-year calculus.) Students who are well-prepared will generally register for MATH 115Q-116Q in their Freshman year. Students with weaker backgrounds are advised to enroll in the alternate extended-course, MATH 112Q-113Q-114Q sequence, which includes remedial college algebra and trigonometry.

The Committee began its deliberations regarding the evaluation part of the problem with the question, “To test or not to test?” Almost immediately the question was divided as follows: Do we need a mathematics placement procedure? Do we need University of Connecticut-administered quantitative-readiness tests? *The overwhelming consensus of the Committee was that a mechanism of mathematics evaluation and placement of entering students is essential.* The enormous range of proficiencies and deficiencies of our entering students is adequate justification for this. Several Committee members with years of experience in teaching Freshman courses lamented the inability of many current students to manipulate even simple

algebraic expressions, such as Ohm's Law ($V = IR$), or the Ideal Gas Law ($PV = nRT$), and related how this lack of ability has hindered teaching the conceptual ideas represented by these equations. It is the Committee's belief that as long as the University of Connecticut admits students with deficiencies in Q-skills, we will need an evaluation and placement procedure. Nevertheless, the political implications of faculty teaching and students taking "remedial" courses at the University of Connecticut remain a concern.

The current Q-course Readiness Test evaluates a certain level of proficiency in algebraic skills *only*. From discussions with faculty involved in its inception, it was never intended to do otherwise, and certainly it was never meant to evaluate students regarding their preparation for entry into Q-courses other than Mathematics (e.g., CHEM 127Q or STAT 100V), which require more broadly-based abilities in quantitative reasoning. The question then is whether the University should make an effort to write a "new and improved" Q-course Readiness Test with questions aimed at evaluating students' abilities in quantitative reasoning. The Committee immediately realized this process would be fraught with difficulties. What would be the areas of coverage of the new exam? How would the test be constructed and delivered? How would it be graded, and by what standard would it be calibrated? How would its validity as a predictor of success be evaluated?

The Committee felt that a study of the mathematics evaluation and placement procedures used by other institutions of higher education should be undertaken. This was done, and a document detailing the procedures of 32 other institutions of higher education - including several certified as peer institutions by the University of Connecticut Office of Institutional Research (OIR) - is presented as Appendix C. The information given in the document was obtained either by examining the institutional web sites or by talking directly with faculty members, advisors, and/or administrators at these institutions. A brief summary of the data is as follows:

Virtually all universities have some form of Mathematics placement procedure for incoming students. The procedure begins prior to enrollment with an evaluation of the student's quantitative abilities and ultimately results in a recommendation to the student for placement at a particular level of Mathematics which either *must* be followed (i.e., is mandatory) or is advisory. At every institution surveyed, students are evaluated and placed in courses based on some combination of the following (the University of Connecticut is included in the summary for comparison):

1. High school record (GPA, class rank, courses taken, etc.)
2. Performance on college entrance exams (e.g., SATI, SATII, ACT, etc.)
3. Performance on an in-house-administered exam (not used by all institutions):
 - A. Either locally-written exam or acquired from a testing service (*Univ. Connecticut*).
 - B. In some cases given un-proctored, on-line (*Univ. Connecticut*), or administered as a proctored, sit-down, in-person test during summer orientation, or for those who cannot attend orientation, during enrollment.

C. Mandatory for all students (*Univ. Connecticut*), mandatory for a subset of students (e.g., whose curriculum will involve Math beyond algebra, mandatory only for Freshman but not transfer students, or mandatory only for those scoring low on the SAT, ACT or other exams.

D. Given as different tests assessing different levels of Math proficiency (*Univ. Connecticut*).

E. Given also in areas outside Math (e.g., Chemistry).

4. The student's interests (using either a questionnaire completed prior to orientation, the student's statement of potential majors, or obtained during the advising session, or by personal interview).

Based on the evaluation, students receive advice and recommendations for placement in courses which fall into different categories:

1. Enforced restrictions on enrollment in mathematics courses only (*Most universities*).
2. Enforced restrictions on enrollment in mathematics *and* quantitative courses (e.g., CHEM and/or STAT (*Univ. Connecticut*)).
3. Stated restrictions on enrollment in courses, but not actually enforced.
4. Recommendations for placement are solely advisory, i.e., restrictions for enrollment are neither explicitly stated nor enforced, but students may be strongly cautioned.

From the above summary of the information presented in Appendix C, it is clear that there exist many different types of evaluation/placement procedures. The question then becomes which evaluation procedure is right for the University of Connecticut? The Committee reviewed evaluation materials and exams used by many of these other institutions.¹ Many commercial exams are available at some cost to our institution either per student, or for the license, or both. In the course of this review, the Committee could not convince itself that any commercially available product would fulfill our needs of providing both diagnostic and predictive information about a student's readiness and potential for success in our own Q-courses. The Committee noted that these individual exams may provide validity in assessing a student's content of knowledge at a certain level of mathematics, but they may not have validity as predictors of success in the Q-courses offered at the University of Connecticut.

¹ These included: Accuplacer (an un-timed, adaptive, electronically administered, proctored, semi-secure exam); The Mathematics Diagnostic Testing Project (MDTP) exam (a timed, non-adaptive exam, sold in booklet form, but parts of which are electronic, non-secure, not originally used for placement, but is being used by the University of California, Cal State and Community College systems as one pillar in their placement procedure for several different levels of mathematics); The Entry Level Mathematics (ELM) exam (a highly-controlled, secure exam, regulated by the Educational Testing Service (ETS), but not designed for placement into higher level mathematics, e.g., calculus. It is used solely by the California State system who commissioned it and owns the copyright to whom royalties would be paid if adopted).

The SAT1 is widely advertised by the College Board, and the ETS that oversees it as being effective at measuring innate aptitude in verbal and quantitative skills. (See Appendix D for sample questions from the SAT1 Mathematics part.) Indeed, it has been used for decades as a key tool for admission to colleges and universities in the United States. Thus, the Committee considered whether the SAT1, which is an authenticated exam and required of all entering students, might be used in conjunction with other indicators, e.g., class rank, as a predictor of success in entry-level Q-courses. A positive aspect is that the SAT1 score would be available at no cost to the institution.

The important question is whether the SAT1 score has statistically significant predictive validity that would justify its use for evaluating readiness for mathematics and/or Q-courses. The Committee thought that at the very least, the SAT1 could be used to narrow the population of students who need a Q-course Readiness Test, thereby facilitating its administration. The entry expectations for quantitative skills in the newly approved General Education guidelines state that “All entering students who have not demonstrated entry-level proficiency in mathematics with a math SAT score of 650 or higher, or who have not earned university credits in mathematics through a UConn High School Cooperative course, or an appropriate score on the mathematics AP exam, will be required to take a proctored quantitative placement test. Students who do not attain a passing grade on the quantitative placement test will be required to enroll in Mathematics 101 to satisfy entry level expectations in mathematics proficiency.” The exit expectations are that “All students must take two Q courses, which may also satisfy other requirements. (Note: MATH 101 or a passing grade on the Q-Course Readiness Test is a prerequisite to all Q courses.) One Q course must be a mathematics or statistics course, unless the student attains a high pass on the Q-Course Readiness Test.” The Committee imagined for example, that students could be exempted from the Q-course Readiness Test and allowed to register for Q-courses if they scored above a value on the SAT1 that corresponded to a high probability of success in an entry-level Q-course. The assignment of this value would need to be determined from a detailed statistical study correlating SAT1 scores with students’ grades in their first Q-course, considering also the effect or lack thereof (to be determined) of prior completion of MATH 101. The Committee undertook such a statistical study. A brief summary of the results is as follows:

Data from seven years (1995-2001) consisting of SAT1 Math score only, high school class ranks, and course grades in nine entry-level Q-courses, CHEM 127Q, MATH 103Q, MATH 105Q, MATH 109Q, MATH 112Q, MATH 115Q, PHYS 101Q, STAT 100V, and STAT 110V, were examined. SAT1 Math scores range between 200 and 800, and high school class ranks range from 1 to 100. For each Q-course, “Success” was defined by a grade of C- or better, otherwise it was denoted “Failure”. Using the well-known logistic regression model, this dichotomous response variable was modeled as a function of two predictors, SAT1 Math score and class rank. Data from all students with a given entry year were analyzed for each of the nine courses, and the fits from the logistic regression were reported. The coefficients of SAT1 Math score and class rank are significant in each case, and the model shows adequate fit. A model with SAT1 Math score alone as predictor also gives a good fit. However, the inclusion of class rank also as a predictor appears to provide a better fit in most cases, in terms of correctly predicting the proportion of true successes.

The Q-course Readiness Test score, Calculus Readiness Test score, and SAT1 verbal score were also included as predictors in logistic regression models, singly and in combinations with other variables. It was found that the Q-course Readiness Test score, using the 60% pass rate, by itself was not a significant predictor of success in Q-courses. Similarly, it was found that the SAT1 verbal score was not a significant predictor of success in Q-courses. Too few students take the Calculus Readiness Test for a useful conclusion on its significance as a predictor of success. The SAT1 Math score in combination with the Q-course Readiness Test and Calculus Readiness Test scores provided a significant predictor of success, but with little value added compared to the SAT1 Math score by itself or the SAT1 Math score used in combination with class rank.

Also included in the analysis was an assessment of success based on whether the first Q-course was taken in the initial semester of entry or in later semesters. It was found that students performed better if the Q-course was not taken in the semester of entry to the University. Also, models were fit separately to students who did *not* take MATH 101 prior to their first Q-course and compared to those who did. It was found that students who took MATH 101 were less likely to succeed in their first Q-course compared to those who did not take MATH 101. These findings will be discussed in detail below in the Placement section of this report. The details of all these analyses are provided as supplementary information on one of the two CD's accompanying this report.

Our final model therefore includes SAT1 Math score and high school class rank as the most significant predictors of success in entry-level Q-courses. Class rank surfaces as a strong predictor of success because it may very well be a good measure of interest in academics, attitude, enthusiasm, and study habits, factors that were noted above to be significant prognosticators of success in class work, and which may even compensate in Q-courses for lack of strong mathematical skills. Based on the fitted model for each Q-course for every year, we then solved for the combination of SAT1 Math score and class rank values that would predict $(100 \times p)\%$ probability of success, for $p = 0.3$ to 0.9 in steps of 0.1 . These data are shown in “*advising contour diagrams*.” (See Appendix E for examples based on the recent performance of students in nine entry-level Q-courses.) These diagrams were obtained from a model (with no interaction) with SAT1 Math score and class rank as predictors. The combinations yield straight lines.

The following are conclusions and recommendations from the Committee on the Evaluation part of the problem.

Conclusions (Evaluation component):

- That there should be a system to evaluate quantitative reasoning skills of incoming students.
- That the system of evaluation needs to be used for both Mathematics course placement and to assess readiness for Q-courses.
- That the evaluation of students should be completed no later than during summer orientation and that the results of the evaluations should be transmitted to the advisors and students immediately after completion.

- That the evaluation should include more than just a raw number score and should consist of an advising report that delineates student potential for success in different Q-courses.
- That students should not be told that they have “failed” the evaluation.
- That if an exam is to be used as a placement tool, it should be proctored, because the validity of the exam would be compromised if the identity of the student examinee is not certain.

Recommendations (Evaluation component):

- That the current Q-course Readiness Test be retired from use as an evaluative tool for Q-course placement.
- That the SAT1 Math score combined with high school class rank be used as primary evaluative tools for Q-course placement.
- That the results of the evaluation be used in an *advisory manner* for Q-course placement.
- That the SAT1 Math score and class rank data used in the advising contour diagrams be updated annually.
- That the final recommendation for Q-course placement be based on a thoughtful advising session with each student taking into account the quantitative evaluators and the student’s interests (see Advising component recommendations below).

B. Advising of Entering Students

Many individuals are making a concerted effort to revise and improve the advising system at the University of Connecticut. At the heart of a new plan are several core values that have been articulated by Vice-Chancellor for Undergraduate Education & Instruction, Fred Maryanski, to the SEC and other groups. These include: The desire to have individual contact between advisor and advisee, the recognition by advisors that each student is unique, the importance of accurate information being transmitted to students, that students accept responsibility for part of the process, and that the contribution of faculty and staff to advising is recognized as important by the University.

Based on the system of evaluation described above regarding quantitative reasoning skills, students fall into six broad groups for advising:

1. Students who have expectations of majoring in quantitatively-oriented fields
 - a. Students appearing to possess sufficient quantitative skills for success in entry level Q-courses
 - b. Students with average quantitative skills
 - c. Students not appearing to possess adequate quantitative skills for success in entry level Q-courses
2. Students who do not have expectations of majoring in quantitatively-oriented fields
 - a. Students appearing to possess sufficient quantitative skills for success in entry level Q-courses, but with no intent to pursue more than that required by the General Education guidelines
 - b. Students with average quantitative skills

c. Students not appearing to possess adequate quantitative skills for success in entry level Q-courses

Students in groups 1a and 2a pose the least challenge to the advisor seeking to counsel them with regard to Q-course selection. Students should simply be allowed to choose Q-courses compatible with their interests and consistent with their intended areas of study.

Students in groups 1c and 2c should be cautioned in the strongest possible terms that “based on a thoughtful statistical analysis of their peers” they are seriously at risk for poor performance (D+ or lower) in an entry-level Q-course. They should be shown the advising contour diagram given in Appendix E for the course in which they are interested in enrolling, and told that based on a detailed analysis of the performance of several years of students, they are “not likely to succeed”. They should be told that they have several options:

- To enroll in MATH 101 (see below for recommendations for restructuring this course) in an attempt to gain better quantitative skills.
- To postpone enrolling in the first Q-course until after at least one semester has elapsed.
- To enroll in extended-sequence versions of entry level-Q courses; e.g., the new three-semester General Chemistry sequence being proposed.

They should also be counseled that perhaps fields of study involving intensely rigorous quantitative coursework (e.g., engineering, pre-med) may not be the best fit to their abilities.

The advising contour diagrams should be used by advisors in the following way: Suppose that a student is to be advised on whether to take a particular Q-course. Based on the student’s SAT1 Math score and class rank, the advisor can immediately determine from the diagram specific to that course what the student’s predicted probability of success in that course is. If the value is less than desirable, the advisor would counsel the student appropriately as described above. Recent advising contour diagrams are given in Appendix E for the nine most heavily enrolled Q-courses. These plots are available on CD 1 for each year from 1995-2001. The diagrams for a given Q-course over several years will enable advisors to track the stability of the behavior of the predictors over time. Given in Appendix F is an example of a probability table using the SAT1 Math score alone because many high schools do not provide class rank data. It is recommended that the advisor use the most recent year’s diagram so as to be current with changes in instructor, student abilities, etc. The diagrams should ideally be updated each year with new data from the incoming classes and based on similar statistical analyses.

Students in groups 1b and 2b should also be counseled using the advising contour diagrams for the courses in which they are interested in enrolling. The diagrams show precisely their likelihood of success. They also have several options including enrolling in MATH 101, postponing enrolling in the first Q-course until after one semester has elapsed, or enrolling in extended-sequence versions of entry level-Q courses. This may be the preferred avenue for students in group 2c intending to pursue fields of study not involving intensely rigorous quantitative coursework.

Conclusions (Advising component):

- That each student is unique and brings their own set of abilities and talents to the University.
- That the advisor should recognize that some students may benefit from a conservative approach involving less rigorous course selections.
- That advisors also caution students about adopting too conservative a plan of study. Students who take courses that largely repeat what they had in high school may not be stimulated sufficiently to engage themselves in the subject matter. Experience shows that frequently, this results in a mediocre grade in the course.
- That no student will be forced to register for any course, but that if inadequately prepared students choose to ignore the historical record of similar students who have preceded them, they may find themselves repeating such poor performance. This possibility should be explained carefully to the student.

Recommendations (Advising component):

- That advisors ascertain in whatever manner they deem appropriate (e.g. by an on-line questionnaire) whether or not the student has an interest in following a quantitatively-oriented degree curriculum.
- That the language used to describe level of performance in quantitative-skills in the evaluation process be altered so the student is not made to feel he or she has failed anything prior to enrolling at the University.
- That the advisors be trained to interpret and to assist students with Q-course selection based on the advising contour diagrams.
- That the diagrams be made available to advisors and students in a convenient manner; e.g. on the Web, and that they be updated every year.
- That the interpretation of the results of the evaluation and the student's probability of success in a course be made clear to him or her during advising sessions.
- That students have individual one-on-one sessions with advisors where they discuss their preparedness for the university curriculum.
- That the recommendations made to the student by the advisor be recorded for future reference and/or follow-up.
- That students be told during the one-on-one advising sessions that the advice given by the advisor is not mandatory, and that no student will be forced to register for a course he or she does not wish to take.
- That students be told they are responsible for their own decisions and the consequences thereof.
- That students seriously at risk for failure in all quantitative courses be strongly encouraged to enroll in MATH 101. If a student is strongly opposed to this, then they should be counseled to wait a semester before taking their first Q-course while availing themselves of programs, clinics, and modules offered by the Q component of the Learning Center to review and promote mastery of key mathematical skills. If they are opposed to this they should be advised to enroll in extended-sequence versions of entry-level Q-courses.

C. Placement of Entering Students in Mathematics and Q-Courses

The question must now be addressed of what quantitatively-oriented courses should a student be advised to take based on the evaluation procedure described above. As previously mentioned, students appearing to possess sufficient quantitative skills for success in entry-level Q-courses, and who may or may not have the intent of majoring in quantitatively-oriented fields, should simply be allowed to choose any Q-course that meets their interests and intended area of study. Students possessing average quantitative skills should be counseled according to their interests and using the advising contour diagram for the course in which they wish to enroll. Students appearing *not* to possess adequate quantitative skills and who are seriously at risk for success in entry level Q-courses, and who may or may not have expectations of majoring in quantitatively-oriented fields, provide the most serious challenge to our system because they may require remedial work and/or tutorial assistance.

For students with average or above quantitative skills not wishing to pursue a quantitatively-oriented degree program, several mathematics courses are offered as attractive possibilities to fulfill the Q-requirement. These are: MATH 102Q, *Problem Solving*; MATH 103Q, *Elementary Discrete Mathematics*; MATH 107Q, *Elementary Mathematical Modeling*; and MATH108Q, *Mathematical Modeling in the Environment*. These courses focus on problem-solving strategies involving discrete (non-Calculus) based mathematics topics. MATH 102Q concentrates on problem-solving techniques and on interesting, puzzling problems, while MATH 103Q delves into more specific formal mathematics topics. MATH 107Q approaches college algebra from a discovery, data-driven, less manipulative point-of-view. MATH 108Q deals specifically with some of the mathematics used in studying environmental problems. These courses are desirable for most non-science majors and are aimed particularly at students not majoring in business or economics for which other mathematics courses are available.

The issue of the value of the Calculus Readiness Test for placement into calculus sequences is complex. Students who score poorly on this test are advised to enroll in MATH 112Q: *Introductory Calculus I* (the first of a three-course sequence, MATH 112Q-113Q-114Q, covering first-year calculus.) Students who are well-prepared will generally register for MATH 115Q-116Q in their Freshman year, but many students who score well on this exam opt for the more conservative MATH 112Q-113Q-114Q course sequence, which includes remedial college algebra and trigonometry. Because “failure” on the Calculus Readiness Test does not carry the same stigma as “failure” on the Q-course Readiness Test, and because both calculus sequences carry college credit, there is significantly less incentive for students to misrepresent themselves. Given in Appendix E are advising contour diagrams for MATH 112Q and MATH 115Q which have reliable predictive validity and can be used instead of the Calculus Readiness Test for calculus course placement. However, the Committee concluded that the decision on whether to continue to use the Calculus Readiness Test for placement in calculus courses, perhaps as a supplementary evaluative tool, should be left to the Mathematics Department. The Committee recommends that the Mathematics Department undertake a thorough evaluation of this issue.

Placing students who appear *not* to possess adequate quantitative skills is complex because they may need remedial work. Traditionally the burden of providing remedial work for such

students has fallen on the Mathematics Department, and has been relegated entirely to the instructors of MATH 101. When the Mathematics Department was assigned the job of running MATH 101, all that was given in the way of resources were extra teaching assistants with no extra support for faculty oversight of the course. Given such sparse resources, the MATH 101 course was modest in scope. Without budgetary support of more robust remedial efforts, the Department mounted a course that lacked the faculty involvement and coordination present at the level of calculus, where there is significant administrative support of what are clearly vital service courses. A further negative factor regarding MATH 101 is that the course carries no academic credit and is imposed on students who are told that they “failed” the Q-readiness test. This engenders a negative attitude among enrollees, who see themselves unfairly being held back in their degree progress and made to restudy high-school material that they believe they learned before coming to the University. Still another problem is that the current course content is essentially limited to traditional hand algebraic manipulation of expressions, functions, linear and quadratic equations, with little attention to quantitative reasoning skills students need to transfer to later Q courses.

From the data provided to the Committee, it was possible to assess the performance of students who did *not* take MATH 101 prior to their first Q-course and compare it to the performance of those who did. The present study found *for all nine entry-level Q-courses analyzed, for all years,² the percent of students who achieved success in their first Q-course after taking MATH 101 is significantly less than the percent of students who achieved success without MATH 101.* (See data table in Appendix G.) Thus, MATH 101 fails to prepare students for success in Q-courses. The reason for its failure probably involves a number of factors including: (1) the possibility that students who have a need to take MATH 101 are likely to be poorer performers than those who do not have a need to take it; (2) the content of MATH 101 is not consistent with that needed for success in Q-courses; (3) the possibility that students are unable to transfer what they learn in MATH 101 to Q-courses; etc. Nevertheless, the implications are clear: *There is no justification for MATH 101 to continue in this capacity, and in particular, students should not be mandated to take it as a condition for enrollment in Q-courses.*

The Committee on Q believes that a significant infusion of staff and resources must be allocated to the Mathematics Department in concert with the Q-component of the Learning Center to deliver skills to students that would be transferable to other courses. In order to truly create and run a remediation program that would help prepare students for Q-courses, they would need a new faculty line whose expressed responsibility would be the running of this program and overseeing its implementation. It would also require a rethinking of MATH 101, including redesigning the syllabus with an emphasis on some of the manipulations found in the various Q-courses, as well as those found in math courses, using not only “abstract” algebraic constructions, but some realizations of these concepts. The course could de-emphasize some of the more rote memorization topics, but not exclude them. Perhaps it can incorporate technology and more modern approaches to quantitative analysis, analogous to the newly initiated MATH 107Q course. However, whatever MATH 101 course emerges, it will not be a magical panacea for all the ills of under-prepared students. No one course will fix a problematic system so varied

² Except in 2001 where 1 student out of 1 (100%) successfully completed MATH 115Q after taking MATH 101.

in its causes. But, the Committee believes that, in addition to other support activities associated with the Learning Center, such a course could go a long way toward helping students have a better chance of success in Q-courses and other courses requiring quantitative reasoning. Still there is no guarantee that after completing one or more remedial courses targeting reasoning skills, students would be able to apply the same skills when required to do so in a new setting. It may also be beneficial for faculty to develop strategies within their own courses and not expect too much from the remedial training. This is not a perfect solution either, because it would mean using precious class time for remedial work that should be dedicated to the subject material of the Q-course. Compounding the problem is the fact that the regional campuses admit students with SAT1 scores and class ranks significantly lower than students admitted to Storrs, and many of the students entering the regional campuses are identified late, which could delay progress in their degree curriculum if remedial work is desired.

After considerable discussion the Committee reached the following conclusions:

Conclusions (Placement component):

- There is no single solution that applies to all students.
- Whatever the solution is, it is certain to entail significant costs.
- With additional resources, the Mathematics Department can develop and sustain a more modern, more focused, and more consistent course to address the algebraic-manipulation skills required in basic Q courses.
- The problem of placement of students at the regional campuses is worse because a higher proportion of those students tend to need remedial work.

Recommendations (Placement component):

- That along with retiring the current Q-course Readiness Test, Q-course prerequisites be changed accordingly to no longer require a passing score on the Q-course Readiness Test or MATH 101 prior to enrollment.
- That the MATH 101 syllabus be revised to focus more on real-world problems and the mathematics necessary to solve them and to introduce skills that would transfer to other quantitative courses, but that it remain a non-college credit course.
- That the Mathematics Department be asked to lead a study to identify the key topics in various Q-courses (mathematical and physical science) that can be taught to a student at the basic algebra level, and then come up with a way to present it and help students achieve with it.
- That other Departments develop strategies and extended course sequences (e.g., the newly proposed three-semester General Chemistry sequence) that provide built-in remedial instruction.
- That departments be encouraged to develop Q-courses for students not pursuing quantitatively rigorous degree programs (i.e., those requiring only two Q-courses to satisfy the General Education requirements) so a wider variety of choices are available to these students.
- That the Mathematics Department undertake a thorough evaluation of the utility of the Calculus Readiness Test for placement in calculus sequences.

D. Support

In order to implement the above recommendations for reform of the components of evaluation, advising, and placement of students with regard to their quantitative skills, significant personnel support will be required. The Committee believes the following recommendations are essential to the success of the process:

Recommendations (Support component):

- That general support for students enrolled in Q-courses be provided at least at the same level as that provided for students enrolled in W-courses in the newly constituted Learning Center.
- That more advisors be provided for one-on-one counseling for students especially with regard to screening their quantitative abilities.
- That follow-up and supplemental diagnostic testing opportunities regarding quantitative skills be provided for students in conjunction with the Q-component of the Learning Center.
- That the newly formed Learning Center be well-staffed and able to provide a variety of support for students experiencing difficulties with quantitative studies.
- That the administration provide an additional faculty line in the Mathematics Department to be also affiliated with the Q-component of the Learning Center. The specific responsibilities will be determined by the Department and the administration, and may include interfacing with advisors, instructors, the GEOC, administrators, tutors, and other student service providers, overseeing MATH 101, and tracking students through the entire process of taking Q-courses.
- That the administration provide an additional faculty line in the Department of Chemistry specifically in support of teaching the proposed three-semester General Chemistry course sequence and existing sequences that serve the > 1000 students from the various schools and colleges. The goal is to work toward reducing the failure/drop/withdrawal rate among students in General Chemistry without compromising standards.
- That support be provided by the Vice-Chancellor to the Statistics Department for carrying out annually the statistical analysis described in this report and to update the advising contour diagrams using the most current student data.
- That an additional staff counselor for advising be added at the regional campuses. This particular recommendation should only be acted upon after follow-up by the Vice Chancellor in consultation with the Associate Vice-Chancellor (AVC) at each campus site. Each AVC may have a different way of meeting the responsibility of the new advising system and remedial training that effectively coordinates with resources particular to that campus. Thus, an additional counselor is recommended unless an alternate solution is preferred by a particular campus AVC.

III. Summary of the Process for Implementation

If this report is accepted, the co-Chairs of the Committee on Q will work on appropriate motions for reform of the language of the General Education Guidelines with regard to entry and

exit expectations of quantitative skills of students that will be consistent with the spirit of these deliberations. It will also be the case that there will need to be numerous changes to course catalog descriptions. These will need Senate approval.

IV. Acknowledgements

The Committee on Q expresses its appreciation to Vice Chancellor Fred Maryanski for his continued support of these efforts and for providing financial assistance for graduate students, Rongwei Fu and Lan Huang, in the Department of Statistics who, under the careful guidance of Nalini Ravishanker, carried out the statistical analyses described herein. The Committee is also very grateful to Eric Soulsby for the laborious job of culling and organizing the student data provided for these analyses. We also thank Zeus Pendon for technical assistance with the PictureTel system used for telecommunicating with Prof. Watnick at the Stamford Campus.

Appendices

- A. Current Q-course Readiness Test Sample Questions
- B. Current Calculus Placement Test Sample Questions
- C. Mathematics Placement Procedures Used by Various Colleges and Universities
- D. Sample Questions from the SAT1 Mathematics Part
- E. Advising Contour Diagrams Based on Recent Student Performance in Nine Entry-Level Q-courses
- F. Example of a Probability Table using SAT1 Math Score Alone (for use when class rank is not available – Tables for all courses given on the CD 1)
- G. Percentages of Students Successfully Completing their First Q-Course with or without Prior Completion of MATH 101

Appendix A

Current Q-course Readiness Test Sample Questions

1. $2[3 - 2(4 - 5)] =$

- a) -10 b) -4 c) -2 d) 2 e) 10
-

2. If $x = -3$ and $y = -4$, then $x - y =$

- a) -7 b) -1 c) 1 d) 7 e) 12
-

3. $\frac{1}{u} - \frac{3}{v} =$

- a) $\frac{-2}{u-v}$ b) $\frac{-2}{u+v}$ c) $\frac{-2}{uv}$ d) $\frac{v-3u}{uv}$ e) $\frac{u-3v}{uv}$
-

4. $6x + 4(x - y) - y =$

- a) $2(5x - y)$ b) $2(5x - 4y)$ c) $5(2x - y)$ d) $10x - y$ e) $10(x - y)$
-

5. If $\frac{2}{x} = \frac{9}{4}$, then $x =$

- a) $\frac{2}{9}$ b) $\frac{8}{9}$ c) $\frac{9}{8}$ d) $\frac{9}{2}$ e) 18
-

6. The graph of $3x - y + 6 = 0$ crosses the x -axis at $x =$

- a) -6 b) -2 c) 0 d) 2 e) 6
-

7. $(-5a)^2 =$

- a) $-10a$ b) $-25a^2$ c) $-5a^2$ d) $5a^2$ e) $25a^2$
-

8. If $6x - 12 = 3 - 3x$, then $x =$

- a) $-\frac{5}{3}$ b) -1 c) 1 d) $\frac{5}{3}$ e) 2
-

9. $\frac{2}{2 + \frac{1}{3}} =$

- a) $\frac{3}{4}$ b) $\frac{6}{7}$ c) $\frac{4}{3}$ d) 2 e) 3
-

10. $(3x^3y)(-2x^2y^3) =$

- a) $-6x^5y^4$ b) $-6x^6y^3$ c) xy^{-2} d) $6x^5y^3$ e) x^6y^3
-

11. $2x - 3(x - 2) + 2(y - 2) =$

- a) $2y - x + 2$ b) $2y - x - 10$ c) $2y - x - 4$ d) $2y - 3x$ e) $2y - 3x + 2$
-

12. $2^0 3^2 =$

- a) 0 b) 6 c) 9 d) 12 e) 36
-

Appendix B

Current Calculus Placement Test Sample Questions

Sample problems for Calculus placement test

1) Solve for x : $x^2 + 2x = 2$ 2) Factor: $2a^2 + 3ab + 6a + 9b$

3) Factor: $27r^6 + 8s^6$ 4) Simplify: $\left(\frac{x^3}{y^{-6}}\right)^{-4/3}$

5) If $f(x) = x^2 - 1$ and $g(x) = \frac{x+1}{x-1}$ find $f(g(2))$

6) Simplify: $\frac{\frac{x+1}{x} - \frac{x^2-2}{x^2-x}}{2 - \frac{x}{x-1}}$ 7) Simplify: $\frac{1}{\sqrt{x} - \sqrt{x+1}}$

8) Solve for x : $\frac{1}{x} + \frac{2}{x^2-1} = \frac{1}{x^2-x}$

9) Solve for x : $2^{x^2} = \frac{8^x}{4}$ 10) If $\cos(A) = x$ find $\cos(2A)$

11) One angle of a triangle is 60° . The two adjacent sides are 1 & 3 respectively. Find the length of the opposite side.

12) Write the equation of the line through the pts (1,2) & (2,-3)

13) If $\cos(A) = 1/3$ and $\sin(a) < 0$ then find $\tan(A)$

14) Find all solutions to $2\sin^2 x + 5\sin x + 2 = 0$ in the interval $[-\pi/2, \pi/2]$.

15) Simplify $\frac{\sin 2x + \cos 2x + 2\sin^2 x}{\sin x + \cos x}$

Answers:

1) $x = -1 \pm \sqrt{3}$ 2) $(2a+3b)(a+3)$ 3) $(3r^2+2s^2)(9r^4-6r^2s^2+4s^4)$

4) $\frac{1}{x^4 y^8}$ 5) 8 6) $\frac{1}{x^2-2x}$ 7) $-(\sqrt{x} + \sqrt{x+1})$

8) $x = -2$ (not $x = 1$) 9) $x = 1$ or 2 10) $2x^2 - 1$

11) $x = \sqrt{3}$ 12) $y + 5x = 7$ 13) $-2\sqrt{2}$

14) -30° or $-\pi/6$ 15) $\sin x + \cos x$

APPENDIX C

Mathematics Placement Procedures Used by Various Colleges and Universities[†] Compiled by the Q-Committee, University of Connecticut Version: 20-March-03

[†]Most of the institutions surveyed are listed by the University of Connecticut Office of Institutional Research as “peer institutions”. This information was compiled either from text cut-and-pasted from web sites or from discussions with faculty, advisors, and/or administrators at the various institutions. Because in some cases this information was not entirely clear, the committee cannot guarantee the complete accuracy of the policies and procedures described.

Institution	Math Placement Procedure Summary	Placement Test (mandatory or advisory)	On-line/Proc-tored	Re-test	Comments
Air Force Academy	Self test-“practice exam” with answer key. Students select course with guidance from exam. Note-most have AP calculus in high school.	Yes (Advisory)	N/N		
Arizona State Univ.	All students enrolling in <i>College Algebra (MAT 117)</i> must take a mathematics placement test. The exam is not required of students meeting one of the following: Four years of high school courses: one year each of Algebra I, Geometry, Algebra II, and an advanced math class for which Algebra II is a prerequisite. Minimum test score of 24 on ACT Math or 540 on SAT Math. One transferable three-semester-hour college math course for which at least intermediate algebra is a prerequisite.	Mandatory only for students enrolling in Coll. Algebra	Y/N	Not clear	“Being placed in the mathematics course appropriate to your current background and knowledge is important for your success at ASU.” Failure to take the readiness exam will result in a drop of one letter grade at the end of the semester.
Binghamton State Univ.	Calculus-Statistics placement by course grade. B+ required in intermediate Algebra and Trigonometry. Self-placement into	State-wide exam			No placement needed outside of math/stat

	Developmental Mathematics				
Boston College	General recommendation for Math placement considers the student's background, interest level and scores on AP, AB or SATII tests (e.g. 700 or higher on the SAT-II test places no student will be forced to register for a Math course suggested by a table of recommendations given on the web site.	None	N/A	N/A	Students who have reservations about their abilities, or who are taking multiple science courses with labs, or who have heavy commitments in other disciplines, might consider "dropping back" in Math. Cautions are given about this also because enrolling in courses that are too easy can lead to bad study habits, etc.
Boston Univ.	The Mathematics and Statistics Department offers two on-line placement exams to help students choose the appropriate mathematics or statistics course. These exams do not fulfill any mathematics requirements or grant credit for any mathematics or statistics course; they are intended only to help the student choose the correct course.	Yes/Advisor y	Y/N	Y, once	The exams are available at http://math.bu.edu/placement/placement.html . Students take the Pre-Calculus Diagnostic Exam if they: 1. Intend to take calculus and want to see if a pre-calculus review is necessary before taking calculus I; or 2. Intend to take statistics in the fall and want to choose the appropriate statistics course. Students should take the Calculus Diagnostic Exam if they: Have taken calculus and have (or expect to receive) credit for calculus I from the AP exam or from another university, in order to choose the appropriate level of calculus.
CCSU	Use an on-line proctored test called ACU-PLACER. This exam uses statistical sampling to determine what a student knows. Based on this exam they are placed anywhere from Arithmetic, Elementary Algebra, Intermediate Algebra, College Algebra, Pre-calculus and Calculus.	Yes	Y/Y		It seems to work well, especially for students at lower levels, which constitute a large percentage of the entering student body
Colorado State University	All entering freshmen are required to take a Math Placement Exam (MPE). The MPE is waived for students who either scored 3, 4 or 5 on an Advanced Placement Calculus Exam	MPE/ Mandatory	N/Y	Y	The MPE is given in group sessions on Day 1 of Preview and during the Orientation and Registration period before fall semester begins. It's also given on a walk-in basis in

	(either AB or BC) or have transfer credit in a math course at the level of college algebra or above. The Math Placement Exam consists of 50 multiple choice and multiple choice-multiple response questions. The exam period is two hours and twenty minutes long. The MPE covers pre-algebra and algebra, trigonometry, and logarithmic and exponential functions. They are expected to use a calculator on the exam. However, calculators that have a "QWERTY" keyboard are not permitted.				the Individualized Mathematics Program Testing Center. A fee of \$15 is charged to the student account the first time they take either the MPE or the Entry Level Math Exam. There is no charge for subsequent attempts on either exam. Poor performance requires entry into several different mini-courses that attempt to remedy deficiencies. The chemistry department does not do any additional math placement. They do require a certain level of math as a pre-requisite for many classes. For general chemistry classes those pre-reqs are NOT enforced which means that students can register for the courses without having taken the required math, and they find many students take the classes without the proper math background. For any classes after general chemistry, they enforce the math pre-reqs which means the students cannot register for the chemistry class unless they have taken the appropriate math class or convinced the professor of the class to allow them to let them into the class without the math which is possible.
Michigan State Univ.	All students entering MSU as new freshmen must take the MPS Exam, except for those who have ACT Math scores of 28 or higher, SAT Math scores of 640 or higher, or AP scores that earn them credit in Math 132. All transfer students must also take the Exam except for those satisfying the same conditions as above or those transferring credit for specific MSU mathematics courses (above MTH 1825).	Mandatory	Y/N	Y	On the web site: "Dishonesty of any kind while taking this exam (including failure to follow the preceding instructions) can only result in your placement into a course in which you are <i>extremely</i> unlikely to succeed." A proctored exam is also available to all new and transfer students at academic orientation (presumably for those who do not have access to computers) and it is also available at several sites spread around the State of Michigan.

Missouri Baptist College	No exam. Look at ACT, HS math score, interview by counselor.	None: (abandoned)			
NC State-Raleigh	Requires admitted students to take the SAT II Mathematics, Level IIC test prior to attending New Student Orientation and registering for fall classes.	SATII in Math	N/Y	Y	If they have taken AP Calculus AND plan to take the AP exam, they are not required to take the SAT II; however, they must score at least a 2 or better to be placed into freshman calculus. Similarly, if they have taken IB Mathematics (Higher Level) and plan to take the IB exam, they are not required to take the SAT II; however, they must score at least a 5 or better to be placed into freshman calculus. In cases where they get an AP score and an SAT II score, they will use the score giving the highest placement. Students who do not present an SAT II or an AP Calculus score will not be placed in freshman calculus. Enrollment enforced.
Northeastern Univ.	Students are required to pass a math course that "demonstrates mathematics proficiency" in their first year or they are blocked from further registration. Student and advisor may opt to take a preliminary remedial course (which doesn't demonstrate proficiency) before one of the required ones that does. If a student attempts one of the required courses and fails, it may be taken over (they are offered every quarter).	None	N/A	N/A	About 15-20% of the students fail Gen Chem 1.
Northern Illinois Univ.	Students are required to take a Math Placement Exam only if their intended major involves a substantial Math requirement.	Mandatory for certain majors	N/Y	Y, once	An adequate score on the examination is one way to meet the prerequisite for some Math courses. Students not meeting the prerequisite for a course will not have access to that course. Registration is enforced.
Penn. State Univ.	Students who are admitted participate in the First-Year Testing, Counseling and Advising Program (FTCAP). During the testing	FTCAP. The test is mandatory	N/Y	N	First-Year Testing, Counseling and Advising Program (FTCAP): Established in 1957, gives all entering first-year students the

	<p>component of this program, students take placement tests in English, Mathematics, and Chemistry. When testing is completed, the Division of Undergraduate Studies develops for each student the <i>Profile of Academic Abilities</i>, which is based on the student's high school record, SAT scores, and scores on the placement tests. The profile is reviewed in detail with students and their families during FTCAP. More than 95% of newly admitted first-year students participate in this program before registering for first-semester classes. Therefore, the majority of students receive copies of their profiles and detailed interpretations of their test results before they meet with their academic advisers. Students are advised not to schedule English, mathematics, or chemistry courses referred to on the profile unless the placement actions and recommendations are available to the adviser.</p>	<p>for all students. Only the Math results claim to restrict registration, but in truth, they do not prevent students from registering for advanced Math courses. In that sense it is advisory.</p>		<p>opportunity to examine their academic abilities, interests, and educational plans before their first semester of classes. Students' families are also encouraged to participate. FTCAP is a comprehensive program of pre-registration testing in English, mathematics, and chemistry; individualized educational planning; and academic advising. As part of their participation in FTCAP, all new students are asked to complete an "Educational Planning Survey." This survey, which includes questions about the student's background and interests, was developed by the Division of Undergraduate Studies.</p> <p>Enrollment in quantitative courses such as General Chemistry is written in the catalog as restricted depending on performance on the Math placement tests. In fact, they do not enforce it. Poor performance on Chem test results in advice not to take General Chem without a lower level Chem "review" course and additional Math. Contact person: Judith J. Goetz, Assoc. Dean, Div. Undergrad. Studies: 814.865.7576</p>
Rutgers Univ.	<p>Uses State wide exam. No placement needed outside of Math/Stat.</p>	<p>Yes, for some majors.</p>	N/Y	<p>Proctored live in-state, on-sight; Out-of-state in HS counselor's office mailed electronically. Can take proficiency exam to satisfy original placement as in course credit by examination. Testing coordinator, dedicated position and office.</p>
Stony Brook Univ. – SUNY	<p>Use a three-part multiple-choice exam: Part I tests basic arithmetic, algebra manipulation, solving equations. Part II tests pre-calculus topics: composition of functions, trig, graphs.</p>	<p>Yes. Mandatory for all entering</p>	No	<p>The General Ed requirements are one math or stat course (or some discipline stat research methods courses). However, the physics, chem and bio departments use the math exam</p>

	<p>Part III tests single variable calculus. A low grade on Part I forces a low grade overall, but if a student gets low score on Part I and a high score on a later part, then the system flags that exam for a faculty member to look over. Students with a low grade are forced to take "Proficiency Algebra", which does not carry graduation credit. A highly detailed report is generated for the student the same day as when they take the exam. The report includes: How they did on the exam, what courses are open to them. If they came close to a cut point (within 2 points) the system tells them so, lets them know the topics they did not do well on and informs them that if they study these kinds of questions, retake the exam (a variation) and do well, then these other courses will open to them as well as new options in the various majors. When questions are added to the exam, they are added provisionally (not effecting the score of the exam) until they have been check to statistically be valid indicators. In this way, over years, they have increased their question bank so that now, test generation is not difficult.</p>	<p>students, even those with AP or transfer credit. However, for such students the advice given is not mandatory. Students can contest the results and they are dealt with individually by a faculty member.</p>			<p>in placing students into their freshman major courses. The contact person felt pretty confident that, with the checks to the system in place, their system works well.</p>
Univ. of Alabama	<p>All entering students to UA take a Mathematics Placement Examination. The exam consists of 55 problems in a computer-based, multiple-choice format. The problems represent a variety of topics taught in undergraduate mathematics courses at UA. Students have 50 minutes to complete the exam. No calculators are allowed. At the conclusion of the exam, students receive their</p>	<p>UA Math Placement Exam/ Mandatory</p>	<p>Computer based / Proc-tored</p>	<p>Y for an additional fee</p>	<p>When a student registers for an orientation session, they are also registering to take the placement exams at the designated times for that session. The Chemistry Dept gives its own Chem-readiness test.</p>

Univ. of Arizona	<p>scores. The goal is to help students identify where they should begin their math sequence of courses in order to have the best opportunity for success.</p> <p>MATH 105 (Math in Modern Society) or PHIL 110 (Logic and Critical Thinking) or any three-unit mathematics course numbered above MATH 105 is required of ALL students. Registration in all MATH courses below MATH 129, as well as MATH 160, MATH 263, and PHIL 110, requires ALL students to take the UA Mathematics Readiness Test (MRT). Test scores are valid for one year. This requirement includes transfer students with or without mathematics credit and students with credit by examination, such as Advanced Placement, CLEP, or International Baccalaureate. Students may register only for a course at or below the level placed into by their MRT score. Transfer credits in mathematics and credit by AP, CLEP or IB do not exempt a student from taking the MRT in order to be eligible for the courses (e.g. Chemistry) requiring Math skills.</p>	UA Mathematics Readiness Test administered by the Univ. Testing Office/ Mandatory	N/Y	N	<p>Test given to ALL students during orientation in the summer. Also given in Chicago during the summer. New freshmen with a reported RSAT 1 mathematics score of at least 670 or an ACT mathematics score of at least 29 may register for higher level Math courses, but they are still not exempt from taking the MRT.</p>
Univ. Massachusetts	<p>Local derivative of old MAA algebra & trigonometry exam; chart for score-based placement advice</p>	Mandatory to take; Placement is advisory	N/Y	N	<p>Doris Stockton served on a national committee that determined appropriate placement advice completely offset deficiencies in that instrument</p>
Univ. California, Riverside	<p>For Mathematics Placement, they use the Mathematics Diagnostic Testing Program (designed for UC/CSU and administered out of UC San Diego). Dr. Alfred Manaster, a mathematician in their department is one of the three principal architects. Their exams</p>	Mandatory	N/Y proct or-ed in- perso n	N	<p>67% of entering freshmen were recommended for remedial mathematics this year, remedial being defined by UC Riverside to be anything below calculus. Courses below calculus include: pre-calculus (Math 5), college algebra (Math 3) and individualized</p>

<p>are available from the MDTP Center free but they charge for the scantrons---MDTP collects the exams, grades and returns information with every conceivable analysis. If you don't want the analysis, the exams are still free. They use two of these exams: <u>Pre-Calculus</u> (60 questions) and <u>Mathematics Analysis</u> (no trigonometry, 45 questions). If a student's raw score is 36-60 on the <u>Pre-Calculus</u> he/she is allowed into first quarter calculus. First quarter calculus is required for the entering biology course as is chemistry (1A). Calculus must be taken concurrently by students to enroll in introductory physics, chemistry or computer sciences. Students enroll electronically and the system controls for the circumstances above. If a student's raw score is 18-35 on the <u>Pre-Calculus</u> exam they must enroll in Math 5, less than 18 - Math 3 or (individualized math below Algebra 1) IMP. Having to take Math 5 or below delays student's ability to "get going" in the science courses. If a student's raw score is 28 - 45 on the <u>Mathematics Analysis</u> exam, he/she may take Math 5, below 28 - Math 3 or IMP. The test is given May 1-Aug 30 with most during July orientation. Students who were accepted receive letters, reminders and various mass mailings informing them of the time, day and location of the exams. The test must be taken at the university, in person and it is proctored by employees of the Learning Center on our campus. ALL students must take the exam. If a student is a transfer student he/she must</p>			<p>mathematics (IMP Math for students below Algebra 1). Chemistry gives a completely separate Chem-placement test in the summer when the students are in town for orientation.</p> <p>Through outreach efforts on campus they are trying to work with high schools to better prepare students for the mathematics of college as it so dramatically affects the courses in science. But, UCR has only seriously been at this effort for 4 years. They are making some progress in our local schools but not all UCR students come from local schools--- because of this along with other reasons they haven't seen dramatic changes. Also they college student retention is "not good." Between the 1 and 2 quarter they lose a lot of freshmen students and in many cases mathematics is part of the reason they leave the university. Usually with this process they have a few students who "mumble and grumble" about being placed in the wrong class. They frequently hear the comment, "But I already took Calculus in High School, how can I be assigned to Math 5?" They respond, but did you learn it? Students quickly adapt to the system and it seems to work for them.</p>
--	--	--	--

	take it or show evidence of having taken and passed a pre-calculus course at the C level from some other institution. Sometimes special arrangements can be made for a student to take the exam at one of the other UC or CSU campuses for convenience, but everything must be approved by the Learning Center.				
Univ. California, San Diego	A student must take the MPE before registering for a mathematics class at UCSD unless: They have taken the <u>Advanced Placement Calculus Exam</u> and received, or expect to receive, a score of 2 or better; OR They have completed at least one quarter of college credit calculus with credit awarded by a college or university; OR They have received a score of 650 or better on the <u>SATII Level 2C Mathematics Exam</u> ; OR They have received a score of 5 or better on the <u>International Baccalaureate Higher Mathematics Exam</u> ; OR They have taken only the U.C.-required 3 years of high school mathematics beginning with Beginning Algebra and do not intend to take any UCSD mathematics class other than Math 3C. If they took a calculus course in high school but did not take the AP Calculus Exam and did not receive college credit for the course they must take the MPE before registering for a UCSD math class. A pre-calculus course taken at either the high school or community college does not exempt them from the MPE.	Mandatory	N/Y	N	Placement results are entered into the student registration system to allow them to register for a math class. It is used to enforce registration in Math classes. Test results are valid for one calendar year from the test date.
Univ. Iowa	Iowa requires all students to take a Math Placement Test at an Orientation program. First-year students take it the first day of their	Mandatory, but the particular	N/Y but are	N	At this time, students take a paper test but we are currently working on an on-line version to be completed before students come to

	Orientation program (we have 2-day programs). Scores are available to advisors in the evening of the first day. Students take one of three possible tests depending on their math background. Test #1 assumes only algebra and geometry knowledge, test #2 the same as well as trig and functions, and test #3, the same as #2 as well as at least 8 weeks of calculus.	test they take depends on their Math background	changing to the University of Minnesota next year.		Orientation (to be ready this Spring 2003). The current test is proctored by Orientation Student Advisors. At this time, students take the MPT and this affects their placement into both math and chemistry. But also on tap for us this coming year is an on-line chemistry placement test. We believe that our foreign language placement test will remain an on-site Orientation paper test because of the oral component of the test.
Univ. Kentucky	Based on their ACT/SAT Math score, the students have the following eligibility: ACT < or = 18, SAT < or = 420 MA 108 Intermediate Algebra (remedial; reviews high school algebra) ACT 19 or greater SAT 440 or greater MA 109 College Algebra, ACT 21 or greater SAT 470 or greater MA 123 Elementary Calculus, ACT 23 or greater SAT 520 or greater (a prep. for Calc I, II, III & IV), MA 110 Analytic Geometry & Trig ACT 26 or greater SAT 540 or greater, MA 113 Calculus I. They cannot take a higher course unless they take and pass the math placement exam.	Combination of SAT/ACT and a Math placement exam, the latter is required to jump into higher Math.	Y/Y	N	The exam is on-line and proctored during orientation. It is monitored and scored immediately after completion. Students take the results to the advisors prior to final courses selection. UK also restricts Biology and Chemistry courses based on math ACT/SAT scores. Students can take the math placement exam to enter these restricted courses. All students must demonstrate a minimum proficiency in Math before graduation, by either a score of 26 on the mathematics section of the ACT or MA 109 College Algebra, or MA 110 Analytic Geometry and Trigonometry, or any calculus course. No further Math is required beyond that unless their major requires it.
Univ. Maine	Local on-line Math placement exam used for Math placement only.	Math placement exam does not appear to be mandatory	Y/N	N	On-line unproctored. Information used in an advisory capacity only.
Univ. Michigan	Local Math placement exam; placement on basis of score & prior courses	Mandatory for	N/Y	Very rare. ¹	Advisors have final authority for math course placement; considered but rejected on-line

		freshman, but not transfer students.			administration; Chem gives a test derived from ACS; Physics nothing. Placement is not mandated. It is an ingredient for a serious recommendation, which is also based on high-school grades and courses completed. More common: Give the exam less weight in the face of evidence that the score did not measure actual mastery of basic algebra, so recommend a higher placement than the raw score suggests.
Univ. Minnesota	There are three placement exams: "General Math," "College Mathematical Readiness," and "Calculus Readiness". Incoming students take one of these tests online before they arrive, or they take it during orientation. These one-hour multiple choice exams are available online at http://onestop.umn.edu/placement . Username and password are sent to them with their orientation materials. Calculators may be used during the "General Math" test but may not be used during the "College Mathematical Readiness" test or the "Calculus Readiness" test. Students cannot qualify for course credits by taking these exams.	Mandatory	Y/N	N	Test scores are used in an advisory capacity only. A high score on a placement test indicates that the student has sufficient prerequisite knowledge to begin the course in question. Students receive a Placement Report, and a course recommendation based on their test results. They should take the recommended course or any course with a lower catalog number. When used in conjunction with other data, such as high school performance and transfer courses, they can help the adviser obtain some idea of where students should start in math. They believe high school calculus courses are not reliable indicators for math placement.
Univ. Mississippi	Students whose ACT mathematics score is 16 or less (or SAT mathematics score is 360 or less) are required to enroll in Math 99 (Intermediate Algebra) during the first semester, or to pass the algebra placement exam administered by the Department of Mathematics. These students are also encouraged to participate in the Academic Support Program during their freshman year.	Mandatory for specific students	N/Y		

Univ. New Hampshire	Placement exam undergoing pilot study with participation from small group of incoming Physical Science majors.	Mandatory for specific students	N/Y		One course in Quantitative Reasoning must be taken during a student's first year as part of the GenEd curriculum.
Univ. North Carolina, Chapel Hill	<p>All students applying to must take the SATIIC Standardized Mathematics Test through their high school and have the College Board provide their score to the university. Only those who attain scores >510 are given placement credit for their "remedial" college algebra course (Math 10). It's not a perfect system. The most common problem seems to be that some high school guidance counselors do not properly advise their students to take the SATIIC promptly. It is well publicized both on their application and on their new student website. One advantage, it removes the burden of actually administering the test from depts. and the university, which they are not inclined to take on.</p>	SATIIC/ Mandatory	N/Y	Y	<p>In order to enroll in a general chemistry course, students must already have placement credit for the Math 10 course or above. This means either they scored a 520 or higher on the SATIIC Math test or they used AP or college transfer courses to receive credit for a math course on a higher level than Math 10. Students who are enrolled in Math 10 are not allowed to take a gen. chem. Class until they've completed it. An SATIIC Math score of >510 also allows incoming students to register in our gen. chem. classes (placement credit for Math 10).</p> <p>One thing this administrator did at Ohio State, "... which worked about as good as you can hope for, is that we had a small group of math faculty who actually cared about preparation of high school students entering the university. so they built a network, personally driven, where they had teachers from high school who knew the system: placement procedures, content students need to begin at certain levels and succeed in a college math course, etc. I would strongly urge you to begin that conversation. the teachers are the key to getting info/advice and preparedness to the students. if they hear from the university faculty what they need to succeed in college, they seem to take it more seriously."</p>

Univ. Rhode Island	A locally-written Mathematics Placement Exam is given only to those entering students who have specified an interest in majors having a sequential Math course requirement. Students who have an interest in majors needing only 3 credits of math do not take the exam. The exam is given during June orientation. 50-60% of the entering students take it. It is computer-scored exam. The advisors get the scores within one hour and use it for Math and Chemistry placement, but it is used only in an advisory capacity. The placement is not enforced.	Mandatory only for students who have specified an interest in majors having a sequential Math course requirement.	N/Y	N	All students must graduate with at least 3 credits of Math – required by the GenEd curriculum. Contact: Jane Richmond (401-874-5157) or Lou Pakula (pakula@math.uri.edu).
Univ. Vermont	An in-house-written test is given on-line and designed to assess the student's ability to handle the concepts and skills needed for success in their first semester of college mathematics.	Not clear from web site	Y/N	Not clear	The test is multiple choice and timed.
Univ. Wisconsin-Madison	A test is given to facilitate placement into the college mathematics course most compatible with a student's skill level. The 90 minute test consists of 85 multiple choice questions measuring skills in elementary algebra, intermediate algebra, college algebra, and trigonometry. While it is a state-wide university system exam, each campus determines the appropriate scores for entry into their specific courses. At the Madison campus, use of the test varies by College. In CLAS for both a BA and a BS degree students must: (a) Pass the math placement test, or the equivalent of UConn's Math 101. (b) Take one Q (quantitative reasoning course). For a BS degree students must also pass two additional Department of	Mandatory	N/Y	Y	Substantial research has been done on the design of the test by Testing Center Staff and the School of Education. Test is redesigned and pre-tested each year. Process is overseen by a state wide committee of university mathematics faculty. At www.wisc.edu/exams there are available: a 2 page outline of the test components, 2 pages of criteria for math logic and problem solving skills, etc, and 7 pages of sample test questions. The coordinating faculty member from the UW Madison Department of Mathematics is Gloria Marabetha, 608-263-1634. The person in charge of test administration at the Placement Center is Char Totorice, 608-263-6887.

	Mathematics courses.					
Western Washington Univ.	State of Washington Pre-College test. Intermediate and advanced test. Placement depends on score in both exams. Low score puts them in equivalent to UConn's Math 101. Test waived for students scoring 3 or higher on FTS Advanced Placement Calculus test or who have college credit equivalent of Calculus I. Sample problems available on line. Note-respondent felt test is no better predictor than SAT/HS GPA.	Y	N/Y	Y		

Appendix D

Sample Questions from the SAT1 Mathematics Part

6



6

Unauthorized copying or reuse of
any part of this page is illegal.

6



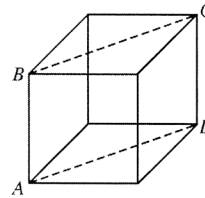
6

3. The ratio of toggle-bolt prices in year X to toggle-bolt prices in year Y was 4 to 3. If the ratio of prices in year Y to prices in year Z was 3 to 2, what was the ratio of prices in year X to prices in year Z ?

(A) 3 to 1
(B) 2 to 1
(C) 3 to 2
(D) 4 to 3
(E) 7 to 5

4. A group of 110 people is divided into 4 committees. If each committee contains at least 2 people, which of the following statements must be true?

(A) Each committee has at least 4 people.
(B) No 2 committees have the same number of people.
(C) No committee has more than 100 people.
(D) At least 1 committee has more than 25 people.
(E) The largest committee has 3 more people than the smallest committee.



5. In the cube above, $AB = 4$. What is the perimeter of rectangle $ABCD$?

(A) 24
(B) $16\sqrt{2}$ (approximately 22.63)
(C) $16 + 4\sqrt{2}$ (approximately 21.66)
(D) $8 + 8\sqrt{2}$ (approximately 19.31)
(E) $4 + 8\sqrt{2}$ (approximately 15.31)

$$n = 1234567891011 \dots 787980$$

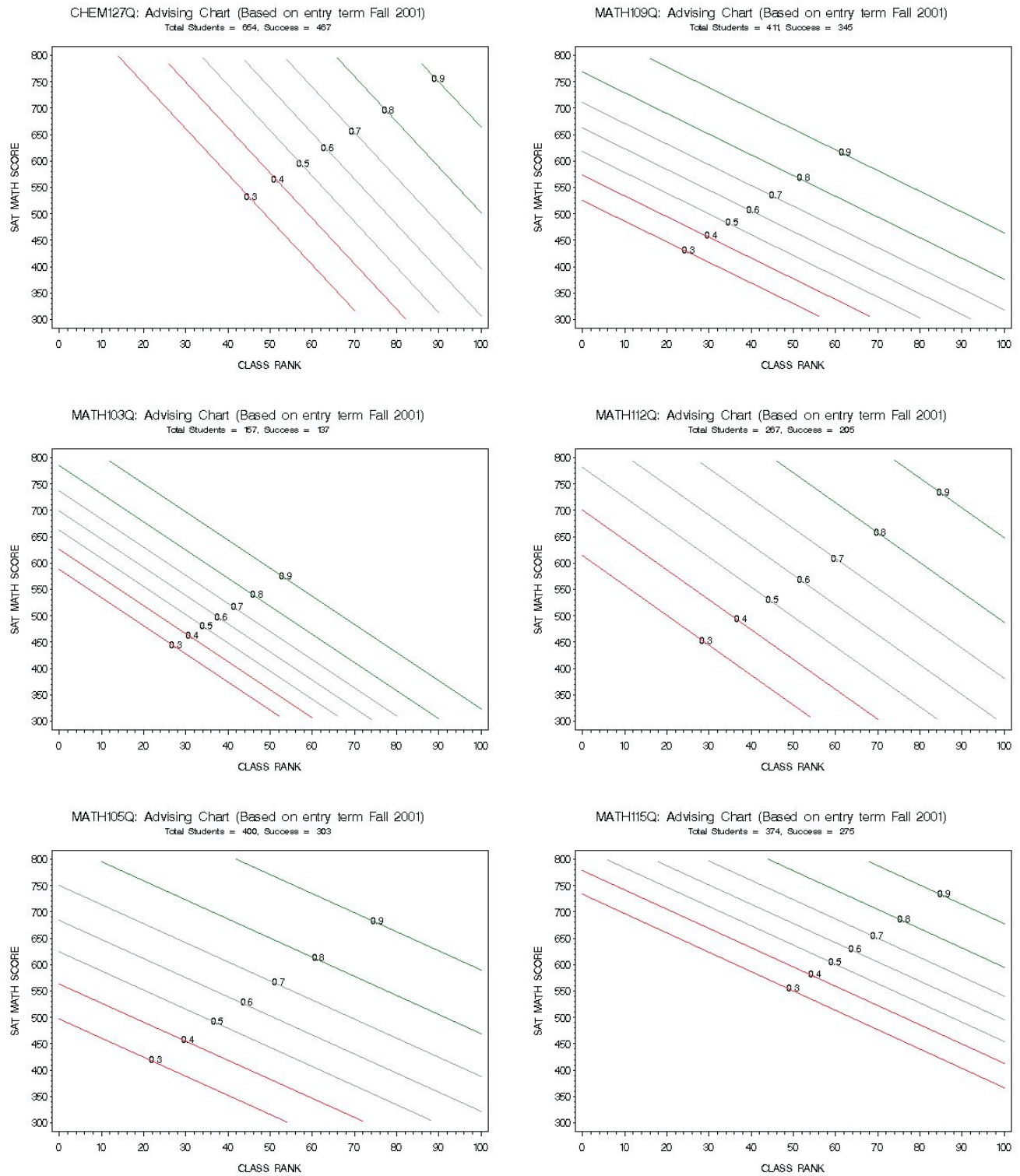
6. The integer n is formed by writing the positive integers in a row, starting with 1 and ending with 80, as shown above. Counting from the left, what is the 90th digit of n ?

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

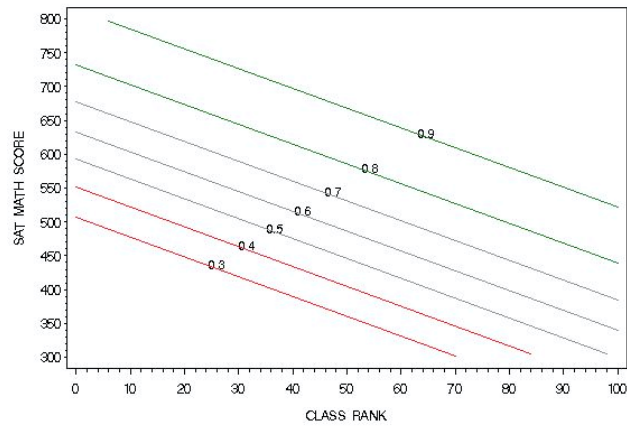
GO ON TO THE NEXT PAGE 

Appendix E

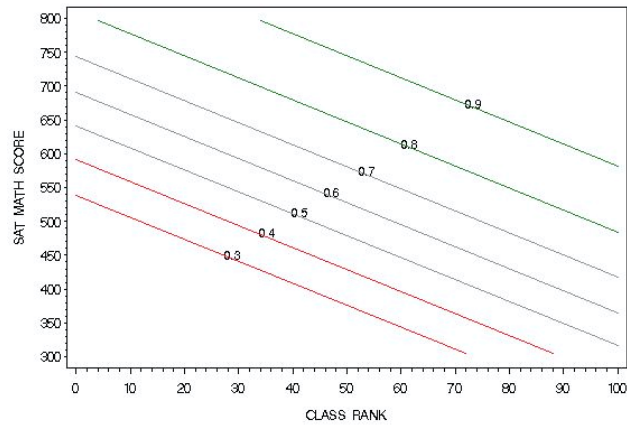
Advising Contour Diagrams Based on Recent Student Performance in 9 Entry-Level Q-courses



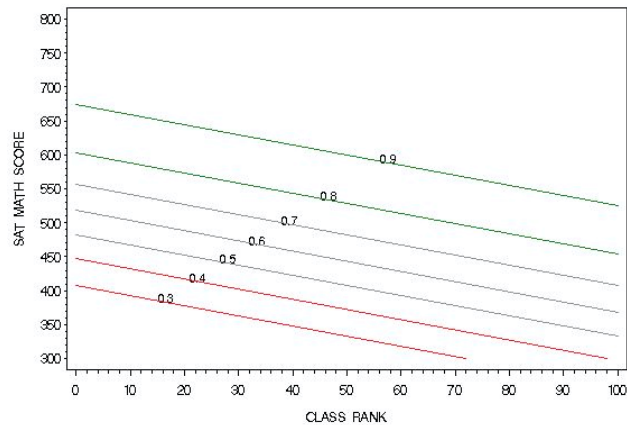
PHYS101Q: Advising Chart (Based on entry term Fall 1999)
 Total Students = 69, Success = 68



STAT100V: Advising Chart (Based on entry term Fall 2001)
 Total Students = 334, Success = 286



STAT110V: Advising Chart (Based on entry term Fall 2001)
 Total Students = 279, Success = 251



Appendix F

Example of a Probability Table using SAT1 Math Score Alone (for use when class rank is not available – Tables for all courses given on the CD)

CHEM 127Q

The values correspond to the predicted probability of a student with particular SAT1 Math score achieving a C- or better in CHEM 127Q in a given year.

SAT Math Score	Predicted prob. Fall 1995	Predicted prob. Fall 1996	Predicted prob. Fall 1997	Predicted prob. Fall 1998	Predicted prob. Fall 1999	Predicted prob. Fall 2000	Predicted prob. Fall 2001
340	0.40	0.20	0.26	0.18	0.20	0.12	0.29
360	0.44	0.23	0.29	0.21	0.23	0.15	0.32
380	0.47	0.26	0.33	0.25	0.26	0.18	0.35
400	0.50	0.30	0.37	0.29	0.29	0.22	0.39
420	0.54	0.34	0.41	0.33	0.33	0.26	0.42
440	0.57	0.38	0.45	0.38	0.37	0.31	0.45
460	0.60	0.43	0.49	0.43	0.41	0.36	0.49
480	0.64	0.47	0.53	0.48	0.45	0.41	0.52
500	0.67	0.52	0.57	0.53	0.49	0.47	0.56
520	0.70	0.56	0.61	0.58	0.53	0.53	0.59
540	0.73	0.61	0.65	0.63	0.58	0.58	0.62
560	0.75	0.65	0.69	0.68	0.62	0.64	0.66
580	0.78	0.69	0.72	0.72	0.66	0.69	0.69
600	0.80	0.73	0.75	0.76	0.69	0.74	0.72
620	0.82	0.76	0.78	0.80	0.73	0.78	0.74
640	0.84	0.79	0.81	0.83	0.76	0.81	0.77
660	0.86	0.82	0.83	0.86	0.79	0.85	0.79
680	0.87	0.85	0.86	0.88	0.82	0.87	0.81
700	0.89	0.87	0.87	0.90	0.84	0.90	0.83
720	0.90	0.89	0.89	0.92	0.86	0.92	0.85
740	0.91	0.91	0.91	0.93	0.88	0.93	0.87
760	0.92	0.92	0.92	0.94	0.90	0.95	0.88
780	0.93	0.93	0.93	0.95	0.91	0.96	0.90
800	0.94	0.94	0.94	0.96	0.92	0.96	0.91

Appendix G

Percentages of Students Successfully Completing their First Q-Course with or without Prior Completion of MATH 101

Course	F1995				F1996			
	Wm101	Wm101	Woutm101	Woutm101	Wm101	Wm101	Woutm101	Woutm101
math103q	64.79	71	84.87	119	67.50	80	83.78	74
math105q	49.52	105	76.33	338	64.29	98	68.41	345
math109q	52.34	128	74.03	362	51.43	140	79.63	383
math112q	58.33	12	68.05	457	25.00	16	65.18	471
math115q	0.00	1	80.30	203	.	.	83.73	252
chem127q	34.43	61	69.47	737	28.57	35	60.27	672
stat100v	51.92	52	78.74	127	58.49	53	65.61	157
stat110v	58.21	67	80.00	160	67.44	86	72.50	160
phys101q	68.42	19	76.19	42	86.36	22	95.45	66

Course	F1997				F1998			
	Wm101	Wm101	Woutm101	Woutm101	Wm101	Wm101	Woutm101	Woutm101
math103q	56.45	62	88.57	70	69.81	53	83.33	54
math105q	55.46	119	76.01	346	61.29	155	80.87	366
math109q	61.83	131	78.61	346	50.90	167	78.34	374
math112q	16.67	18	65.49	368	32.35	34	68.03	416
math115q	.	.	75.10	257	0.00	4	76.10	385
chem127q	31.75	63	64.93	633	20.69	58	66.71	700
stat100v	58.67	75	75.76	132	56.36	110	73.10	171
stat110v	64.29	84	80.84	167	60.61	99	83.98	256
phys101q	64.29	14	83.87	62	60.87	23	83.33	54

Course	F1999				F2000			
	Wm101 (percentage)	Wm101 (n)	Woutm101 (percentage)	Woutm101 (n)	Wm101 (percentage)	Wm101 (n)	Woutm101 (percentage)	Woutm101 (n)
math103q	67.16	67	77.78	63	65.31	49	86.96	69
math105q	58.18	165	78.23	464	40.54	74	73.44	497
math109q	58.23	158	83.87	527	47.13	87	74.57	468
math112q	27.27	22	73.33	420	20.00	5	64.74	380
math115q	0.00	2	74.57	405	.	.	71.98	496
chem127q	11.90	42	58.99	790	23.08	26	61.21	843
stat100v	63.38	71	75.30	166	52.00	50	73.99	419
stat110v	64.10	117	75.17	298	49.06	53	85.14	222
phys101q	68.18	22	87.69	65	73.33	15	94.59	74

course	F2001			
	Wm101	Wm101	Woutm101	Woutm101
math103q	65.12	43	89.54	153
math105q	51.92	52	70.94	499
math109q	50.82	61	81.88	480
math112q	42.86	7	66.93	387
math115q	100.00	1	67.56	484
chem127q	36.84	19	64.99	854
stat100v	50.00	28	76.92	403
stat110v	61.54	26	86.71	331
phys101q	80.00	5	95.12	41

Supplemental Information on Compact Disks

CD 1

Detailed Summary of Statistical Results

Note that EntryTerm=0958 denotes Fall 1995, 0968 denotes Fall 1996, 0978 denotes Fall 1997, 0988 denotes Fall 1998, 0998 denotes Fall 1999, 1008 denotes Fall 2000, 1018 denotes Fall 2001, and 1028 denotes Fall 2002.

I. Folder: Advising Contour Diagrams: This folder contains the following subfolders, one for each of nine first Q courses. Note that Success is defined as a grade of C- or better.

1. CHEM127Q Advising Contour Diagrams: This subfolder consists of the following files:

- a) CHEM127Q Advising Contour Diagram---1995: The combinations of SAT Math Score and Class Rank that will predict 100p% probability of Success of a student with entry term Fall 1995 are shown, for $p=0.3, 0.4, 0.5, 0.6, 0.7, 0.8$, and 0.9 . For example, a student entering in Fall 1995 with an SAT Math Score of 650 and Class Rank of 10 has approximately 30% chance of getting a grade of C- or better in CHEM127Q, while a student with an SAT Math Score of 650 and Class Rank of 72 has an approximate 80% chance of getting a grade of C- or better in CHEM127Q.
- b) CHEM127Q Advising Contour Diagram---1996: The combinations of SAT Math Score and Class Rank that will predict 100p% probability of Success of a student with entry term Fall 1996 are shown, for $p=0.3, 0.4, 0.5, 0.6, 0.7, 0.8$, and 0.9 .
- c) CHEM127Q Advising Contour Diagram---1997
- d) CHEM127Q Advising Contour Diagram---1998
- e) CHEM127Q Advising Contour Diagram---1999
- f) CHEM127Q Advising Contour Diagram---2000
- g) CHEM127Q Advising Contour Diagram---2001

2. MATH103Q Advising Contour Diagrams: For 1995-2001
3. MATH105Q Advising Contour Diagrams: For 1995-2001
4. MATH109Q Advising Contour Diagrams: For 1995-2001
5. MATH112Q Advising Contour Diagrams: For 1995-2001
6. MATH115Q Advising Contour Diagrams: For 1995-2001
7. PHYS101Q Advising Contour Diagrams: For 1995-2001
8. STAT100V Advising Contour Diagrams: For 1995-2001
9. STAT110V Advising Contour Diagrams: For 1995-2001

Advising Tables with SAT1 Math Scores

II. Folder: Exploratory Graphs and Tables. This folder contains the following files.

1. Plots for SAT Math Score.ppt: This file contains

- a) Frequency Histograms of SAT Math Scores for all students for entry terms Fall 1995-Fall 2001
- b) Percent Histograms of SAT Math Scores for all students for entry terms Fall 1995-Fall 2001
- c) Comparison of Frequency Histograms of SAT Math Scores for students with MATH101 and students without MATH101 for entry terms Fall 1995-Fall 2001 (Yes: with MATH101; No: without MATH101)
- d) Comparison of Percent Histograms of SAT Math Scores for students with MATH101 and students without MATH101 for entry terms Fall 1995-Fall 2001 (Yes: with MATH101; No: without MATH101)
- e) Boxplots for SAT Math Scores for all students for entry terms Fall 1995-Fall 2001
- f) Comparisons of Boxplots for SAT Math Scores for students with MATH101 and students without MATH101 for entry terms Fall 1995-Fall 2001 (Yes: with MATH101; No: without MATH101)

2. Plots for Class Rank.ppt: This file contains

- a) Frequency Histograms of Class Ranks for all students for entry terms Fall 1995-Fall 2001
- b) Percent Histograms of Class Ranks for all students for entry terms Fall 1995-Fall 2001
- c) Comparison of Frequency Histograms of Class Ranks for students with MATH101 and students without MATH101 for entry terms Fall 1995-Fall 2001 (Yes: with MATH101; No: without MATH101)
- d) Comparison of Percent Histograms of Class Ranks for students with MATH101 and students without MATH101 for entry terms Fall 1995-Fall 2001 (Yes: with MATH101; No: without MATH101)

3. Plots for Q Test Score.ppt: This file contains

- a) Frequency Histograms of Q Test Scores for all students for entry terms Fall 1995-Fall 2001
- b) Percent Histograms of Q Test Scores for all students for entry terms Fall 1995-Fall 2001
- c) Comparison of Frequency Histograms of Q Test Scores for students with MATH101 and students without MATH101 for entry terms Fall 1995-Fall 2001 (Yes: with MATH101; No: without MATH101)
- d) Comparison of Percent Histograms of Q Test Scores for students with MATH101 and students without MATH101 for entry terms Fall 1995-Fall 2001 (Yes: with MATH101; No: without MATH101)

- e) Boxplots for Q Test Scores for all students for entry terms Fall 1995-Fall 2001
- f) Comparisons of Boxplots for Q Test Scores for students with MATH101 and students without MATH101 for entry terms Fall 1995-Fall 2001 (Yes: with MATH101; No: without MATH101)

4. Plots for Calculus Test Score.ppt: This file contains

- a) Frequency Histograms of Calculus Test Scores for all students for entry terms Fall 1995-Fall 2001
- b) Percent Histograms of Calculus Test Scores for all students for entry terms Fall 1995-Fall 2001
- c) Comparison of Frequency Histograms of Calculus Test Scores for students with MATH101 and students without MATH101 for entry terms Fall 1995-Fall 2001 (Yes: with MATH101; No: without MATH101)
- d) Comparison of Percent Histograms of Calculus Test Scores for students with MATH101 and students without MATH101 for entry terms Fall 1995-Fall 2001 (Yes: with MATH101; No: without MATH101)
- e) Boxplots for Calculus Test Scores for all students for entry terms Fall 1995-Fall 2001
- f) Comparisons of Boxplots for Calculus Test Scores for students with MATH101 and students without MATH101 for entry terms Fall 1995-Fall 2001 (Yes: with MATH101; No: without MATH101)

5. Correlation1.ppt: This file contains, for all students, for students with MATH101 and for students without MATH101,

- a) Plots of correlations between (i) SAT Math Scores and Q Test Scores, (ii) SAT Math Scores and Calculus Test Scores, and (iii) Q test Scores and Calculus Test Scores.

6. Plots and Correlations for Class Rank.ppt: This file contains

- a) Plots of correlations between (i) SAT Math Scores and Class Ranks, (ii) Q Test Scores and Class Ranks, and (iii) Calculus Test Scores and Class Ranks
- b) Boxplots for Class Ranks for entry terms Fall 1995-Fall 2001 for all students, for students with MATH101, and for students without MATH101

7. Tabulation for different Q Courses.rtf: This file contains

- a) tabulation of grades for different Q courses for all students
- b) tabulation of grades for different Q courses for students with MATH101
- c) tabulation of grades for different Q courses for students without MATH101

III. Folder: Logistic Regressions for Advising Contour Diagrams: This folder contains the following subfolders, one for each of nine first Q courses.

1. **CHEM127Q_regchart:** This subfolder contains

- a) **subfolder, Logistic Regressions** which contains for each entry term (Fall 1995-Fall 2001) results from the logistic regression with covariates (i) SAT Math Score alone, (ii) Class Rank alone, and (iii) SAT Math Score and Class Rank. The advising Contour Diagrams were constructed based on the results from (iii), i.e., using both SAT Math Score and Class Rank as covariates. Note: we tested a model which includes the interaction between Sat Math Score and Class Rank as covariate and determined that in all cases, this interaction effect was not significant.
 - b) a file with tabulated values of the sensitivity for each entry term: sensitivity is defined as the probability that the fitted logistic regression model classifies an observed Success as a Success. The sensitivity does not decrease when Class Rank is added as a covariate to a model which has SAT Math score as covariate.
 - c) a file with tabulated values of the specificity for each entry term: specificity is defined as the probability that the fitted logistic regression model classifies an observed Failure (defined as a grade of D+ or below) as a Failure.
- 2. **MATH103Q_regchart**
 - 3. **MATH105Q_regchart**
 - 4. **MATH109Q_regchart**
 - 5. **MATH112Q_regchart**
 - 6. **MATH112Q_regchart**
 - 7. **PHYS101Q_regchart**
 - 8. **STAT100V_regchart**
 - 9. **STAT110V_regchart**

IV. Folder: MATH 101 Assessment

CD 2

Additional background results on various statistical models.

- a) those including Q Test Scores and Calculus Test Scores as covariates
- b) fitting separate models for students who took MATH101 prior to taking their first Q course and those who did not
- c) including a dummy variable in the regression model to see whether there is an effect on performance if a student takes his/her first Q course during the first (entry) semester