Definition of Mathematics/Quantitative Reasoning Competency:
The University of Virginia expects graduates of its College of Arts and Sciences and its Schools of Architecture, Commerce, and Education to have and to understand basic knowledge and skills about mathematics and/or quantitative literacy in order to use it effectively and productively for their own purposes. Specifically, we expect these graduates to be able to apply simple mathematical methods to the solution of real-world problems. We believe a quantitatively literate graduate should be able to:

1. Interpret mathematical models such as formulas, graphs, tables, and schematics, and draw inferences from them.
2. Represent mathematical information symbolically, visually, numerically, and verbally.
3. Use arithmetical, algebraic, geometric, and statistical methods to solve problems.
4. Estimate and check answers to mathematical problems in order to determine reasonableness, identify alternatives, and select optimal results.
5. Recognize that mathematical and statistical methods have limits.¹

Description of Methodology Used to Gather Evidence of Mathematics/Quantitative Reasoning Competency
In spring 2004, the University administered the “Collegiate Assessment of Academic Proficiency” (CAAP) test in Mathematics/Quantitative reasoning to a random sample of not less than 5 percent of fourth-year undergraduates enrolled in the schools listed above. We believe the American College Testing Service’s (ACT) CAAP test for Mathematics/Quantitative reasoning measures the elements in the Mathematics/Quantitative reasoning competency definition given above, and that, therefore, the CAAP test provides a good reading on the extent to which UVa undergraduates are achieving the goals listed. Moreover, results of this test provide information on the competency levels of UVa students in comparison with students at other institutions using the same test.

The results below show the mean test score as well as the percentile ranking of UVa students compared to all other students in the United States who took the same test. The test is scored on a scale of 40 to 80.

<table>
<thead>
<tr>
<th>Results for spring 2004 assessment of Mathematics/Quantitative Reasoning Competency</th>
<th>College of Arts and Sciences Math Majors Only</th>
<th>College of Arts &amp; Sciences All students except Math Majors</th>
<th>School of Architecture All Undergraduate Majors</th>
<th>School of Commerce All Undergraduate Concentrations</th>
<th>School of Education All Undergraduate majors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Test Score</td>
<td>68</td>
<td>61</td>
<td>60</td>
<td>61</td>
<td>61</td>
</tr>
<tr>
<td>Percentile Ranking</td>
<td>99</td>
<td>84</td>
<td>76</td>
<td>84</td>
<td>84</td>
</tr>
</tbody>
</table>

Summary:
The percentile rankings listed above show how well UVa students did in comparison with students at other institutions which gave the CAAP test within the last three years. As expected, mathematics majors performed exceedingly well, in the 99th percentile. The College of Arts and Sciences and Schools of Commerce and Education all had the same mean score, which corresponds to the 84th percentile. The School of Architecture was a bit lower, scoring in the 76th percentile.

¹ This definition is excerpted in part from Quantitative Reasoning for College Graduates: A Complement to the Standards, Mathematical Association of America, 1996. [http://www.maa.org/past/ql/ql_toc.html](http://www.maa.org/past/ql/ql_toc.html).
Definition of Mathematics/Quantitative Reasoning Competency:
All students graduating from the University of Virginia’s School of Engineering and Applied Science (SEAS) should be able to demonstrate the following competencies in mathematic/quantitative reasoning:

1. Use proper mathematical notation and terminology.
2. Express mathematical arguments clearly, demonstrating an understanding of what is necessary and sufficient support.
4. Graph basic functions without a calculator. These functions include linear, factored polynomial, trigonometric, exponential, and logarithmic.
5. Compute, without a calculator, derivatives and integrals of single variable and multivariable functions.
6. Set up and solve problems involving the application of the derivative and integral in both single variable and multivariable context. Such applications must include optimization, rates of change, area, volume, arc length.
7. Set up and solve simple problems in polar and spherical coordinate systems.
8. Calculate and use the dot product and cross product.
9. Solve the differential equations $y'' + y = 0$ and $y'' + y = 0$.
10. Define the concepts of linear independence; superposition.
11. Solve nth order, homogeneous constant coefficient ODEs.
12. Solve nth order, inhomogeneous constant coefficient ODEs.

Description of Methodology Used to Gather Evidence of Mathematics/Quantitative Reasoning Competency
In spring 2004, the University administered the “Collegiate Assessment of Academic Proficiency” (CAAP) test in Mathematics/Quantitative Reasoning to a random sample of not less than 5 percent of fourth-year undergraduates enrolled in the School of Engineering and Applied Science. We believe an exemplary score (above the 95th percentile) on the American College Testing Service’s (ACT) CAAP tests for Mathematics/Quantitative Reasoning would show that Engineering undergraduates are achieving the goals listed. Moreover, results of this test provide information on the competency levels of UVa students in comparison with students at other institutions using the same test.

The results below show the mean test score and the percentile ranking of UVa students compared to all other students in the United States who took the same test. The test is scored on a scale of 40 to 80.

| Results for spring 2004 assessment of Mathematics/Quantitative Reasoning Competency | School of Engineering and Applied Science All Majors and Concentrations |
| Mean Test Score | 66 |
| Percentile Ranking | 98 |

Summary:
As expected, Engineering students did extremely well on the CAAP test, scoring in the 98th percentile of all students who have taken the test in the last three years.
**Definition of Scientific and Quantitative Reasoning Competency:**

The University of Virginia’s School of Nursing assesses its students’ knowledge and skills in the areas of scientific and quantitative reasoning together because both are very closely related in the curriculum of the School. The School of Nursing expects its graduates to have mastered essential fundamental knowledge in scientific and quantitative reasoning in preparatory coursework and in clinical application of professional nursing practice. The School of Nursing has assessed student competency in scientific and quantitative reasoning by using the results of two national tests, which all graduates of the School are required to take annually. The first is the secured version of the Mosby AssessTest, which is a diagnostic readiness and practice test for the professional nursing licensure exam. The second is the National Council Licensure Examination (NCLEX), which is required prior to licensure for practice as a registered nurse.

**Description of Methodology Used to Gather Evidence of Scientific and Quantitative Reasoning Competency**

The Mosby AssessTest is administered to students during a 3-week period in April of each academic year. Two-hour blocks of time are used for each of the exam’s four parts. The exam is administered in a secured monitored classroom setting with a proctor. The Professional Testing Corporation of New York scores the exams and returns both the individual and group analysis to the School for review prior to distribution to the students. The entire process takes about 3 weeks.

Graduates arrange to take the NCLEX as part of the process of state licensure application. The test is developed and administered by the National Computer Systems – Pearson Company under contract with the National Council of State Boards of Nursing. The test is offered in a computer-adapted format at computer testing centers by appointment and under strict security and supervision. Results of the NCLEX are available to graduates within days. Aggregate data on pass-fail rates are provided quarterly by the state boards of nursing, and the Virginia Board of Nursing provides a breakdown of results for all nursing programs in the Commonwealth of Virginia. Detailed program analysis is available annually from the national testing service for the programs with comparison data on performance related to the aggregate test pool.

**Results for Spring 2004 Assessment of Scientific Reasoning Competency**

The 2003 results of the Mosby AssessTest are as follows:

- Of the 265 RN Assess Test questions, the UVA group answered 173 correctly (65%)
- Overall the group scored 1 point higher than the total RN norm group and 2 points higher than the bachelor norm group.

Overall pass-fail rates for the NCLEX:

- The 2003 overall pass-fail rates for 90 first time candidates taking the NCLEX in Virginia was 88.89% (80 pass-10 fail).

**Summary:**

Comparison of the NCLEX results with other schools of Nursing in the Commonwealth of Virginia: the state average was 85.15. The UVA pass rate of 88.89% was above the state average and the national average of 87.01

- UVA: 88.89
- State: 85.15
- National: 87.01