



## St. Olaf College General Education Curriculum Abstract and Quantitative Reasoning (AQR) Requirement

### Description:

A course that develops analytic thinking skills through systematic focus on abstract and quantitative reasoning.

### Intended learning outcomes:

*Students will demonstrate:*

1. an ability to recognize and employ patterns, structures, and models appropriate to particular theoretical or applied problems, as well as derive and understand properties of patterns, structures, and models themselves.
2. an ability to apply abstract and quantitative reasoning to solve problems in novel contexts.
3. an ability to approach problems from multiple perspectives, employing a variety of strategies.

### Course guidelines with Curriculum Committee comments:

1. Abstract reasoning is the study of structures and patterns that arise in quantitative or computational settings. Quantitative reasoning is the use of formal structures and methods to model and analyze phenomena in the natural and human-made worlds. An AQR course should include elements of both of these reasoning activities.

*Comment:* AQR courses may attach varying relative weights to abstract and quantitative reasoning. However, most courses will include significant elements of both modes of thought.

The structures, patterns, and phenomena modeled might come from almost any area, including the natural sciences, the social sciences, the arts and humanities, and mathematics itself. The main focus, however, should be on abstract and quantitative reasoning themselves, rather than solely on particular applications. Concrete data, if employed, are best collected in a variety of disciplines and settings, as this approach illustrates the power and transportability of the methods under study.

Examples: Courses in calculus, gateways to mathematics, computer science, formal logic, game theory, and statistics are among (but not necessarily exhaustive among) those that would probably address AQR goals. In calculus, for example, mathematical functions are used to represent and study phenomena of motion, including acceleration, velocity, and displacement. Data structures, formal operations, quantification, and methods of inference are studied in computer science and formal logic. In statistics, students collect, represent, structure, and draw inferences from data.

2. An AQR course should develop students' problem-solving proficiency through analytic thinking, not merely routine calculation. An AQR course should develop skills and ideas beyond what is typically attained in secondary school.

Comment: Students should learn to solve novel problems in novel ways, rather than simply to perform routine procedures. AQR courses should be more than “technical cookbooks”; they should help students build flexible tools for thinking and solving problems. Courses that are mainly remedial at the college level (such as college algebra) should not receive AQR credit.

3. An AQR course should incorporate multiple elements of abstract or quantitative reasoning (e.g., symbolic, geometric, and numerical perspectives; data analysis and statistical inference; visualization; algorithms and formal models).

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### **Information for instructors proposing AQR credit for a specific course:**

The St. Olaf Curriculum Committee is responsible for reviewing and approving proposals to designate individual courses as meeting the Abstract and Quantitative Reasoning requirement. Instructors may seek AQR credit as part of a proposal for a new course, or may seek to add AQR credit to an existing course. AQR credit is attached to the *course*, not to the instructor or to the specific term in which the course is offered. A proposal for AQR credit must show how the course meets each of the AQR course guidelines; the comments following a guideline provide additional information about how the Curriculum Committee interprets and applies that guideline in reviewing proposals. Instructors are encouraged to consider the comments as well as the guidelines themselves in preparing proposals. Forms and additional instructions for submitting proposals electronically are available on the website of the [Office of the Registrar](#).