

# Quantitative Intensive Designation Guidelines

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The five criteria comprising the QL rubric are intended to be used to assess whether a person is *beginning to form* an aggregate of skills, knowledge, beliefs, dispositions, habits of mind, communication capabilities, and problem solving skills that people need in order to engage effectively in quantitative situations arising in work and in life. This intention is meant to reflect the ideas communicated by the R470, and also the *OECD's definition of Mathematical Literacy*\*

Classes with a Quantitative Intensive (QI) designation should be useful for *furthering the development* of the aforementioned aggregate of skills in a person. Moreover, a class with a QI designation should be useful in developing a person's predisposition for looking at the world through mathematical eyes, and seeing benefits and risks of thinking quantitatively. Confidently asking intelligent questions of experts and confronting authority could be seen as ideal consequences. So could the predisposition to seek a mathematical model, by creating one or obtaining one from experts, and being able to assess the limitations and usefulness of the model. This predisposition is predicated on well-developed skills with arithmetic, data, computers, modeling, statistics, chance, and reasoning; that is, skills with **mathematics and statistics**. A foundation for these skills should exist in the student who has earned credit for a Quantitative Literacy course. A Quantitative Intensive course should therefore provide a mechanism by which these skills are brought to bare on issues, problems, or ideas germane to a specific *upper-division* course.

Below are examples of questions that could be present in, or guiding the content of, a course with a QI designation, and so should be identified in any course proposal where they are used as such. Since many courses tend to have a mathematical or a statistical bent, the example questions are separated into those categories.

A QI course with a statistical bent should be informed by the realization that statistics underlies every clinical trial, every opinion survey, every government economic report, every estimate of chance or odds, every assessment of a medical treatment. A QI course could bring this realization into light by having one or more of the following questions at the core of part of its curriculum.

- Do you understand the importance of variability?
- Do you recognize the differences between correlation and causation?
- Do you understand the difference between randomized experiments and observational studies?
- What is the difference between finding no effect and finding no statistically significant effect?
- Can you identify when a statistical model or statistics-based calculation is relevant?

A QI course with a mathematical bent should be informed by the ideology that mathematics is the *science of deduction*, and is a model for the construction of knowledge, the assessment of truth, as well as the backbone for much of our technologies. A QI course should have, as a focus of part of its curriculum, one or more of the following questions at its core:

- Do you understand how to identify the limitations of a model?
- Do you have a sense for the limitations of conclusions made from well-defined assumptions?
- Do you have a sense for the ubiquity and importance of mathematics in technological development?
- Can you translate between numerical, verbal, or symbolically represented mathematical facts?

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\**OECD's Mathematics Literacy*: An individual's capacity to identify and understand the role that mathematics plays in the world, to make well-founded mathematical judgements and at least to engage in mathematics in ways that meet the needs of that individual's current and future life as a constructive, concerned and reflective citizen, [1].

- Can you identify reasoning that is deductive versus scientific versus inferential?
- Do you exercise caution in generalizations?

## References

- [1] Jan De Lange, *Mathematical literacy for living from oecd-pisa perspective*, (2006).