General Mathematics Expectations for Incoming Students to Iowa Institutions of Higher Education

Below are general expectations based upon discussions and research among members of the Iowa Higher Education Mathematics Transition Advisory Council (IHEMTAC) who are faculty at Iowa's colleges and universities, including community colleges, private four-year colleges and universities, and the public Regents' universities, and also high school teachers. These are general expectations for incoming students to Iowa institutions of higher education, specific expectations vary by institution.

These expectations primarily consider, but are not exclusively determined by, academic preparation for students to be successful in their first collegiate mathematics course and they reflect the Iowa Core high school mathematics standards, most especially the Standards for Mathematical Practice.

These general expectations identify what students need entering college in order to be successful in their first collegiate mathematics class.

Students attending Iowa colleges and universities typically end up in the following areas of study (these groupings are based on common requirements of entry-level mathematics courses)**:**

- STEM
- Allied Health
- Social Sciences
- Humanities
- Business

Common entry-level mathematics courses for students entering Iowa colleges and universities, depending on major, include the following:

- Introduction to Statistics
- Mathematics for Liberal Arts or Contemporary Mathematics
- Introduction to Data Sciences
- Applied Mathematics or Tech Math (nontransferable courses in trade school programs)
- Pre-calculus
- Calculus

Universal expectations for all incoming students:
College mathematics courses expect incoming students to have significant prior experiences developing mathematical habits of mind and habits of practice, such as those emphasized in the K-12 Iowa Core Standards of Mathematical Practice:

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with mathematics
- Use appropriate tools strategically
- Attend to precision

- Look for and make use of structure
- Look for and express regularity in repeated reasoning

These mathematical practices from the Iowa Core Standards are often summarized as follows:
- Develop critical thinking
- Read and use quantitative arguments with understanding
- Communicate coherently

In addition, general expectations for mathematical practice include:
- Exposure to using mathematical quantitative models
- Exposure to and comfort with technology and apps (phones, tablets, computers)

Recommended preparation for entry-level courses:

Mathematics for Liberal Arts or Contemporary Mathematics
What is expected entering into this class (practices, skills, and knowledge)?
- Some algebra skills (solve linear and quadratic equations, systems of linear equations)
- Basic number sense
- Understand percent
- Basic geometry: perimeter, area, volume
- Basic sense of measurement systems

Introduction to Statistics
What is expected entering into this class (practices, skills, and knowledge)?
- Critical thinking
- Reading with understanding
- Writing in full sentences
- Some research exposure (reading research papers that involve statistical evidence)

Introduction to Data Sciences
What is expected entering into this class (practices, skills, and knowledge)?
Data Science is a very new field. It is still in its developing stage. Institutions are trying out different approaches, so there is not yet consensus on appropriate content for entry level courses.
Different institutions in Iowa have different incoming expectations for an Intro to Data Science course. Here are examples of the range of expectations from a few institutions around the state:
- Same expectations as Introduction to Statistics course
- Same ALEKS placement score as for Pre-calculus
- No statistics expectation

Applied Mathematics or Tech Math (nontransferable courses in trade school programs)
What is expected entering into this class (practices, skills, and knowledge)?
Any student that took Algebra I and Geometry in high school can be successful in this course in any trade school program.

Pre-Calculus (or College Algebra + Trigonometry)
What is expected entering into this class (practices, skills, and knowledge)?

- In addition to those listed above, also:
- Growing fluency in algebra beyond Algebra I
  Understanding functions (notation, operations, domain, range; primarily polynomial functions)

Calculus
What is expected entering into this class (practices, skills, and knowledge)?
(For details, see the IPAC publication on precalculus, see Appendix)

- Same as the previous courses but also:
  Trigonometry concepts (trigonometric functions modeling periodic change, unit circle)
  Fluency in algebra
  Working knowledge of functions (polynomial, rational, transcendental)
  Understand inverse functions