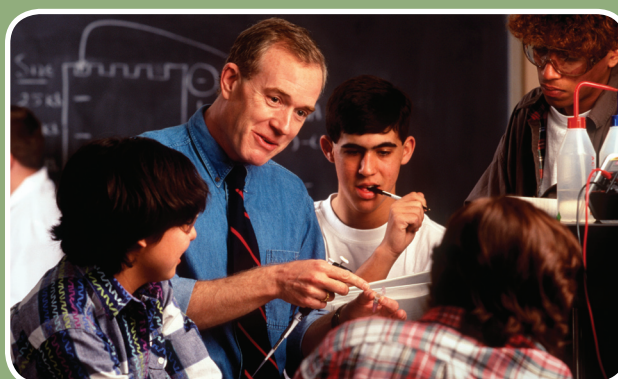
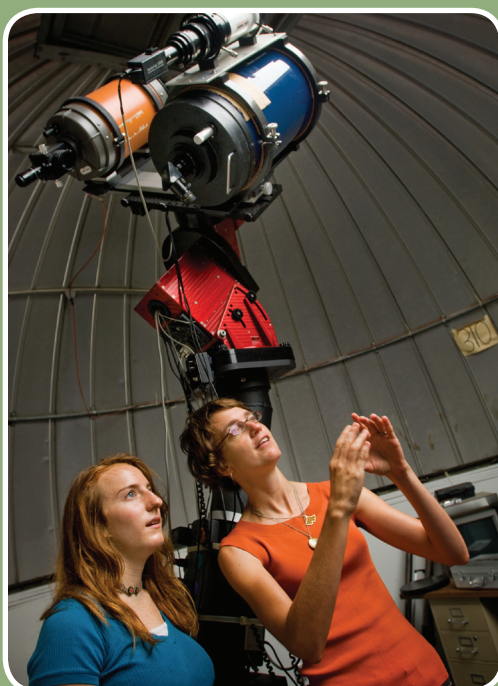


IOWA HIGH SCHOOLS-TO-REGENT UNIVERSITIES Mathematics Transition Guide



Iowa
Math and
Science
Education
Partnership

IOWA HIGH SCHOOLS-TO-REGENT UNIVERSITIES Mathematics Transition Guide

Iowa
Math and
Science
Education
Partnership

Introduction

Evidence from several sources, including Iowa's Department of Education, the Regent universities, ACT and the College Board, indicates that too many Iowa students struggle with the transition from high school to university mathematics study. Transition difficulties affect decisions about courses, majors, and even careers.

The Iowa Math Science Education Partnership was charged by the Council of Provosts to address this challenge. In turn, partnership leaders assembled a team of high school and university mathematics faculty to organize and conduct a Mathematics Transition Congress, and from it, to produce a guide for successfully navigating the transition.

A three-part guide

Part A addresses concerns expressed by stakeholders who attended the Mathematics Transition Congress in November of 2007. A chief concern expressed by the group was the need for alignment of content and pedagogy. This inspired the comparative table which describes for both high school and university math teachers the relevant mindsets and experiences of their students.

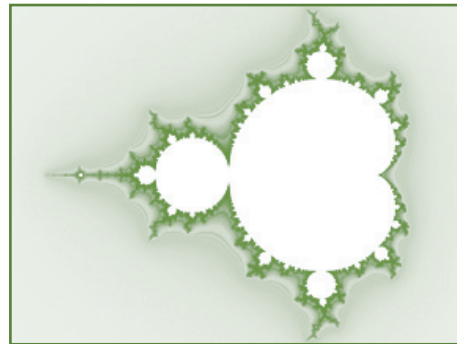
Part B lists six general entry points for math study at Iowa's public universities. A brief set of skills and competencies to be possessed by the entrant at the appropriate level will ensure a smooth transition from high school to one of the Regent universities. These guidelines are anchored to current mathematics education thinking as expressed by the American Mathematical Society (AMS), Mathematical Association of America (MAA), National Council of Teachers of Mathematics (NCTM), the Conference Board of the Mathematical Sciences (CBMS), and National Mathematics Advisory Council. These guidelines reflect a great deal of input and review by instructors of those courses at Iowa's Regent universities.

Part C includes current publications (as of May 2008) available to prospective students regarding math transition to one of the Regent universities.

About this guide

A team of mathematics faculty at each of Iowa's Regent universities wrote this guide with the oversight of a review committee consisting of mathematics leaders from across the state, including high school teachers and administrators, AEA consultants, Iowa Department of Education officials, and faculty from community colleges, private colleges and Regent universities. We recognize in compiling this guide that a sound high school mathematics education should include more than just the topics identified here.

This guide is supported by both the Council of Provosts of the Regent universities and by the Iowa Department of Education.



A Functional Description of the Transition to University Mathematics for Iowa High School Students

High school and university mathematics instructors are nearly unanimous in agreeing that communication is at the core of a smooth transition from high school to university math study. At the November 2007 Math Transition Congress held at the University of Northern Iowa, improved communication became a primary objective. Instructors on both sides of the equation want to understand what to expect and what is expected. This inspired **Part A**, which describes for both high school and university math teachers the relevant mindsets and experiences of their students.

		Information for students, teachers and parents about what they can expect at UNI, ISU and UI when it comes to entry-level math study.	Information for university instructors about what they can expect from entry-level students' high school math study.
Student	Motivation	<ul style="list-style-type: none"> Independent learning environment favors the perseverance, motivation and initiative of the learner. 	<ul style="list-style-type: none"> Tends to be extrinsically motivated – “just tell me what I have to do to get the grade.” If the topic is relevant, more may become intrinsically motivated.
	Schedule	<ul style="list-style-type: none"> Schedule is planned and managed entirely by student. Advising services are available to aid in scheduling. 	<ul style="list-style-type: none"> High school students are extremely busy, hence very good at prioritizing- unfortunately this often leads to setting goals for minimums (see Motivation). Their days are externally planned, thus managing their own time is a skill to be developed.
	Skills and Responsibilities	<ul style="list-style-type: none"> Student chiefly responsible for learning. Support available by way of instructor office hours or tutoring services. <u>Student</u> must initiate such support. 	<ul style="list-style-type: none"> Students are adept at communication technology and respond well to its application to lessons. They are provided numerous supports to their learning; responsibility for “failure” is often borne by teachers and schools.
School Classroom	Schedule	<ul style="list-style-type: none"> Classes meet typically two or three times per week for 50 to 90 minutes. Weekly discussion and/or lab session accompanies some courses. 	<ul style="list-style-type: none"> Classes meet every day for 45 to 60 minutes throughout the year or in some cases, every other day for about 90 minutes.
	Classroom	<ul style="list-style-type: none"> Class size may range from under 20 to several hundred students. Attendance may not be regularly taken by the instructor; students are expected to be responsible about attendance. 	<ul style="list-style-type: none"> Size varies from under 10 per class to more than 30 (virtually never more). Student attendance is closely monitored and enforced.
Parental Involvement	Communication and Expectations	<ul style="list-style-type: none"> All communication occurs between student and instructor only. It is the student's responsibility to communicate math course information to parents. Course grades are conveyed to students only; parents must be granted access to student's grades by the student (in accordance with the <i>Federal Family Educational Rights and Privacy Act</i>). 	<ul style="list-style-type: none"> Frequent communication between math teachers and parents through phone, e-mail or conferences. Expectations for success vary greatly, as does support at home. End of course grades are sent home to parents.

A

Functional Description of the Transition to University Mathematics for Iowa High School Students

Instructional Practices

Instructional Style	<ul style="list-style-type: none"> Multi-step problems are typical. The process of solving a problem may have four or five false starts. Instructor rarely presents material more than once. Two to three times the pace of high school, little repetition. In many classes, reading of textbook for comprehension is expected. Instructional modes vary widely. 	<ul style="list-style-type: none"> Experiences vary widely in high school—from daily lecture to investigative approach. High school teachers typically vary approaches day-to-day to include over the course of a week lectures, independent learning, group work, problem-solving, discovery with technology. Some class time is often devoted to working on “homework.” High school students are typically encouraged to be active participants in math lessons, even in lectures. Learning math from reading is not a developed skill for most high school students.
Technology	<ul style="list-style-type: none"> When it comes to calculator use, some math courses do not allow calculators on quizzes or exams; whereas in other courses calculators are not only permitted but required. Among the courses that allow calculators, there is variability on whether symbolic algebra functionality (such as the TI-89) is permitted. Policies vary within departments and across Regent universities. Prospective enrollees should consult departmental Web sites of respective universities for calculator policies. Technologies (e.g., software, calculators) often must be learned independently, outside of class time. 	<ul style="list-style-type: none"> Availability of calculators varies from not available to everyday use. Use of calculators varies from simple computations to exploration. School owned vs. student owned varies depending on level. Mathematical software is increasingly being used in high school classes but varies greatly.
Homework	<ul style="list-style-type: none"> The frequency of graded homework is less than that of most high schools. Homework problems address material not necessarily discussed in class but for which students are informed they are responsible. At least two hours of work outside of class per hour of class time is expected, and usually required. 	<ul style="list-style-type: none"> Type and amount varies greatly, as does its weight in grading for course. Approximately half hour dedicated outside of class for every hour in class (a rough estimate).
Assessment	<ul style="list-style-type: none"> Comprehensive exams are the norm. Spare or no review sheets. Tests may include material the instructor did not cover but that appeared in readings and homework problems. Typically, two to three tests plus comprehensive final exam largely determine final grade. 	<ul style="list-style-type: none"> Exams and quizzes typically not weighted as heavily in high school, yet often are the primary determinant of grades. A wide variety of assessment types, e.g., projects, may be used by teachers. Thorough reviews are usually held before exams. A sense of “entitlement” to know what the exam covers may occur. Final exams are common but are not always comprehensive.

Special note on AP calculus

The AP calculus exam requires students to use calculators to:

- Plot the graph of a function within an arbitrary viewing window*
- Find the zeros of functions (solve equations numerically)*

- Numerically calculate the derivative of a function*
- Numerically calculate the value of a definite integral*

The nine goals of AP Calc are at www.collegeboard.com/student/testing/ap/sub_calab.html?calcab

B

Essential Skills & Competencies For General Entry Points of Regent University Mathematics

1. SKILLS AND COMPETENCIES FOR ENTERING PRE-CALCULUS (ALGEBRA/TRIGONOMETRY)*

A) ARITHMETIC

Fluency in real number arithmetic-PEMDAS, fraction arithmetic, rational roots of whole numbers, rules of exponents, simplification of rational number expressions, including those with fractional exponents in numerators or denominators. Basic understanding of complex numbers.

B) ALGEBRA

Ability to translate basic word problems involving one or several unknowns into problems of finding solutions to one or several equations (or inequalities) each with one or several variables representing those unknowns. Ability to recognize reasonableness or un-reasonableness of candidate solutions. Types of problems may involve proportionality-similarity, area-length measurements, volumes-surface area measurements, etc.

C) ALGEBRA

Facility with expressions involving variables such as polynomials, including the ability to understand meaning of roots and the ability to determine if a given number is a root of a given polynomial; factorization, ability to describe and compute all attributes of linear expressions in one variable ($m \cdot x + b$), factor quadratics using the coefficients of the quadratic and the quadratic formula, recognition of complex roots as roots of quadratics; ability to find factorizations of higher-order polynomials with additional information (e.g. factoring out a common power of the variable, or given a root and polynomial division). Facility with rational expressions involving one or several variables (e.g. simplifying a rational

expression including one or several variables, including those with rational exponents in numerators and denominators).

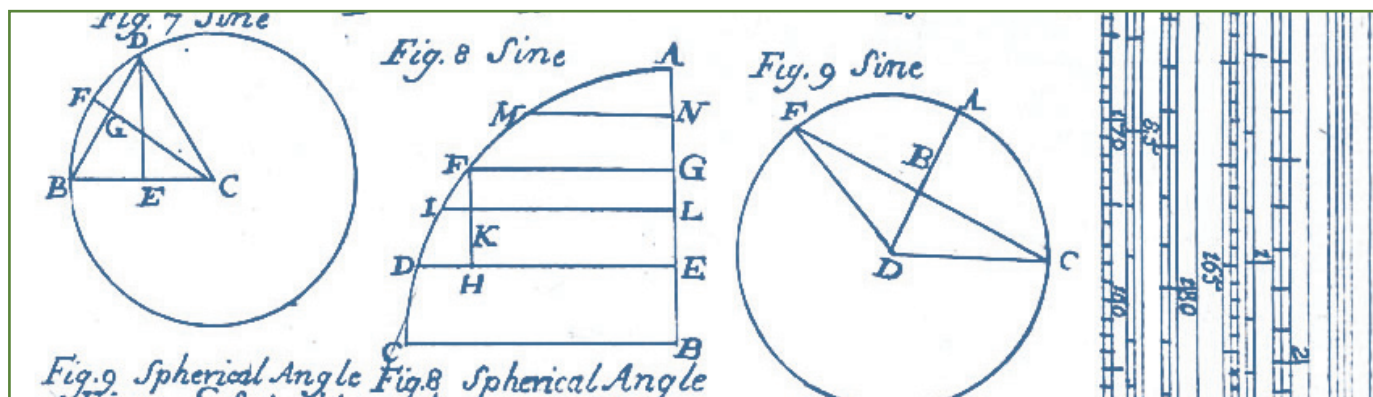
D) ALGEBRA

Facility with concepts related to functions-single-valuedness, algebraic formulae such as $f(x) = 2x^3 + 7$, tabular and x-y coordinate plane representations of functions and their graphs, the vertical line test, and meanings of domains and ranges. The basic function families: polynomial, exponential and logarithmic, rational and periodic (cf. trigonometry). Understanding the relationship between a function $f(x)$ and functions such as $f(x)+k$, $f(x+h)$, $a \cdot f(x)$, $f(a \cdot x)$, etc. In general, the elementary analysis of the numerical, functional and graphical attributes of functions (polynomial, exponential, logarithmic) is a central topic.

E) TRIGONOMETRY

Basic notions of triangle components-angles, side lengths, right triangle attributes. Similarity and congruence of triangles. Definitions of the six elementary trigonometric functions: sine, cosine, etc. via triangle ratios (SOHCAHTOA) and unit circle coordinate definitions. Basic trig identities such as the Pythagorean, addition, and subtraction identities, and the ability to retrieve such information quickly. Use of such trigonometry in basic geometric and/or story problems involving proportionality, triangles, etc. Such problems may include but are not limited to computing measurements of inaccessible objects such as tall trees and buildings using measurable objects.

*Not an entry point math course option at ISU



B

Essential Skills & Competencies For General Entry Points of Regent University Mathematics

2. SKILLS AND COMPETENCIES FOR ENTERING CALCULUS I

A) ALGEBRAIC FUNCTIONS

Experiences with functions, including analysis of families of functions (linear, quadratic, general polynomial, exponential, trigonometric, rational, logarithmic, and piecewise). Analysis of these functions should include: zeros, maxima and minima, domain and range, global and local behavior, intercepts, and asymptotes. Ability to recognize, represent, transform, compose, and find inverses of functions, and to represent functions in multiple ways: via algebraic formulae, graphs, data tables, and descriptions such as “the volume of a cylinder of fixed height is proportional to the square of its radius”, and ability to go back and forth between these representations. Understand and analyze relations that are not functions such as $x^2 + y^2 = 5$ and $x = y^2$.

B) ALGEBRAIC EQUATIONS AND INEQUALITIES

Solve inequalities and equations using algebraic and graphic methods, including equations involving exponents and logarithms, and equations of quadratic form such as $e^{2x} - 3e^x + 2 = 0$. Solve systems of equations, including inconsistent and dependent systems. Be able to represent systems of two equations and two unknowns geometrically.

C) ALGEBRAIC EXPRESSIONS

Ability to meaningfully manipulate algebraic expressions to get equivalent forms by simplifying, factoring, expanding, composing, decomposing, using order of operations, using laws of exponents and logarithms and applying properties of real numbers. Understand the difference between equations and expressions.

D) RATE OF CHANGE

Familiarity with such examples as the speed of a car, the number of people per year by which a population increases, and slope of a line. Ability to analyze average and instantaneous rate of change in multiple ways including: numeric, algebraic, and graphic representations. Students should distinguish between a constant rate of change and a non-constant rate of change. They should be thoroughly comfortable with using appropriate units for both functions and their rate of change.

E) GEOMETRY AND TRIGONOMETRY-COORDINATES

Use (x,y) coordinates to describe points, lines, circles and rectangles. Use formulas for distance, midpoint and slope, and the *Pythagorean Theorem*, and have some degree of understanding where they come from. Find and analyze equations that represent lines, circles and parabolas. Familiarity with the other conic sections—ellipses and hyperbolas.

F) GEOMETRY

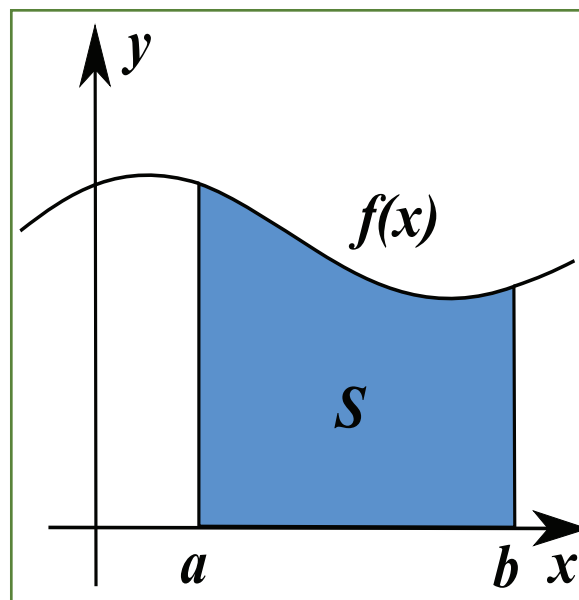
Find perimeter, area, volume and surface area of various objects. Estimate these quantities as a check on accuracy. Recognize and use appropriate units, and use dimensional analysis.

G) TRIGONOMETRY

Study right-triangle trigonometry and unit circle trigonometry. Understand the trigonometric ratios, the *Pythagorean Theorem* and its converse, and the special-case triangles: 30-60-90 and 45-45-90. Understand the trigonometric functions including their domains, ranges and periodicity. Understand the effect of various transformations on their amplitudes and periodicity. Know basic identities such as the Pythagorean, addition, and subtraction identities, and be able to use the Law of Sines and Law of Cosines. Use trigonometry to solve applied problems. Be able to solve simple trigonometric equations with multiple solutions, such as $\cos(x) = \sqrt{3}/2$ and $\sin(x) = 0.6$.

H) THEOREMS AND PROOFS

Ability to read and understand a simple proof or mathematical argument, at the level given in a collegiate textbook. Understand that a theorem does not imply its converse – e.g. “Differentiability implies continuity” does not mean that continuity implies differentiability. Ability to formulate and test conjectures, and understand the difference between noticing a pattern and proving that the pattern always holds.



B

Essential Skills & Competencies For General Entry Points of Regent University Mathematics

3. SKILLS AND COMPETENCIES FOR ENTERING CALCULUS II

In addition to the material below, it is assumed that an incoming Calculus II student has mastered all the material recommended for success in Calculus I, as listed above.

A) LIMITS AND CONTINUITY

Understand and be able to compute limits in graphic, numeric and algebraic contexts. Understand continuity in these contexts as well. Be familiar with the *Intermediate Value Theorem*.

B) DERIVATIVES

Definitions and Theorems: Understand the limit definition of the derivative, the connection between differentiability and continuity, the *Mean Value Theorem*, and *Rolle's Theorem*. Understand the derivative in terms of slope of a tangent line, and an instantaneous rate of change

Computation: Be able to write the formula for f' quickly and accurately given a formula for a function f , either defined by a formula or defined implicitly (this is the equivalent to knowing one's multiplication tables).

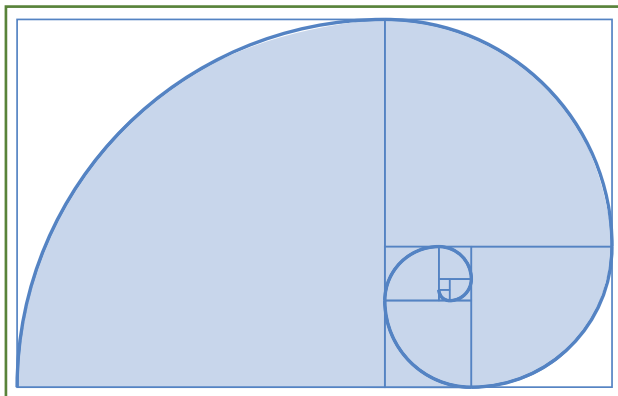
Geometry: Given a graph of a function f , be able to sketch a graph of f' that, while not necessarily perfect, should be positive when f is increasing, negative when f is decreasing, and flat when f has a local extremum. The intervals where f' is increasing and decreasing should correspond to where f is concave up or concave down.

Applications: Given a description of a function f , such as "The height H of a column of mercury in a thermometer is given by $H=f(t)$, where t is the temperature in degrees Fahrenheit," be able to describe the meaning of f' , including understanding its units. Ability to set up and solve global optimization problems. Find exact values of local maxima,

local minima, and points of inflection of a function. Other applications, such as *Newton's Method* and *L'Hopitals Rule* are desirable as well.

C) INTEGRALS

Most Calculus II courses start with integrals, but many of them assume a familiarity with antiderivatives from Calculus I. Ideally, know how to find antiderivatives of basic functions, and be familiar (if not fluent) with u -substitution. Understand the meaning of the constant of integration. Understand the definite integral as the limit of Riemann sums. Be able to approximate the definite integral of a function over a given interval with a calculator. Understand and be able to apply the *Fundamental Theorem of Calculus*.



4. GENERAL SKILLS & COMPETENCIES FOR ENTERING STATISTICS

A) ALGEBRA

Use and apply algebraic concepts that include ratio, proportion, percentage, slope and intercept. Be able to transfer algebra competencies to statistics applications.

B) CALCULATORS AND SOFTWARE

Have experience using calculators to solve algebraic equations. Be familiar with (or ability to independently learn) software such as jmp.

C) MODELING

Be able to do least squares regression and inference.

ENGINEERING STATISTICS

Should be preceded by an introduction to calculus. Knowledge of functional notation, summation notation, facility with linear functions, and the ability to solve algebraic equations (e.g., quadratic equations) as part of a good working knowledge of high school algebra. Be familiar with exponential and logarithmic functions. Know basic techniques of integration and differentiation. Have exposure to exponential, Poisson, and normal distributions.

B

Essential Skills & Competencies For General Entry Points of Regent University Mathematics

5. SKILLS & COMPETENCIES FOR ENTERING LIBERAL ARTS MATH

Liberal Arts Mathematics covers a range of liberal arts mathematics courses. At the Regent universities, these courses include:

Iowa State University: Math 105 Introduction to Mathematical Ideas

University of Iowa: 22M:10 Finite Mathematics

University of Northern Iowa: 800:023 Math for Decision Making

A) ARITHMETIC

Fluency in real number arithmetic and fraction arithmetic, rules of exponents, square roots. Knowing when it is appropriate to multiply, divide, add, subtract or exponentiate.

B) MODELING

Ability to translate a verbal situation into a mathematical problem, and to check the solution for reasonableness.

C) ALGEBRA

Ability to solve linear equations and inequalities in one variable, facility with linear equations and inequalities (slope of a line, two-point form, point-slope form, slope-intercept form, etc.), finding the intersection of two lines/the solution of two linear equations in two unknowns.

D) SYMBOLIC MANIPULATION

Facility with effectively working with symbolism. Be able to distinguish between expressions like $(P+Q')$ and $(P+Q)'$ in both reading and their writing.

E) REPRESENTATION

The ability to use graphs, Venn-diagrams, pie charts, data-tables, and other pictures that are used to represent mathematical situations.

F) GENERALIZATION

The ability to generalize from examples, and then test the generalization by applying it to additional situations. Mathematics involves finding answers to specific questions according to prescribed rules, but it also involves generalizing from specific problems to general principles.

G) INDEPENDENCE

The ability to go beyond being told what to do at every step and take the responsibility to understand the context of the topics being discussed and to independently proceed using appropriate methods to solve problems.



6. SKILLS & COMPETENCIES FOR ENTERING ELEMENTARY EDUCATION MATH

A) OVERALL

Positive disposition toward the study and learning of mathematics. Belief that all children can learn mathematics. Experience in the use of technology for learning mathematics.

B) NUMBER AND OPERATIONS

Work flexibly with and understand the meaning and effects of arithmetic operations with rational numbers, their position in the real number system, and can use that understanding to solve problems. Use properties of addition and multiplication to simplify computations.

C) ALGEBRA

Able to represent, analyze and generalize a variety of patterns with tables, graphs, words and symbolic rules. Possess a conceptual understanding of different uses of variables, graphs and the nature of changes in quantities.

D) GEOMETRY

Able to describe, classify and understand relationships among two- and three-dimensional objects using their

defining properties. Can create and critique inductive and deductive arguments concerning geometric ideas and relationships, such as congruence, similarity and the Pythagorean relationship.

E) MEASUREMENT

Understand relationships among the angles, side lengths, perimeters, areas and volumes of similar objects. Can select and use units of appropriate size and type when working with such measures. Select and apply techniques and tools for measuring.

F) DATA ANALYSIS AND PROBABILITY

Can interpret measures of center and spread. Understand the appropriate use and how to analyze histograms, box plots, and scatter plots. Able to use observations about differences between two or more samples to make conjectures about the populations from which the samples were taken. Command a basic understanding of probability to make and test conjectures about the results of experiments and the concept of randomness.



Existent Advisory Materials For Regent University Mathematics Entrance



High school course requirements and recommendations for first year students:
www.uni.edu/admissions/freshmen/courseRequirements.html

**Notes: Minimum high school course requirements for admission. How to calculate RAI score for admission.*

The UNI Math Center

www.uni.edu/mathcenter/info.htm

**Notes: Study center, tutorial assistance.*

Math Center helpful links

www.uni.edu/mathcenter/links.htm

**Notes: Compendium of sites for: math tutorial, study skill development, math anxiety, etc.*

Math Center PPST assistance

www.uni.edu/mathcenter/ppst.htm

**Notes: For prospective teaching majors, strategies for preparation for the Pre-Professional Skills Test in mathematics.*



Admission Requirements and Regents Admission Index calculation for entering freshmen:

www.admissions.iastate.edu/freshman/requirements.php?action

**Notes: Minimum high school course requirements for admission. How to calculate RAI score for admission.*

Department of Mathematics Math Placement Exams

<http://orion.math.iastate.edu/placement/>

**Notes: Guidelines for who should take the placement exams. Preparation, including sample tests. Making arrangements to take the exams. Course-taking options.*

College of Engineering admission requirements

www.eng.iastate.edu/prospective/admissions.asp



High school course requirements for first year students, College of Liberal Arts and Sciences:

www.uiowa.edu/admissions/undergrad/requirements/rai-page.html

**Notes: Minimum high school course requirements for admission. How to calculate RAI score for admission.*

Comprehensive mathematics resource for parents, teachers and students—“Math Matters at Iowa”:

www.uiowa.edu/~examsserv/mathmatters/

**Notes: Web site created to help students understand math preparation needed for various majors at UI. Complete list of UI majors includes math requirements of each major. Five mathematics topics are divided into modules, each including quizzes, solutions, and tutorial material—arithmetic, algebra, analytic geometry, trigonometry, and logarithms/exponentials. Two options for assessing current mastery of subject are online quizzes and sample final exams of math courses. On-campus math events are posted here as well. An advisory on the use of calculators, and on benefits of a strong math foundation.*



Information for students and their parents

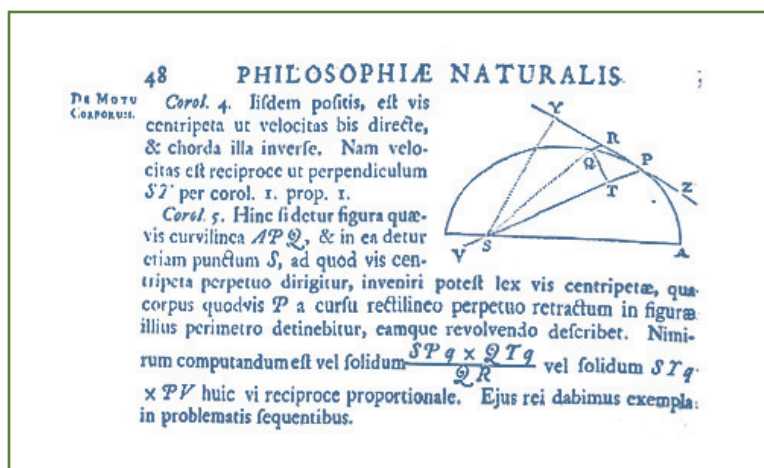
www2.state.ia.us/regents/StudentInfo/studentparentinfo.html

**Notes: Includes “Building Your Future” blueprint for preparation for the Regent universities that details minimum and optimum college preparatory curriculum. Also links to the Regent Admission Index (RAI) calculator.*



APPENDIX 1: References

- ACT College Readiness Standards for Mathematics, www.act.org/standard/planact/math/index.html
- American Mathematical Society. (2003, October). *Summary Report from the Committee on Education Meeting*. Retrieved March 1, 2008, from www.ams.org/ams/coe-summary03.pdf.
- Ball, D.L., Mundy, J.F., Kilpatrick, J., Milgram, R.J., Schmid, W., & Scharr, R. (2005, October). Reaching for common ground in K-12 mathematics education. *Notices of the AMS*, 52(9), 1055-1058.
- Beckmann, S. (2008). *Mathematics for Elementary Teachers*. Boston, WA: Pearson/Addison-Wesley.
- Conference Board of the Mathematical Sciences (CBMS). (2001). *The Mathematical Education of Teachers*, Chapter 9: The Preparation of High School Teachers. www.cbmsweb.org/MET_Document/chapter_9.htm
- Conference Board of the Mathematical Sciences (CBMS). (2001). *The Mathematical Education of Teachers*, Vol. 11. American Mathematical Society.
- GAISE Reports of the American Statistical Society, www.amstat.org/education/gaise/
- Hodges, V. (2004). President's Message: The Journey Continues. *Virginia Mathematics Teacher*, Spring 2004: www.vctm.org/VA%20Math%20Teacher/Spring%2004.pdf
- Iowa Model Core Curriculum, www.iowamodelcore.org/content/Mathematics
- Ma, L. (1999). *Knowing and Teaching Elementary Mathematics: Teachers' Understanding of Fundamental Mathematics in China and the United States*. Lawrence Erlbaum.
- Mathematics course descriptions of the University of Iowa, Iowa State University, and University of Northern Iowa.
- McCrory, R. (2006). Mathematicians and mathematics textbooks for prospective elementary teachers. *Notices of the AMS*, 53(1), 20-29.
- National Council of Teachers of Mathematics. (2000). *Principles and Standards for School Mathematics*. Reston, VA: NCTM.
- National Mathematics Advisory Council: Final Report 2008, www.ed.gov/about/bdscomm/list/mathpanel/index.html
- Stiff, L.V. (2002, August). Working together to improve mathematics education. *Notices of the AMS*. 49(7), 757-758.
- Stump, S., Bishop, J., Britton, B. (2003), Building a vision of algebra for preservice teachers. *Teaching Children Mathematics*, 10(3), 180. Reston, VA: NCTM.
- Wu, H. Preservice Professional Development of Mathematics Teachers. Retrieved March 1, 2008, www.math.berkeley.edu/~wu/.
- Zucker, S. (2003, March). Opinion: Telling the truth. *Notices of The AMS* 50(3), p. 325.
<http://www.ams.org/notices/200303/commentary.pdf>
- Zucker, S. (1996, August) Teaching at the university level. *Notices of The AMS* 43(8), 863-865.





APPENDIX 2: Authors & Contributors

AUTHORS

Justin Peters Ph.D., Professor and Chair, Department of Mathematics, Iowa State University
Walter Seaman Ph.D., Associate Professor, Department of Mathematics and Department of Teaching and Learning, University of Iowa
Doug Shaw Ph.D., Associate Professor, Department of Mathematics, University of Northern Iowa
Bridgette Stevens Ph.D., Assistant Professor, Department of Mathematics, University of Northern Iowa
Jeffrey Weld Ph.D., Associate Professor, Department of Biology, University of Northern Iowa

CONTRIBUTORS

Dan Anderson Ph.D., Professor, Department of Mathematics, University of Iowa
Megan Balong, Math Instructor, Malcolm Price Laboratory School, University of Northern Iowa
David Duncan Ph.D., Professor Emeritus, Department of Mathematics, University of Northern Iowa
James Maltas, Math Instructor, Malcolm Price Laboratory School, University of Northern Iowa
Rich Strike, Math Instructor, Cedar Falls High School

REVIEWERS

Barbara Adams, Math Coordinator, Des Moines Schools
Roger Alexander, Mathematics, Iowa State University
Dan Anderson, Mathematics, University of Iowa
Megan Balong, Mathematics, Price Laboratory School
LeRoy Barnhart, Mathematics, Kirkwood Community College
Maureen Busta, Mathematics, Upper Iowa University
Isabel Darcy, Mathematics, University of Iowa
Oguz Durumeric, Mathematics, University of Iowa
Mark Ecker, Mathematics, University of Northern Iowa
Joyce Eveland, Mathematics, Oskaloosa High School
Cos Fi, Math Education, University of Iowa
Sharon Flinspach, Mathematics, Fairfield High School
Ron Fox, Math Consultant, AEA 13
Amy Froelich, Statistics, Iowa State University
Breanne Garrett, Mathematics, Oskaloosa High School
Glenn Grove, Chief Administrator, AEA 13
Eric Hart, Mathematics, Maharishi University
Julie Hukee, Math Consultant, AEA 11
Nicole Johnson, Communication Studies, University of Northern Iowa
Gail Johnston, Mathematics, Iowa State University
Bryan Kaster, Mathematics, Harlan High School
Fritz Keinert, Mathematics, Iowa State University
Art Kirk, Mathematics, University of Iowa
Russ Lenth, Statistics, University of Iowa

Sergio Loch, Mathematics, Grandview College
Jim Maltas, Mathematics, Price Laboratory School
Jim Marter, Mathematics, Newton High School
Jill Niehaus, Mathematics, Southeast Polk High School
Margaret Prophet, Mathematics, University of Northern Iowa
Jim Reece, Chief, Bureau of Instructional Services, Iowa Department of Education
Suzanne Riehl, Mathematics, University of Northern Iowa
Dennis Roseman, Mathematics, University of Iowa
Cheri Ross, President, Iowa Council of Teachers of Mathematics
Ralph Russo, Statistics, University of Iowa
Lynn Selking, Mathematics, Wayne High School
Olga Sokratova, Mathematics, University of Iowa
Rich Strike, Mathematics, Cedar Falls High School
Keith Stroyan, Mathematics, University of Iowa
Diane Theissen, Mathematics, University of Northern Iowa
Heather Thompson, Mathematics, Iowa State University
Jan Thompson, Mathematics, Sioux City High School
Juliana Tymoczko, Mathematics, University of Iowa
Deb Tvrdik, Mathematics, Ft. Dodge High School
Jeremy Varner, Iowa Department of Education
Joye Walker, Mathematics, Iowa City West High School
Martha Wiley, Mathematics, Mt. Pleasant High School

ADDITIONAL INFORMATION

*Direct comments and questions regarding the
Iowa Mathematics and Science Education Partnership to:*

Jeffrey Weld, Ph.D., Director

E-mail: jeff.weld@uni.edu Ph. 319-273-2723

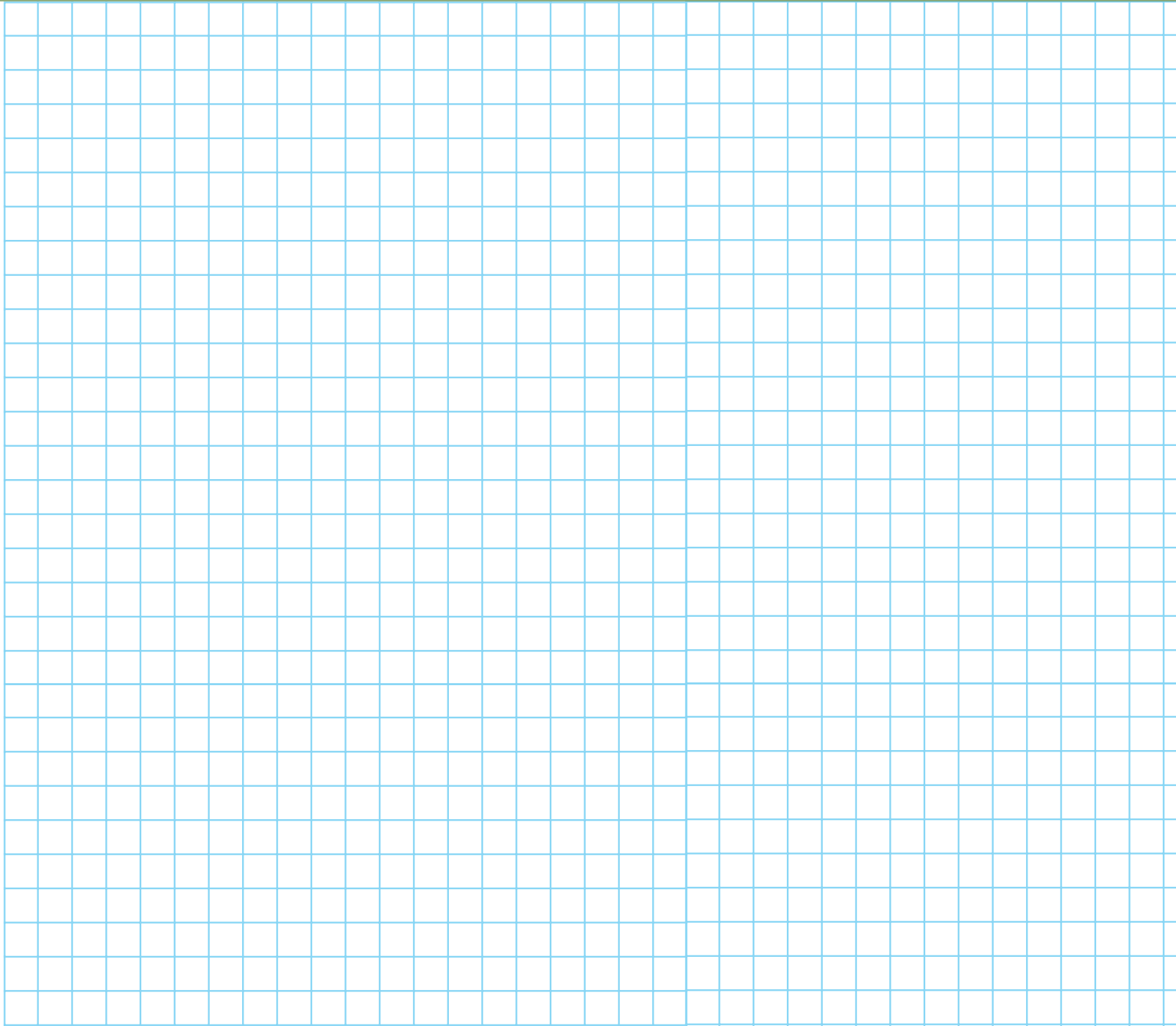
*Direct comments and questions regarding this
Regent Universities Mathematics Transition Guide to:*

Doug Shaw, Ph.D., Associate Professor

Department of Mathematics, University of Northern Iowa

E-mail: guide@dougshaw.com

Notes



[illegible]



IOWA STATE
UNIVERSITY

