Postsecondary & Workforce Readiness Act

Statewide Transitional Math

Competencies and Policies

Updated March 2023

August 2018

The Illinois State Board of Education (ISBE), the Illinois Community College Board (ICCB), and the Illinois Board of Higher Education (IBHE) are jointly committed to increasing the number of Illinois high school graduates placing into college-level math instruction without the need for remediation. We support the goals and approach of the Postsecondary and Workforce Readiness (PWR) Act with its comprehensive model of helping students seamlessly transition from secondary education to postsecondary education and the workforce. In particular, transitional math instruction provides high school students a means to address college readiness in mathematics before high school graduation, enabling students to earn guaranteed placement into college-level math classes at all Illinois community colleges and accepting universities. This approach aligns with other important state policy priorities, including the Illinois Every Student Succeeds Act Plan, the state's 60 percent by 2025 postsecondary attainment goal, and the co-requisite remediation model being implemented at Illinois colleges and universities.

Our three agencies have jointly agreed upon the competencies, performance indicators, and policies set forth in this document, which were first approved in February 2018 by the Statewide Panel for Transitional Math established pursuant to the PWR Act. These competencies, performance indicators, and policies will guide the local partnerships between high schools and colleges necessary for the successful implementation of transitional math instruction.

As the transitional math project moves into the next stages of implementation, our agencies are creating instructional resources with Illinois high school teachers and postsecondary faculty, establishing a course portability approval process, and developing a plan for statewide implementation. We encourage high schools and colleges to continue collaborating on this important and exciting work. ISBE, ICCB, and IBHE will also continue our collaborative efforts. Together, we can contribute to an education system that supports more students to successfully transition from high school into postsecondary education and beyond.

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Transitional Math Overview

The Postsecondary and Workforce Readiness (PWR) Act establishes a new statewide system for transitional math instruction* that provides a mathematical foundation for college and careers that high school seniors are lacking from their previous education. Transitional math instruction provides students with the mathematical knowledge and skills to meet their individualized college and career goals and to be successful in college-level math courses, while aligning with the Illinois Learning Standards.

The use of transitional math courses will reduce remediation rates and bridge the gap of the fourth year of math for students who often opt out of math in their senior year, increasing their chances of needing remedial coursework. Students receive guaranteed placement at any Illinois community college upon successful completion of a transitional math course that has been approved for statewide portability. The procedures for statewide portability require demonstration that the relevant competencies are addressed, and the required policies are met. Success is based on the demonstration of the process and content competencies, which demonstrates readiness for college courses, instead of a single test score.

Although some content in the courses will not be new, the experience should be. Students should work on complex problems, not just complex procedures. The problems should be relevant to a senior in high school who will soon be an adult in society and as such will be a community member, an employee, and a college student. While the students have had some of the content before, they do not understand it well enough to show college readiness as measured by multiple means including standardized tests and course grades. Transitional math courses work to address the gaps in understanding by working on bigger problems, emphasizing problem-based learning and projects, communication, and integration of concepts, not just skill acquisition. Contexts used should be authentic whenever possible and apply to the student's college or career path. This approach is motivating and engaging but also sets the stage for the types of problems a student will be exposed to when they reach college. Additionally, transitional courses will focus on a growth mindset, resilience, and perseverance as well as college knowledge and 21st century skills. These traits are essential to success in college for any student but particularly first generation college students.

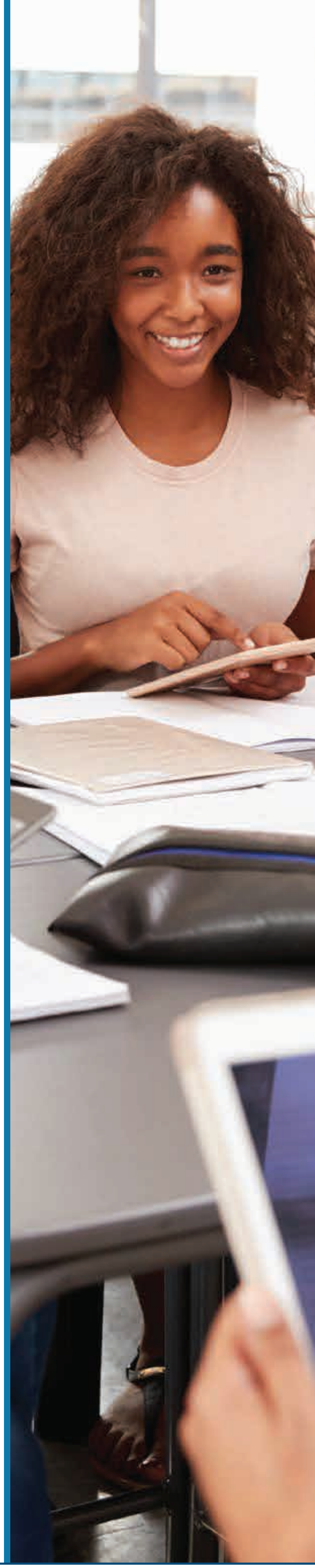
This document includes an overview of the three transitional math pathways established by the PWR Act. It then includes the competencies recommended for adoption by the committees of the Statewide Panel for Transitional Math, including process competencies for all three pathways related to mathematical and student success, and content competencies for each of the three pathways. (See Appendix A for membership of the Statewide Panel, and Appendix B for membership of each of the Pathway Committees.) Next, the document includes a set of policies recommended by the Statewide Panel for transitional math, including:

- General policies addressing issues such as teacher qualifications, student qualifications, grading standards, curriculum documentation, and teacher support and mentoring;

- Policies for determining the projected readiness of high school students for college-level math, so that students not projected ready are placed into transitional math instruction; and

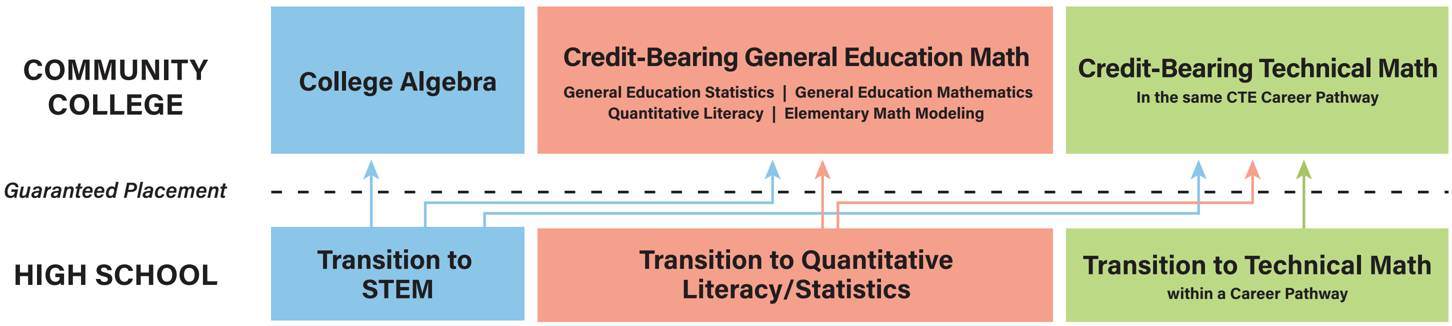
- The policy for approving transitional math instruction for statewide portability throughout the Illinois community college system.

**While this document will often refer to a transitional math course, the competencies can be used within a standalone fourth-year course for high school seniors or integrated within another course or within a competency-based learning system.*



Transitional Math Pathways and Instructional Approach

The PWR Act organizes the State's approach to transitional math into three overarching math pathways, as depicted below:



The emphasis on algebra increases from the technical math pathway to the STEM pathway. Conversely, the amount of contextualization will increase from the STEM pathway to the technical math pathway.

STEM Pathway

The STEM Pathway is for students with career goals involving occupations that require the application of calculus or advanced algebraic skills. In accordance with and subject to the PWR Act, successful attainment of transitional mathematics competencies in the STEM Pathway guarantees student placement into a community college mathematics course in a calculus-based mathematics course sequence. Specifically, this will mean placement into College Algebra.

Quantitative Literacy and Statistics Pathway

The Quantitative Literacy and Statistics Pathway is for students focused on attaining competency in general statistics, data analysis, quantitative literacy, and problem solving. This pathway is intended for students whose career goals do not involve occupations relating to either the STEM or Technical Math Pathway or those who have not yet selected a career goal. In accordance with and subject to the PWR Act, successful attainment of transitional mathematics competencies in the Quantitative Literacy and Statistics Pathway guarantees student placement into a community college GECC mathematics course not in a calculus-based course sequence which includes general education statistics, general education mathematics, quantitative literacy, or elementary math modeling.

Technical Math Pathway

The Technical Math Pathway is for students with career goals involving occupations in technical fields that do not require the application of calculus, advanced algebraic, or advanced statistical skills. The mathematics in this pathway emphasizes the application of mathematics within career settings. In accordance with and subject to the PWR Act, successful attainment of transitional mathematics competencies in the Technical Math Pathway guarantees student placement into a credit-bearing postsecondary mathematics course required for a community college career and technical education program.

Instructional Approach

Transitional math courses should enable students to develop conceptual understanding and problem solving competence while increasing college readiness in the path of their choice. The courses emphasize conceptual understanding and modeling rather than procedures and symbolic manipulation. The study of algebra is included in all three pathways; however, its emphasis varies depending on the outcome pathway. Instruction should be contextualized and emphasize authentic applications whenever possible, and instructional strategies integrating mathematics competencies with other academic and career competencies are encouraged for all students. Relevant contexts that apply to the student's life, job, and future college classes should be used, particularly contexts from local business and industry. Depth, not breadth, is essential when addressing the course competencies. However, exposure to a variety of situations, contexts, and concepts is also expected.

The courses focus on developing mathematical maturity and college readiness through problem solving, problem and project-based learning, critical thinking, data analysis, and the writing and communication of mathematics. Students will develop conceptual and procedural tools that support the use of mathematical concepts essential for their pathway in a variety of contexts. The instruction should emphasize the connections between concepts being taught whenever possible. Emphasis should be placed on extended modeling and problem solving with techniques and manipulations covered in context. The appropriate use of technology is strongly encouraged. Some examples include scientific calculators, graphing calculators, spreadsheets, and/or online programs like Desmos.

Differences in Pathways

While the philosophy and approach to each of the three pathways is the same, there are differences specific to each outcome course. The following table summarizes some main differences. Consult a pathway's content competencies for more information.

TRANSITIONAL MATH		PATHWAY		
		STEM	Quantitative Literacy and Statistics	Technical Math
TRAIT	Mathematical goal	Use Algebra 2 skills and concepts successfully in College Algebra	Use numeracy and basic algebra skills in general education math courses	Use numeracy in a technical math course
TRAIT	Mathematical outcome in a college course requiring extra attention in the transitional course	Transition from procedural algebra to graphical representations	Reading word-based problems and determining the needed algebraic and numeric concepts	Using numeric skills easily in a variety of applied situations
TRAIT	Outcome college math courses	College Algebra General Education Statistics (M1902) General Education Mathematics (M1904) Quantitative Literacy (M1901) Elementary Math Modeling (M1907) Technical math*	General Education Statistics (M1902) General Education Mathematics (M1904) Quantitative Literacy (M1901) Elementary Math Modeling (M1907) Technical math*	Technical math*
TRAIT	Consequence for students changing transitional paths	None	Subject to college placement policies	Subject to college placement policies

** The Transition to Technical Math course provides preparedness for most technical math courses that satisfy the math requirements for an AAS degree. Consult local technical math course requirements.*

Note on Competencies

The competencies stated in this document comprise the minimum standards for a transitional math course. High schools and colleges may add to the minimum content as needed to support existing courses and address local employer needs provided there is sufficient time to address the required and additional content in the manner described here.

Transitional Math Competencies

Process Competencies for All Pathways

Transitional courses are intended to help students develop conceptual understanding and problem-solving ability as well as college and career readiness. To that end, the courses include process competencies related to mathematical and student success. While these competencies are not assessed directly, they should be a part of instruction and assessed indirectly.

For mathematical success, transitional courses satisfy the **Common Core Standards for Mathematical Practice:**

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Additionally, these courses help students do the following:

1. Develop the ability to use mathematical skills in diverse scenarios and contexts.
2. Use technology appropriately including calculators and computers.
3. Demonstrate critical thinking by analyzing ideas, patterns, and principles.
4. Demonstrate flexibility with mathematics through various contexts, modes of technology, and presentations of information (tables, graphs, words, equations).
5. Demonstrate and explain skills needed in studying for and taking tests.

For student success, transitional courses include an emphasis on the non-cognitive skills outlined in the **Illinois Essential Employability Skills Framework.**

Personal Ethic	Work Ethic
Integrity | Respect Perseverance | Positive attitude	Dependability Professionalism
Teamwork	**Communication**
Critical thinking Effective and cooperative work	Active listening Clear communication

Additionally, these courses help students accomplish the following components of college readiness:

1. Develop written and verbal skills in relation to course content.
2. Evaluate personal learning style, strengths, weaknesses, and success strategies that address each.
3. Research using print and online resources.
4. Apply time management and goal setting techniques.
5. Work collaboratively with others throughout the course.

Transition to STEM Content Competencies

Purpose

These competencies are designed to frame the outcomes of a transitional course for high school seniors to prepare them for a career requiring calculus or advanced algebraic skills. This course can serve as a prerequisite for a first college-level mathematics course such as College Algebra. The course emphasizes the mathematical practices necessary for success in a college course, particularly modeling. Mathematical understanding, communication, collaboration, authentic applications, and connections between concepts will be emphasized with procedural ability.

The main emphasis of this course is the understanding of functions and how functions naturally arise through authentic modeling situations. In creating and testing these mathematical models, it can be important to incorporate the necessary algebraic skills in these contexts. While this course will use functions and modeling, the course is not intended to replace College Algebra.

Upon successfully completing the course, students should be able to use their understanding of the concept of functions combined with their ability to select and execute appropriate algebraic procedures and processes. While a successful student can demonstrate the ability to solve complex, multi-step mathematical and contextualized problems, the content of the course is not always applicable to authentic contexts. In those cases, rich mathematical problems should be used so that students make deeper connections between numeric, algebraic, and/or graphic skills.

Domains

Due to the nature of the content in this course, the domains and competencies are organized differently than the other two transitional math pathways.

While the domains of numeracy and functions and modeling are incorporated into a Transition to STEM course, the essential domain of the course is algebra. Only essential algebraic topics are included here so that they can be worked on deeply, allowing students to address any deficits. More time should be spent making sense of the operations and procedures of expressions and equations within the function families as opposed to exposing students to additional topics. Depth of understanding and the ability to integrate and apply algebraic procedures is the goal.

Required Content

In addition to basic function concepts and solving 2 x 2 systems of equations without matrix methods, students should be able to simplify expressions, solve equations, and graph functions* in the following required function families:

- Linear
- Polynomial
- Rational
- Radical
- Exponential

**Linear and quadratic function graphing should be covered in detail while the graphing with the remaining function families should be at the exposure level. Significant time will be spent on graphing those function families in a College Algebra course.*

Prerequisite Skills and Concepts

Students should enter this course with the following abilities that may have been gained from a previous Algebra 1 or 2 course:

1. Perform basic arithmetic operations (addition, subtraction, multiplication, and division) with real numbers and polynomials.
2. Solve linear equations.
3. Apply exponent rules for integer exponents. In particular, they should be able to
   a. Simplify expressions involving integer exponents using the laws of exponents.
   b. Understand negative exponents as reciprocals
   c. Understand scientific notation
4. Understand a graph as the solution set of an equation relating two variables. In particular, they should be able to
   a. Determine if a point in the plane is on a graph.
   b. Interpret a given point on a graph as a solution to the equation of the graph.
5. Apply the geometric formulas for area, perimeter, and volume for standard shapes and figures.
6. Use the Pythagorean Theorem to solve problems.

Course Competencies

Algebra

A successful Transition to STEM student will demonstrate the ability to solve complex, multi-step algebraic problems in the context of authentic situations. Students should be able to communicate their processes and justify their mathematical thinking both orally and in writing. They will persevere in investigating algebraic problems, reasoning both independently and collaboratively. Students will generate and test models of quantitative relationships by exploring pattern and structure. Students will understand that algebra is a way of describing mathematical relationships between quantities. Appropriate technology will be used throughout with an emphasis on recognition of the level of precision required in different contexts.

To address the necessary algebra skills and to help students transition to the outcome course, a lens of functions and graphs will be used in this course. Algebraic procedures are motivated with functions and modeling in rich, contextual problems or in the service of understanding functions and graphs of a particular function family. For example, a student should work with an authentic situation involving a rational function model prior to working with algebraic procedures with rational expressions and equations. This approach will help students make the necessary conceptual shift from procedural algebra to graphic representations, a hallmark of College Algebra.

NOTE: The approach described here should be adjusted with the high school and college as needed to ensure that the transitional course does not duplicate a previous Algebra 2 course or the outcome College Algebra course.

ALGEBRA COMPETENCIES

CA-A1. Students can apply, analyze, and evaluate the characteristics of functions in mathematical and authentic problem solving situations.	*Key performance indicators* a. Understand the concept of a function and use function notation. b. Interpret the dependent and independent variables in the context of functions. c. Create and interpret expressions for functions in terms of the situations they model including selecting appropriate domains for these functions. d. Understand the relationship between a function and its graph. e. Find the domain, including implied domains, and the range of a function. f. Analyze functions using different representations (verbal, graphic, numeric, algebraic).
CA-A2. Students can simplify expressions, solve equations, and graph functions from the linear, polynomial, rational, and radical function families in mathematical and authentic problem solving situations.	*Key performance indicators for linear functions* a. Identify dependent and independent variables in linear relationships and use this knowledge to model authentic situations. b. Understand the relationship between lines and their equations including slope. c. Graph a line using slope-intercept form of the linear equation. d. Determine the equation of a line from its graph and from the point-slope formula. e. Use graphs of lines to identify solutions to linear equations. f. Solve linear inequalities, expressing the solutions sets using interval notation and graphing solution sets on number lines, and interpret their solutions in context. g. Use and understand the slope criteria for parallel and perpendicular lines.
	Key performance indicators for polynomial functions of degree 2 and higher h. Solve application problems and create models involving polynomial equations. i. Factor quadratic polynomials over the rational numbers and identify prime/irreducible polynomials over the rational numbers. j. Apply standard factoring techniques to polynomials. k. Solve quadratic equations by factoring, completing the square, and the Quadratic Formula. l. Graph quadratic functions and be able to determine the quadratic function from the graph. m. Understand the relationship between zeros and factors of a polynomial of degree 2 and higher. n. Solve polynomial equations and inequalities of degree 2 and higher.

ALGEBRA COMPETENCIES *(CONT.)*

	Key performance indicators for rational functions o. Solve applications and create models involving rational equations. p. Simplify rational expressions. q. Solve rational equations. r. Solve rational inequalities algebraically.
	Key performance indicators for radical functions s. Solve applications and create models involving radical equations. t. Convert between radical and rational exponent notation. u. Simplify expressions involving radicals and rational exponents using appropriate exponent rules. v. Solve equations involving radical expressions.
CA-A3. Students can use their understanding of exponential functions of the form $f(x) = C\,b^x$, for some constants $b > 0$ and C, in mathematical and authentic problem solving situations.	*Key performance indicators* a. Solve simple applications and create simple models involving exponential equations. b. Distinguish exponential growth from linear and polynomial growth. c. Graph and recognize the graph of exponential functions of the form $\mathbf{f(x) = C\,b^x}$. d. Solve simple exponential equations numerically.
	Optional key performance indicator e. Solve simple exponential equations algebraically.
CA-A4. Students can create, solve, and reason with systems of equations and inequalities in mathematical and authentic problem solving situations.	*Key performance indicators* a. Solve applications and create models involving 2 x 2 systems of linear equations using both graphical and algebraic methods. b. Use linear inequalities and systems of linear inequalities in two unknowns to create models. c. Graphically identify solution sets to linear inequalities or systems of inequalities.

Transition to Quantitative Literacy and Statistics Content Competencies

Purpose

These competencies are designed to frame the outcomes of a transitional course for high school seniors to prepare them for a general education college-level math course. The course will serve as a prerequisite for General Education Statistics, General Education Mathematics, Quantitative Literacy, Elementary Mathematical Modeling, or a technical/occupational mathematics pathway. To that end, the ultimate goal of this course is mathematical maturity. There are many ways to reach that goal while meeting the required competencies, allowing schools flexibility when designing their course to meet the unique needs of the high school and the college they feed into. Together, high schools and colleges must determine how to best prepare their students for future study.

Students wishing to pursue postsecondary education in a field that requires College Algebra should take a Transition to STEM course. The Transition to Quantitative Literacy and Statistics course does not meet the prerequisite for College Algebra. Students who change to the STEM Pathway are subject to local college placement requirements.

Domains

The required domains are numeracy, algebra, and functions and modeling. Each domain must be covered but schools are free to determine the amount of time spent on each domain. The competencies stated as follows are required to build the foundational skills necessary to be successful in the outcome courses. Flexibility exists with coverage of the additional topics.

Topics to be included in each domain, but are not limited to, are as follows:

- Numeracy - Operation sense, estimation, measurement, quantitative reasoning
- Algebra - Operations on expressions and functions (must include at least one factoring technique in context), construction and solving of equations
- Functions and Modeling - Characteristics of functions including graphical analysis, modeling with geometry, modeling with linear and nonlinear functions (must include at least three types of nonlinear functions from the following list: polynomial, rational, radical, exponential, logarithmic)

Additionally, the course must also expose students to at least one of the following topics:

1. Applications of systems of equations and/or inequalities
2. Applications of probability and statistics
3. Applications of proportional reasoning

Course Competencies

Numeracy

Numeracy denotes the understanding and use of numbers in operation sense, estimation, measurement, and quantitative reasoning in authentic contexts. Students should regularly make sense of their results and judge them for reasonableness. Basic statistical measures and their uses are also included. While technology is encouraged in the course, students should also work on fraction and integer operations without calculators to improve their understanding of and comfort with them. After students have demonstrated adequate proficiency with basic operations without a calculator, use of a calculator is merited as determined by the instructor.

NUMERACY COMPETENCIES

QL-N1. Students can apply, analyze, and evaluate the characteristics of numbers in authentic modeling and problem solving situations.	*Key performance indicators* a. Demonstrate operation sense and the effects of common operations on numbers in words and symbols. b. Apply mathematical properties in numeric and algebraic contexts. c. Use different types of mathematical summaries of data, such as mean, median, and mode. d. Read, interpret, and make decisions based upon information from various data displays. e. Demonstrate competency in the use of magnitude in the contexts of place values, fractions, and numbers written in scientific notation. f. Demonstrate measurement sense that includes predicting, estimating, and then solving problems using appropriate units.
QL-N2. Students can perform operations on numbers and make use of those operations in authentic modeling and problem solving situations.	*Key performance indicators* a. Perform arithmetic operations on whole numbers, integers, fractions, and decimals including basic operations without a calculator. b. Apply quantitative reasoning to solve problems involving quantities or rates.
QL-N3. Students can propose various alternatives, determine reasonableness, and then select optimal estimates to justify solutions.	*Key performance indicators* a. Use estimation skills. b. State convincing evidence to justify estimates.

Algebra

Students will experience an application-based approach to algebraic topics. The goal is not algebraic manipulation. Instead, students should use algebraic reasoning as one of multiple problem-solving tools in the course when it makes a task easier. This includes creating expressions, equations, and functions to solve problems that are more career focused and personal to a student's life. Choosing an appropriate method to solve a problem is an important part of developing the mathematical maturity students need for success in general education college math courses. Depth of understanding is more important than covering many topics.

ALGEBRA COMPETENCIES	
QL-A1. Students can demonstrate understanding of the characteristics of variables and expressions and apply this knowledge in authentic modeling and problem solving situations.	*Key performance indicators* a. Use variables to accurately represent quantities or attributes in a variety of authentic tasks. b. Predict and then confirm the effect that changes in variable values have in an algebraic relationship. c. Interpret parts of expressions such as terms, factors, and coefficients. d. Write expressions and/or rewrite expressions in equivalent forms to solve problems.
QL-A2. Students can perform operations on expressions in authentic modeling and problem solving situations.	*Key performance indicators* a. Perform arithmetic operations (addition, subtraction, multiplication) on polynomials in authentic tasks. b. Demonstrate the relationship between zeros and factors of polynomials.
QL-A3. Students can create, solve, and reason with equations and inequalities in the context of authentic modeling and problem solving situations.	*Key performance indicators* a. Create equations and inequalities that describe numbers or relationships. b. Compare and contrast expressions and equations. c. Use and justify reasoning while solving equations. d. Develop and solve equations and inequalities in one variable.

Functions and Modeling

Modeling links classroom mathematics and statistics to everyday life, work, and decision making. Modeling is the process of choosing and using appropriate mathematics and statistics to analyze empirical situations, to understand them better, and to improve decision making. Quantities and their relationships in physical, economic, public policy, social, and everyday situations can be modeled using mathematical, statistical, and geometric methods. When making mathematical models, technology is valuable for varying assumptions, exploring consequences, and comparing predictions with data.

The use of functions is one way situations can be modeled. Constructing, evaluating, and using models, especially functions, are essential to this component of the course. While function notation may be included, it is not a requirement of the course. Emphasis should be placed on how functions work and how they can be used to model a given situation.

FUNCTIONS & MODELING COMPETENCIES

QL-FM1. Students can apply, analyze and evaluate the characteristics of functions in authentic modeling and problem solving situations.	*Key performance indicators* a. Use variables in a variety of mathematical contexts to represent quantities or attributes. b. Predict and then confirm the effect that changes in variable values have in an algebraic relationship. c. Understand the concept of a function. d. Interpret functions. e. Analyze functions using different representations (descriptions, tables, graphs, and equations). f. Represent common types of functions using words, algebraic symbols, graphs, and tables. g. Identify important characteristics of functions in various representations.
QL-FM2. Students can build and use functions including linear, nonlinear, and geometric models in authentic modeling and problem solving situations.	*Key performance indicators* a. Translate problems from a variety of contexts into mathematical representations and vice versa. b. Build a function that models a relationship between two quantities. c. Build new functions from existing functions. d. Construct and compare models such as linear and nonlinear models and use them to solve problems. e. Interpret expressions for functions in terms of the situation they model. f. Apply geometric concepts in modeling situations.
QL-FM3. Students can evaluate mathematical models and explain the limitations of those models.	*Key performance indicators* a. Identify the reasonableness of a linear model for given data and consider alternative models. b. Use reasoning that supports that abstract mathematical models used to characterize real-world scenarios or physical relationships are not always exact and may be subject to error from many sources.

Transition to Technical Math Content Competencies

Purpose

These competencies are designed to frame the outcomes of a transitional course for high school seniors to prepare them for a career or technical path. The Transition to Technical Math course is intended only for students progressing through a career pathway, meaning that they are taking career-oriented coursework while in high school and intend to enroll in a career and technical education program at the community college level that includes a technical math college course. The technical math pathway cannot serve as a default math pathway and students cannot be advised into a Transition to Technical Math course if they are not taking related career pathway coursework while in high school.

The course emphasizes the mathematical knowledge needed to be successful in the workplace, namely number systems, geometry, and basic algebra. More importantly, the course should feature a problem-solving learning environment, one that helps enrich the student in not only the needed mathematical skills, but also how they are used in that particular student's field of interest. High schools and colleges should partner with local employers in the technical paths of use to incorporate authentic problems from the workplace.

While technology and specifically calculators may be used in this course, there may also be times where it is appropriate to encourage mental math or hand techniques. The teacher's judgement along with the use of technology in the outcome career will weigh into the decision about the use of technology.

NOTE: These competencies provide preparation for many college technical math courses that satisfy AAS degree requirements. Because local uses of technical math courses vary, high schools should work with their partner community college to clarify to students the outcome technical math course this transitional math course feeds into if multiple technical math options exist at the college.

Domains

The required domains are number systems, geometry, and basic algebra. Each domain must be covered but schools are free to determine the amount of time spent on each domain based on the needs of the outcome technical math course.

The technical math competencies that follow are what would be considered the core skills and contexts for this transitional course. However, due to the highly varied career paths that exist in this pathway, these competencies may be incomplete. It is recommended, and actually encouraged, to include additional topics that the instructor sees fit to expose the student to, namely topics and contexts authentic to their career path.

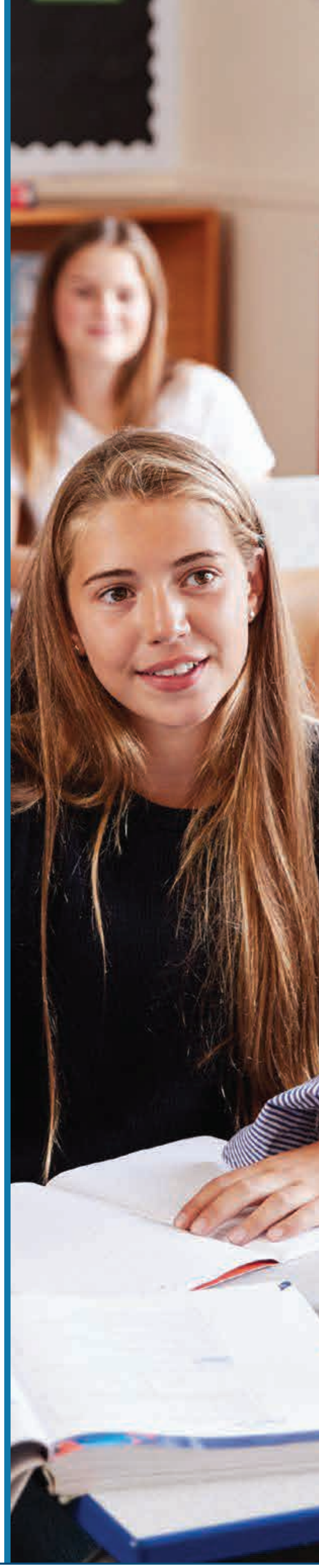
Topics to be included in each domain, but are not limited to, are as follows:

- Number Systems - Operation sense, unit conversions, exponents and radicals
- Geometry - Area, perimeter, and volume; angle properties and applications; scale figures; Pythagorean theorem
- Basic Algebra - Constructions and solving of linear equations and inequalities, use of formulas

Course Competencies

Number Systems

Probably more than any other skill for the career/technical-minded student, being able to work with numbers is the most important. Through problem solving, the student needs to be able to work with measurement, using both rational and irrational numbers. The student also needs to be able to use rounding, estimation skills (both mentally and with technology), and formulas used to help solve authentic applications in their field of study.



NUMBER SYSTEMS COMPETENCIES

TM-NS1. Students can use their understanding of operations with real numbers in authentic contexts.	*Key performance indicators* a. Analyze proportional relationships and use them to solve contextualized and mathematical problems. b. Compute unit rates associated with ratios of fractions, decimals, and percents and including ratios of lengths, areas and other quantities measured in like or different units. c. Apply properties of operations to calculate with numbers in any form including signed numbers. d. Convert between forms as appropriate. e. Assess the reasonableness of answers using mental computation and estimation and rounding strategies. f. Use rational approximations of irrational numbers to compare the size of irrational numbers and estimate the value of expressions (e.g., $\pi/2$).
TM-NS2. Students can perform unit conversions using dimensional analysis and proportions in both the standard and metric systems and between both systems in authentic contexts.	*Key performance indicators* a. Convert like measurement units within a given measurement system and between systems. b. Convert among different sized standard and/or metric measurement units and use these conversions in solving authentic multistep problems. c. Use ratio reasoning (dimensional analysis) to convert measurement units including, but not limited to, distances and rates. d. Manipulate and transform units appropriately when multiplying or dividing quantities.
TM-NS3. Students can use their understanding of exponents and radicals of real numbers in order to calculate quantities in formulas and be able to explain the results.	*Key performance indicators* a. Evaluate expressions at specific values for their variables. Include expressions that arise from formulas in authentic problems. b. Perform arithmetic operations, including those involving whole-number exponents, using order of operations. c. Work with radicals and integer exponents. d. Use square root and cube root symbols to represent solutions to equations of the form $\mathbf{x^2=p}$ and $\mathbf{x^3=p}$, where p is a positive rational number. e. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. f. Know that square roots and cubed roots of non-perfect squares and cubes are irrational and understand what irrational numbers are.

NUMBER SYSTEMS COMPETENCIES *(CONT.)*

TM-NS4. Students can use their understanding of graphs and charts in order to interpret them in contextualized workplace scenarios.	*Key performance indicators* a. Draw conclusions and justify those conclusions from graphics such as order forms, bar charts, pie charts, diagrams, flow charts, maps, and dashboards. b. Identify and interpret trends, patterns, and relationships from graphs and charts. c. Identify types of graphs that best represent a given set of data. d. Make and justify decisions based on data.

Geometry

In almost all technical fields, being able to use geometry concepts is vital. Whether it is more basic skills like finding certain parameters of figures to more complicated applications like working with angles and right triangles, geometry skills are needed. This course reinforces these skills not with rudimentary exercises, but through the application and analysis of applications directly from the outcome career and technical fields.

GEOMETRY COMPETENCIES

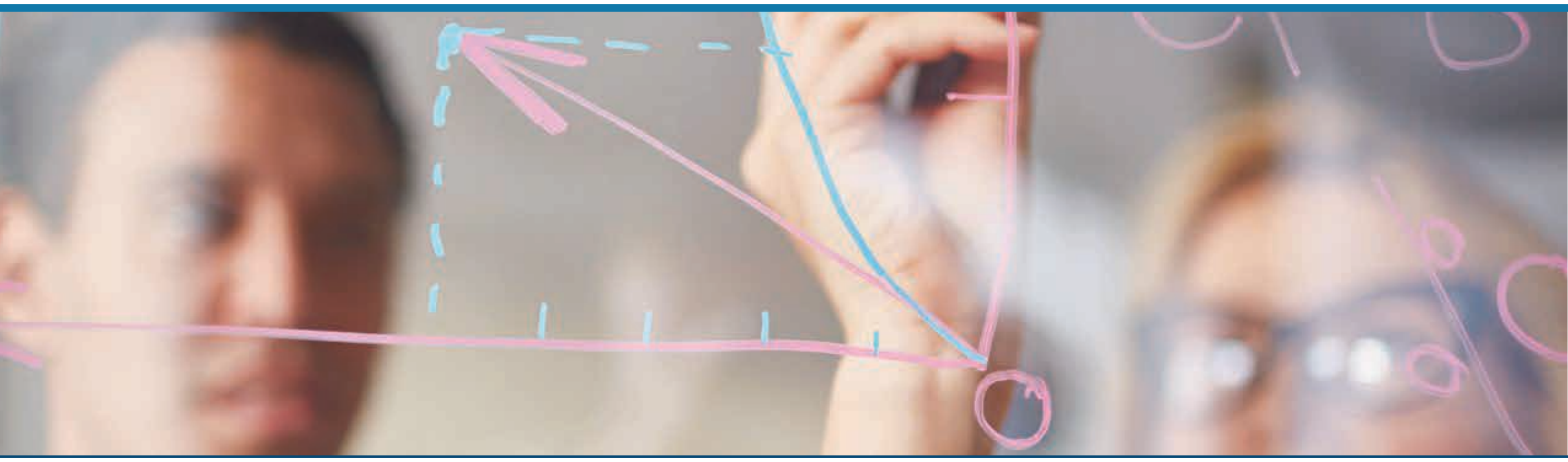
TM-G1. Students can use their understanding of geometry to find and analyze parameters of geometric figures in authentic contexts.	*Key performance indicators* a. Use perimeter, area, and volume formulas to calculate measurements of geometric figures.
TM-G2. Students can use their understanding of geometry to correctly measure and apply the parts of geometric figures in authentic contexts.	*Key performance indicators* a. Use facts about supplementary, complementary, vertical, adjacent, corresponding, alternate interior, and alternate exterior angles to solve for an unknown angle. b. Accurately measure parts of geometric figures such as sides, perimeter, circumference, diagonals, diameter, and angles using the correct measurement tool. c. Solve problems involving scale drawings of geometric figures including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale d. Represent applied problems by graphing points in the coordinate plane and interpret coordinate values of points in the context of the situation.
TM-G3. Students can use their understanding of geometry to analyze authentic applications involving right triangles.	*Key performance indicators* a. Use the Pythagorean Theorem to solve for the length of a leg or the hypotenuse of right triangles. b. Use right triangle ratios (sine, cosine, tangent, and their inverses) to solve for unknown sides and angles in right triangles.

Basic Algebra

Everyone does algebra, but not necessarily in the formal way taught in school. This course takes advantage of the "mental algebra" people do and brings it to the classroom formally through the use of applications in the outcome career and technical area. Algebra techniques such as solving linear equations, modeling, and rearranging equations and formulas for the unknown will be investigated.

BASIC ALGEBRA COMPETENCIES

TM-BA1. Students can use algebra to analyze authentic contexts that involve linear equations and inequalities.	*Key performance indicators* a. Use properties of operations to generate equivalent expressions. b. Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients. c. Solve linear equations and inequalities in one variable. d. Use linear equations to model authentic contexts.
TM-BA2. Represent perimeter, volume, and area as a function of a single variable in authentic contexts.	*Key performance indicators* a. Use variables to represent two quantities involving geometric figures that change in relationship to one another. b. Write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. c. Rearrange formulas to highlight a quantity of interest using the same reasoning as in solving equations.
TM-BA3. Students can apply formulas to solve problems in authentic contexts.	*Key performance indicators* a. Evaluate expressions, including those that arise from formulas in authentic problems, at specific values for their variables. b. Reason quantitatively and use units to solve problems as a way to understand problems and to guide the solution of multistep problems. c. Choose and interpret units consistently in formulas. d. Apply appropriate formulas to solve applications.



Transitional Math Policies

General Policies

The following general policies have been adopted by the Statewide Panel and are intended to guide community colleges and high schools as they jointly create transitional math courses and instructional approaches.

1) Teacher qualifications

A teacher must be certified to teach high school math to teach a standalone transitional math course. If transitional math instruction is integrated with other academic or career-focused content (such as in a senior year capstone course) or taught through a competency-based instructional model, the role of the high school math teacher or community college math instructor must be addressed in the Local Partnership Agreement, and can range from co-teaching to serving in a resource role when needed.

As transitional math courses are not for college credit, a teacher need not meet postsecondary accreditation requirements applicable to community college faculty.

2) Student qualifications

To take a transitional math course, a student must be a senior who has met the high school math graduation requirement. Transitional math courses are intended for students who are not projected ready for college-level math as of the end of their junior year. The state agencies and statewide panel have defined multiple measures criteria for determining projected readiness, which must be utilized for placement into transitional math courses. While a student projected ready for college-math should take an early college credit math course (e.g., Advanced Placement or dual credit) during his or her senior year, the student may enroll in a transitional math course if such enrollment is determined in consultation with a counselor to be in the student's best interest. Each transitional math pathway can be offered in a one-semester or two-semester format.

3) Advising

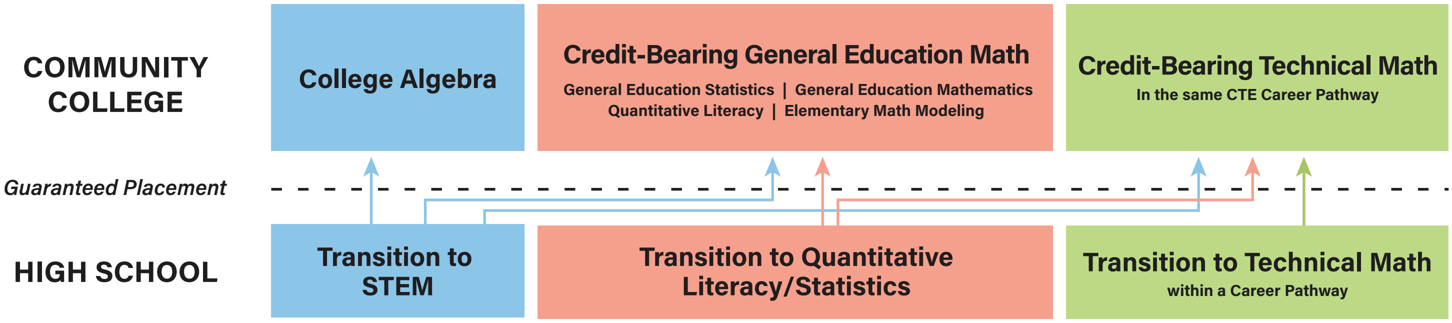
School districts implementing transitional math should include supports in their advising systems to help students choose one of the three math pathways aligned to students' college major or career objectives.

4) Transitional math pathways outcome courses

There are three transitional math pathways for which transitional math courses can be created: STEM, quantitative literacy/statistics, and technical math.

- The Transition to STEM course is intended for students progressing into a field that requires College Algebra. Students successfully completing this course may take College Algebra or any other course in the quantitative literacy/statistics or technical math pathways.
- The Transition to Quantitative Literacy and Statistics course is intended for students progressing into a general education math course. Students successfully completing this course may take a general education math course or a technical math course. This pathway is the default pathway for students who are undecided in their major or career.
- The Transition to Technical Math course is intended only for students progressing through a career pathway, meaning that they are taking career-oriented coursework while in high school and intend to enroll in a career and technical education program at the community college level that includes a technical math college course. It cannot serve as a default math pathway and students cannot be advised into a technical math transitional course if they are not taking related career pathway coursework while in high school.

TRANSITIONAL MATH PATHWAYS



5) Rigor and standards

The high school and college must agree to a grading structure that will include formative and summative assessments such that receiving a C or better indicates the competencies for the course were met and the student is considered ready for college-level math coursework in the appropriate pathway. Grading standards that support college readiness should be mutually established between the high school and college. Specifically, agreed upon grading standards must meet the following guidelines:

- At least 25% of the overall grade must come from problem or project-based learning tasks.
- A single assessment may not be more than 50% of the final grade in the course.
- No more than 25% of the course grade can come from formative assignments such as homework.

Data must be used to evaluate the effectiveness of any transitional math course. Outcomes in the subsequent college-level math courses will inform ongoing adjustments to the transitional math courses.

Grading policies stated in the Local Partnership Agreement take precedence over any conflicting local grading requirements due to the placement and portability agreements.

6) Course curriculum documentation and materials

A course's content, pace, and assessments must be documented according to the documentation requirements established by the transitional math portability panels and the Local Partnership Agreement. Curriculum documents that are created to prove the criteria for portability has been met must be constructed in partnership between a high school and college.

Course materials must support the competencies of the course. The use of a college text is not required.

7) Training and mentoring

High school teachers must receive relevant and applicable professional development prior to teaching a transitional math course. Training should address content and pedagogical issues including active teaching strategies. A process should be established whereby high school teachers can receive ongoing support from college math faculty. Mentoring and liaison models are encouraged to provide support. However, mentors and liaisons do not evaluate high school teachers.

8) Transcripted placement

The high school will transcript the appropriate transitional math course code upon successful completion of the transitional course. Colleges will use high school transcripts and the transitional math codes provided therein to place the student into the appropriate college-level math outcome course associated with the course code.

9) Local Partnership Agreement

The State approved Local Partnership Agreement template is recommended for use as it addresses all state policies as set forth in this document. All local partnership agreements must be agreed to by both the high school and college. It should establish expectations for all involved. All local partnership agreements will be publicly posted in a manner determined by ISBE and ICCB.

10) Portability

ISBE, ICCB, and IBHE, in consultation with the statewide panel, have established criteria and procedures for approving transitional math courses for statewide portability. Submissions to the Statewide Portability Panel, including courses that have been previously submitted but returned for a resubmission, are required to utilize the most current portability documents. To be eligible for portability, a local advisory panel (LAP) must be established between the school district and college with representation from both entities. The primary responsibility of the LAP is to collect syllabi and competency spreadsheets from high schools, approve the partnership's courses, choose representative courses for portability submission(s), and communicate to school principals information from the Statewide Portability Panel. If a transitional math course meets the statewide portability criteria and adheres to these stated policies, a student will receive guaranteed placement at any Illinois community college into the appropriate outcome math course(s) of the transitional pathway as defined in the portability designation policies document upon successful completion of the course. Public and private universities may voluntarily agree to provide guaranteed placement into the outcome math course(s) of the transitional pathway.

Projected Readiness and Placement Policies

College-Level Math Projected Readiness Criteria

The following requirements define benchmarks for projected readiness in college-level math as required by the PWR Act.

Eleventh Grade Students Projected Ready for College-Level Math

All Illinois high school juniors should be assessed on their college readiness regarding mathematics after the first semester of the junior year.

A high school junior who has successfully completed state math graduation requirements and meets **at least two** of the following criteria is projected to be ready for college level coursework in mathematics when arriving at a postsecondary institution in Illinois. This determination is conditional based on enrollment in a senior year of math.

- B or better in Algebra 2
- C or better in a course higher than Algebra 2
- GPA ≥ 3.0
- Standardized Assessment: Math SAT or PSAT ≥ 530 or Math ACT ≥ 22
- Placement test score (such as ALEKS, Accuplacer, Compass, local placement instrument, etc.) into college-level math at the partner community college after taking their placement exam
- Teacher and/or advisor recommendation of college-level math in the senior year

Students who are projected ready should be advised to enroll in the next course of their chosen pathway, preferably an Advanced Placement or dual credit math course, during the senior year.

Notes

1. GPA references cumulative, unweighted GPA on a 4.0 scale.
2. A partner community college refers to the community college district for which the high school has a partnership Memo of Understanding for transitional math.
3. School districts may adjust senior math placements based on end-of-junior year GPA, course grades, and/or other assessments as available.
4. Students who are projected ready may take transitional math courses based on teacher and/or counselor recommendations.
5. Students who do not enroll in subsequent math courses their senior year are in jeopardy of not maintaining their "ready" designation.
6. A determination of readiness does not guarantee placement into dual credit courses in the senior year or college-level math courses at a college. Additional placement criteria may apply.
7. PSAT scores are predictive of SAT scores and measured on the same scale.

College-Level Math Projected Readiness Criteria

The following requirements define placement criteria for transitional math courses as required by the PWR Act.

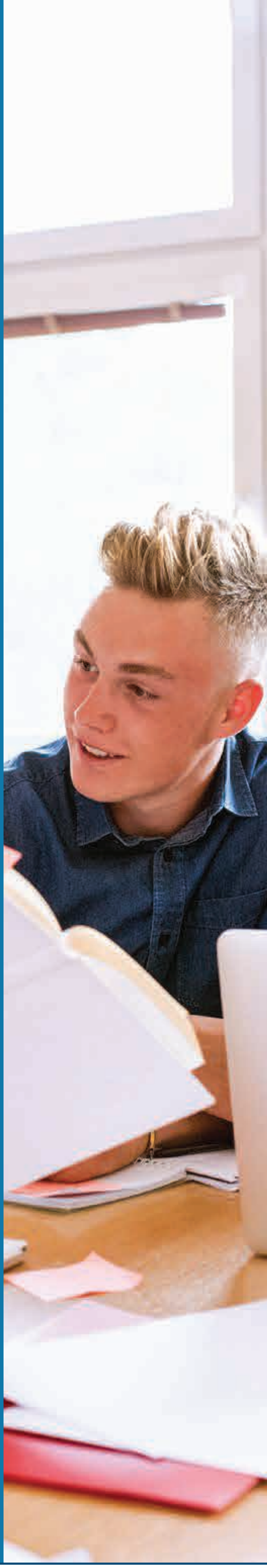
Eleventh Grade Students Projected NOT Ready for College-Level Math

A high school junior who has successfully completed state math graduation requirements but has not met at least two of the college-level math projected readiness criteria will be projected as NOT ready for college-level math and will be given transitional math opportunities in relation to their current math achievement and career interests. A student should consult with a teacher and/or advisor to determine the appropriate transitional math pathway.

Transitional Math Pathway	Minimum Criteria for Enrollment
STEM Results in guaranteed placement into College Algebra or any of the outcome courses associated with the transitional Quantitative Literacy and Statistics or Technical Math pathways. See note.	Successfully completed state high school graduation requirement in math and at least one of the following criteria: ▪ B or better in Algebra 1 or a higher math course ▪ Math GPA of 2.5 or higher ▪ Teacher verification of transitional STEM prerequisite competencies
Quantitative Literacy and Statistics Results in guaranteed placement into IAI courses M1901 Quantitative Literacy, M1902 General Education Statistics, M1904 General Education Mathematics, M1907 Elementary Math Modeling or Technical Math. See note.	Successfully completed state high school graduation requirement in math.
Technical Math Results in guaranteed placement into a technical math course within the career pathway. See note.	Successfully completed state high school graduation requirement in math.

Notes

1. Students who have not selected a math pathway are placed by default into the QL/Statistics pathway.
2. GPA references cumulative, unweighted GPA on a 4.0 scale.
3. Students who have not completed state high school graduation requirements in math must be concurrently enrolled in a course to meet those requirements with a transitional math course.
4. A transitional math course cannot be used by a high school senior who has not successfully completed three years of math that fulfill the State's graduation requirements (see 105 ILCS 5/27-22, and ISBE's guidance: https://www.isbe.net/Documents/grad_require.pdf).
5. Local policies may require students with an SAT math score of 300 or below to enroll in foundational math instruction and supports either in lieu of, or concurrently with, a transitional math course.
6. The Transition to Technical Math course provides preparedness for most technical math courses that satisfy the math requirements for an AAS degree. Consult local technical math course requirements.



Portability Designation Policies

A transitional math course that meets the statewide portability criteria according to the appropriate transitional math panel shall receive a portability designation from the State. This designation guarantees that students who achieve successful completion shall receive placement into an appropriate mathematics course at any Illinois community college as indicated in the table below. Successful completion means the student successfully demonstrates attainment of transitional mathematics competencies either through an overall grade for the mathematics-related portion of a course or demonstrated mastery of all transitional mathematics competencies delivered through a competency-based learning system.

Outcome courses by transitional math pathway after successful completion

Transition to STEM	Transition to Quantitative Literacy and Statistics	Transition to Technical Math[2]
College Algebra		
M1902 General Education Statistics	M1902 General Education Statistics	
M1904 General Education Mathematics	M1904 General Education Mathematics	
M1901 Quantitative Literacy	M1901 Quantitative Literacy	
M1907 Elementary Math Modeling	M1907 Elementary Math Modeling	
Technical Math[1]	Technical Math[1]	Technical Math[1]

Public and private universities may voluntarily agree to provide guaranteed placement into the outcome math course(s) of the transitional pathway.

Portability panel(s)

Panel(s) comprised of secondary and postsecondary faculty will be formed to recognize the statewide portability of transitional math courses. Math faculty from high schools and colleges will comprise the voting membership, in a manner consistent with current Illinois Articulation Initiative processes, modified to fit this panel. Personnel from ISBE, ICCB, and IBHE [(or their designee(s)] may participate as warranted, particularly as the panels are initially formed and the work gets underway. Long-term staffing will be provided by the ICCB.

In addition to determining portability of courses, panels will regularly review the transitional math competencies and recommend adjustments to state agencies for approval, as needed.

Portability Criteria

For a transitional math course to be designated as portable, it must meet the following criteria.

- The course meets all the required process and content competencies
- The course adheres to the statewide policies.

Portability Designation Process

1. A community college shall submit the required documentation for a transitional math course created in partnership with one or more school districts serving grades 9 through 12. A community college may require standardized terms for all of its partner school districts (pursuant to 110 ILCS 148/55(c)) to create and offer a standardized course from each pathway.
2. A community college may, with notification to the portability panel through a procedure yet to be established, add additional school districts or high schools to a previously approved pathway without a full application to the portability panel. The updated documentation need not receive panel review if it does not modify the terms of a Memo of Understanding (other than the participating districts or schools) and course documentation that has been previously approved.
3. The appropriate transitional math panel will review the documentation and grant or deny the portability designation in accordance with the statewide portability criteria.
4. Designation of a course for statewide portability is valid unless, through the ongoing portability review process, the panel determines that a course no longer meets the portability standards.

[1] *The Transition to Technical Math course provides preparedness for a credit-bearing technical math course in the same career pathway.*

5. All courses are subject to ongoing Portability Designation Review from the panel every 5 years.
   a. Each semester the portability panel will review a select number of courses based on capacity. Courses to be reviewed will be selected at random.
   b. A procedure will be established that considers the success of currently enrolled students for removal of a designation in the event that a partnership fails to respond to required modifications based upon the Portability Designation Review.
6. All work related to the transitional math panels is contingent on continued funding for the convening of the panels. Absent funding, courses will maintain their codes for a period of five years, but no new courses will be reviewed.
7. The work of the transitional math panels will be conducted a minimum of twice per year, once in the fall semester and once in the spring semester. Meetings may be conducted in person or electronically, with an expectation that at least one meeting per year will be held in person.

Documentation Requirements

The documentation necessary to prove that a transitional math course meets the portability criteria includes, but is not limited to, the following.

- Competency and curricular documentation that includes information on the pedagogical approach, content, materials, and methods of assessment
- A copy of the partnership's Local Partnership Agreement signed by the college and high school parties

Panels may require additional documentation as the review process matures. Additionally, panels may modify processes to include specific forms and documents, as the work develops, that eases the burden of submission on both the local colleges and local high schools as well as on the panel.

Travel Reimbursement for Panel Participants

Travel reimbursement will be provided if funding allows.

Appendix A: Membership of Statewide Panel

Name	Institution
Malinda Aiello	Illinois Board of Higher Education
Kathleen Almy	Northern Illinois University
Jo Anderson, Jr.	Consortium for Educational Change (CEC)
Ashley Becker	Illinois Community College Board
Marilyn Bellert	Northern Illinois University
Ben Boer	Advance Illinois
Emily Buhnerkempe	Illinois Community College Board
John Burkey	Large Unit District Association (LUDA)
Michael Caparula	Kankakee Community College
Amy Jo Clemens	Northern Illinois University
Brian Durham	Illinois Community College Board
Jon Furr	Northern Illinois University
Jeff Griffin	Peoria Area Chamber of Commerce
Angelique Hamilton	Illinois State Board of Education
Kevin Harrison	State of Illinois
Jason Helfer	Illinois State Board of Education
Kevin Li	Triton College
Lazaro Lopez	District 214
Larry Lovel	Trico District 176
Sherri McLaughlin	Illinois School Counselors Association
Anita Reid	Lewistown High School
George Seelinger	Illinois State University
Whitney Thompson	Illinois Community College Board

Appendix B: Membership of Pathway Subcommittees

STEM

Name	Institution
Ashley Becker	Illinois Community College Board
Joe Bergman	Illinois Central College
Dominica Blalock	Kishwaukee College
Danielle Boggs	Champaign School District 4
Kamra Brandi	New Athens High School
Emily Buhnerkempe	Illinois Community College Board
Brian Dalpiaz	Spoon River College
Keven Hansen	Southwestern Illinois College
Joanne Kantner	Kishwaukee College
Kevin Kennedy	Urbana School District 116
Jean Korder	Urbana School District 116
Kevin Li	Triton College
Kameron Matthis	Elgin Area School District U46
Amy Maxeiner	Black Hawk College
Jeremy McClure	Heartland College
Sherri McLaughlin	Illinois School Counselors Association
Alison Reddy	University of Illinois - Urbana Champaign
Kris Schwarz	Carlyle CUSD 1
George Seelinger	Illinois State University
Dan Weidner	District 214

QUANTITATIVE LITERACY AND STATISTICS

Name	Institution
Malinda Aiello	Illinois Board of Higher Education
Kathleen Almy	Northern Illinois University
Greg Budzban	Southern Illinois University - Edwardsville
Emily Buhnerkempe	Illinois Community College Board
Linda Chapman	Lewis and Clark Community College
Heather Cowell	Waverly High School
Vicky Dunphy	Rock Falls High School
Roseanne Feltman	Triton College
Margaret Gawrych	Lake Park High School
Mary Hill	College of DuPage
Lori Hoffman	Heartland College
Steven Holman	Southwestern Illinois College
Robert Mann	Western Illinois University
Connie McLean	Black Hawk College
Brian Mercer	Parkland College
Briana Mills	Black Hawk College
Ben Mueller	Hinckley Big-Rock High School
Ike Nwosu	Lake Land College
Mike Purcell	District 204
Rick Segovia	Triton College
Chad Shepherd	Pontiac High School
Scott Wetendorf	Bartlett High School

TECHNICAL MATH

Name	Institution
Travis Berth	Kaneland High School
Emily Buhnerkempe	Illinois Community College Board
Michael Caparula	Kankakee Community College
Vina Castelli	Southern Illinois University - Carbondale
Ruth Fabbro	Kankakee Community College
Mike Geist	Wheeling High School/Harper
Michael Grady	Dixon High School
Neal Kauffman	Three Rivers Education for Employment System
Michael McCabe	Northern Illinois University

Name	Institution
Tara McCasland	Kankakee School District
David Miller	Black Hawk College
Kris Sherrick	Urbana High School
Bob Sompolski	Oakton Community College
Thomas Steinbach	Wheeling High School/Harper
William Stuflick	John Wood Community College
Whitney Thompson	Illinois Community College Board
Karen Weiss	Southeastern Illinois College
Amanda Winters	Illinois Board of Higher Education
Patty Zuccarello	Joliet Junior College

Committee chair's names are bolded