PWR Act Transitional Math Competencies

Overview

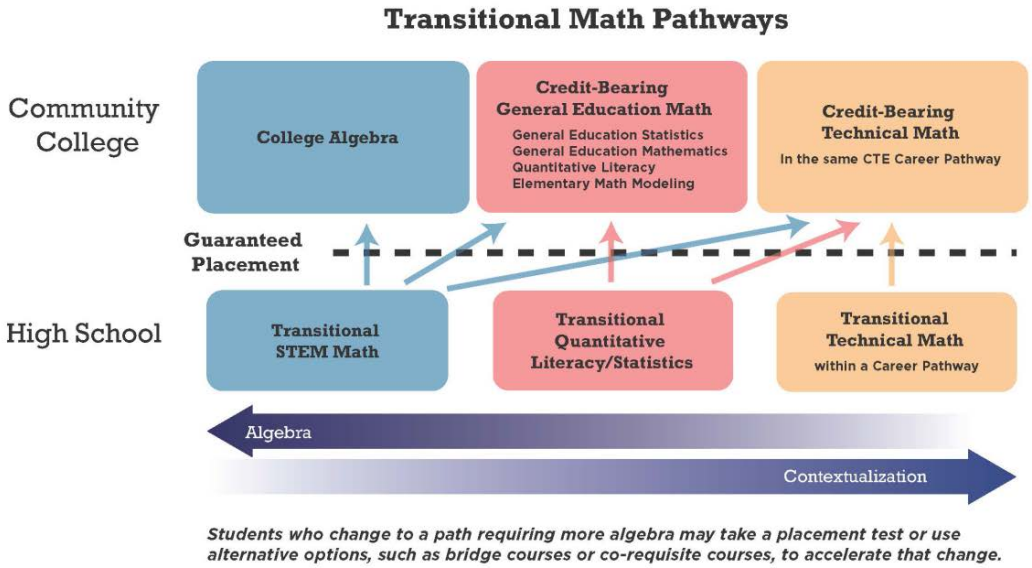
The Postsecondary and Workforce Readiness Act defines transitional math courses* to provide a mathematical foundation for college and careers that high school seniors are lacking from their previous education. They provide students with the mathematical knowledge and skills to meet their individualized college and career goals and to be successful in college-level math courses. Additionally, they align with the Illinois Learning Standards.

The use of these 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, which would increase 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 approval are still being developed, but will require demonstration that the relevant competencies are addressed. 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 citizen, an employee, and a college student. While the students have had some of content before, they do not understand it well enough to show college readiness. 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 college or career path the student is on. This 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 grit 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.

*While this document will refer to a 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



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. Most commonly, 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 Pathway or those who have not yet selected a career goal. In accordance with and subject to this 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 Act, successful attainment of transitional mathematics competencies in the Technical Pathway guarantees student placement into a credit-bearing postsecondary mathematics course required for a community college career and technical education program.

Approach

Transitional math courses should enable students to develop conceptual understanding and problem solving competence while increasing college readiness in the path of their choosing. 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.

Pathway → Trait ↓	STEM	Quantitative Literacy & Statistics	Technical Math
Mathematical goal	Use algebra 2 skills and concepts successfully in a College Algebra class	Use numeracy and basic algebra skills in general education math courses	Use numeracy in a technical math course
Mathematical outcome in 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
Outcome college math courses	College algebra General education statistics General education mathematics Quantitative literacy Elementary math modeling Technical math	General education statistics General education mathematics Quantitative literacy Elementary math modeling Technical math	Technical math
Consequence for students changing transitional paths	None	Subject to college placement policies	Subject to college placement policies

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.

Process Competencies

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.

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. Instead, a STEM transitional course can be used as a replacement for algebra 2 or for seniors who have taken algebra 2 but are not yet proficient enough to be successful in 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 STEM transitional 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 on 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 2x2 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

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 STEM transitional 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

1. Students can apply, analyze, and evaluate the characteristics of functions in mathematical and authentic problem solving situations.

Key performance indicators:

- Understand the concept of a function and use function notation.
- Interpret the dependent and independent variables in the context of functions.
- Create and interpret expressions for functions in terms of the situations they model including selecting appropriate domains for these functions.
- Understand the relationship between a function and its graph.
- Find the domain, including implied domains, and the range of a function.
- Analyze functions using different representations (verbal, graphic, numeric, algebraic).

2. 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:

- Identify dependent and independent variables in linear relationships and use this knowledge to model authentic situations.
- Understand the relationship between lines and their equations including slope.
- Graph a line using slope-intercept form of the linear equation.
- Determine the equation of a line from its graph and from the point-slope formula.
- Use graphs of lines to identify solutions to linear equations.
- Solve linear inequalities, expressing the solutions sets using interval notation and graphing solution sets on number lines, and interpret their solutions in context.
- Use and understand the slope criteria for parallel and perpendicular lines.

Key performance indicators for polynomial functions of degree 2 and higher:

- Solve application problems and create models involving polynomial equations.
- Factor quadratic polynomials over the rational numbers and identify prime/irreducible polynomials over the rational numbers.
- Apply standard factoring techniques to polynomials.
- Solve quadratic equations by factoring, completing the square, and the Quadratic Formula.
- Graph quadratic functions and be able to determine the quadratic function from the graph.
- Understand the relationship between zeros and factors of a polynomial of degree 2 and higher.
- Solve polynomial inequalities of degree 2 and higher.

Key performance indicators for rational functions:

- Solve applications and create models involving rational equations.
- Simplify rational expressions.
- Solve rational equations.
- Solve rational inequalities algebraically.

Key performance indicators for radical functions:

- Solve applications and create models involving radical equations.
- Convert between radical and rational exponent notation.
- Simplify expressions involving radicals and rational exponents using appropriate exponent rules.
- Solve equations involving radical expressions.

3. 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:

- Solve simple applications and create simple models involving exponential equations.
- Distinguish exponential growth from linear and polynomial growth.
- Graph and recognize the graph of exponential functions of the form $f(x) = C\,b^x$.
- Solve simple exponential equations numerically.

Optional key performance indicator:

- Solve simple exponential equations algebraically.

4. Students can create, solve, and reason with systems of equations and inequalities in mathematical and authentic problem solving situations.

Key performance indicators:

- Solve applications and create models involving 2 x 2 systems of linear equations using both graphical and algebraic methods.
- Use linear inequalities and systems of linear inequalities in two unknowns to create models.
- Graphically identify solutions sets to linear inequalities or systems of inequalities.

Quantitative Literacy & 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 STEM field that requires College Algebra should take a STEM-focused transitional course. The Quantitative Literacy & 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

1. Students can apply, analyze, and evaluate the characteristics of numbers in authentic modeling and problem solving situations.

Key performance indicators:

- Demonstrate operation sense and the effects of common operations on numbers in words and symbols.
- Apply mathematical properties in numeric and algebraic contexts.
- Use different types of mathematical summaries of data, such as mean, median, and mode.
- Read, interpret, and make decisions based upon information from various data displays.
- Demonstrate competency in the use of magnitude in the contexts of place values, fractions, and numbers written in scientific notation.
- Demonstrate measurement sense that includes predicting, estimating, and then solving problems using appropriate units.

2. Students can perform operations on numbers and make use of those operations in authentic modeling and problem solving situations.

Key performance indicators:

- Perform arithmetic operations on whole numbers, integers, fractions, and decimals including basic operations without a calculator.
- Apply quantitative reasoning to solve problems involving quantities or rates.

3. Students can propose various alternatives, determine reasonableness, and then select optimal estimates to justify solutions.

Key performance indicators:

- Use estimation skills.
- 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

1. 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:

- Use variables to accurately represent quantities or attributes in a variety of authentic tasks.
- Predict and then confirm the effect that changes in variable values have in an algebraic relationship.
- Interpret parts of expressions such as terms, factors, and coefficients.
- Write expressions and/or rewrite expressions in equivalent forms to solve problems.

2. Students can perform operations on expressions in authentic modeling and problem solving situations.

Key performance indicators:

- Perform arithmetic operations (addition, subtraction, multiplication) on polynomials in authentic tasks.
- Demonstrate the relationship between zeros and factors of polynomials.

3. Students can create, solve, and reason with equations and inequalities in the context of authentic modeling and problem solving situations.

Key performance indicators:

- Create equations and inequalities that describe numbers or relationships.
- Compare and contrast expressions and equations.
- Use and justify reasoning while solving equations.
- 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 and Modeling Competencies

1. Students can apply, analyze and evaluate the characteristics of functions in authentic modeling and problem solving situations.

Key performance indicators:

- Use variables in a variety of mathematical contexts to represent quantities or attributes.
- Predict and then confirm the effect that changes in variable values have in an algebraic relationship.
- Understand the concept of a function.
- Interpret functions.
- Analyze functions using different representations (descriptions, tables, graphs, and equations).
- Represent common types of functions using words, algebraic symbols, graphs, and tables.
- Identify important characteristics of functions in various representations.

2. Students can build and use functions, including linear, nonlinear, and geometric models in authentic modeling and problem solving situations.

Key performance indicators:

- Translate problems from a variety of contexts into mathematical representations and vice versa.
- Build a function that models a relationship between two quantities.
- Build new functions from existing functions.
- Construct and compare models such as linear and nonlinear models and use them to solve problems.
- Interpret expressions for functions in terms of the situation they model.
- Apply geometric concepts in modeling situations.

3. Students can evaluate mathematical models and explain the limitations of those models.

Key performance indicators:

- Identify the reasonableness of a linear model for given data and consider alternative models.
- 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.

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 technical math transitional 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.

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.

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 System Competencies

1. Students can use their understanding of operations with real numbers in authentic contexts.

Key performance indicators:

- Analyze proportional relationships and use them to solve contextualized and mathematical problems.
- 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.
- Apply properties of operations to calculate with numbers in any form including signed numbers.
- Convert between forms as appropriate.
- Assess the reasonableness of answers using mental computation and estimation and rounding strategies.
- Use rational approximations of irrational numbers to compare the size of irrational numbers, and estimate the value of expressions (e.g., $\pi/2$).

2. 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:

- Convert like measurement units within a given measurement system and between systems.
- Convert among different-sized standard and/or metric measurement units and use these conversions in solving authentic multi-step problems.
- Use ratio reasoning (dimensional analysis) to convert measurement units including, but not limited to, distances and rates.
- Manipulate and transform units appropriately when multiplying or dividing quantities.

3. 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:

- Evaluate expressions at specific values for their variables. Include expressions that arise from formulas in authentic problems.
- Perform arithmetic operations, including those involving whole-number exponents, using order of operations.
- Work with radicals and integer exponents.
- Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number.
- Evaluate square roots of small perfect squares and cube roots of small perfect cubes.
- Know that square roots and cubed roots of non-perfect squares and cubes are irrational and understand what irrational numbers are.

4. Students can use their understanding of graphs and charts in order to interpret them in contextualized workplace scenarios.

Key performance indicators:

- Draw conclusions and justify those conclusions from graphics such as order forms, bar charts, pie charts, diagrams, flow charts, maps, and dashboards.
- Identify and interpret trends, patterns, and relationships from graphs and charts.
- Identify types of graphs that best represent a given set of data.
- 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

1. Students can use their understanding of geometry to find and analyze parameters of geometric figures in authentic contexts.

Key performance indicators:

- Use perimeter, area, and volume formulas to calculate measurements of geometric figures.

2. Students can use their understanding of geometry to correctly measure and apply the parts of geometric figures in authentic contexts.

Key performance indicators:

- Use facts about supplementary, complementary, vertical, adjacent, corresponding, alternate interior, and alternate exterior angles to solve for an unknown angle.
- Accurately measure parts of geometric figures such as sides, perimeter, circumference, diagonals, diameter, and angles using the correct measurement tool.
- 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.
- Represent applied problems by graphing points in the coordinate plane and interpret coordinate values of points in the context of the situation.

3. Students can use their understanding of geometry to analyze authentic applications involving right triangles.

Key performance indicators:

- Use the Pythagorean Theorem to solve for the length of a leg or the hypotenuse of right triangles.
- Use right triangle ratios (sine, cosine, tangent, and their inverses) to solve for unknown sides and angles in right triangles.

Basic Algebra

All mathematics is based around "finding the unknown." If everything was known, there would be no problem to solve. 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

1) Students can use algebra to analyze authentic contexts that involve linear equations and inequalities.

Key performance indicators:

- Use properties of operations to generate equivalent expressions.
- Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.
- Solve linear equations and inequalities in one variable.
- Use linear equations to model authentic contexts.

2) Represent perimeter, volume, and area as a function of a single variable in authentic contexts.

Key performance indicators:

- Use variables to represent two quantities involving geometric figures that change in relationship to one another.
- 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.
- Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

3) Students can apply formulas to solve problems in authentic contexts.

Key performance indicators:

- Evaluate expressions, including those that arise from formulas in authentic problems, at specific values for their variables.
- Reason quantitatively and use units to solve problems as a way to understand problems and to guide the solution of multi-step problems.
- Choose and interpret units consistently in formulas.
- Apply appropriate formulas to solve applications.