

# *Course of Study*

## *Algebra I*

**Warren County Career Center**

**3525 North State Route 48  
Lebanon, Ohio 45036**

**Adopted \_\_\_\_\_**

*This document is for the use of the staff at Warren County Career Center.  
Credit is given the designer of the template, Upper Valley JVS, Piqua, Ohio.*

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# *Acknowledgements*

## **Algebra I Warren County Career Center**

We would like to take this opportunity to express our gratitude to the following people for their guidance and support in the preparation of this course of study:

Warren County Career Center Administrative Team  
Warren County Educational Service Center  
Mr. Ali Mehdi  
Mr. Doug Bailey  
Mrs. Liz Rasch  
Mrs. Janet Wilmoth

***Warren County Career Center  
Resolution Of School Board Approval***

WHEREAS, representatives of the Math Department of the Warren County Career Center have reviewed the Course of Study; and

WHEREAS, this Course of Study is based upon Academic Content Standards adopted by the State of Ohio for the Algebra I program; and

WHEREAS, the Math Department has reviewed and added competencies as needed to address local labor market needs and trends in the industry;

NOW, THEREFORE, BE IT RESOLVED, in accordance with the Superintendent's recommendation, that the Warren County Career Center adopt the Algebra I Course of Study.

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District Superintendent

Date

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President, Board of Education

Date

## *Statement of Recommendation*

The Math Department at Warren County Career Center has reviewed this course of study and recommends it for use as the foundation for instruction in the Algebra I class.

The developers of this course of study have considered local labor market needs and the school's ability to offer specialized programs. The competencies have been reviewed and accepted as being congruent with our school's vision, mission, and strategic goals. When appropriate, additional competencies related to the program area have been incorporated into this course of study.

Achievement of technical competencies, utilizing proper attitudes, and demonstrating appropriate values are critical for successful employment and for furthering educational opportunities within a student's chosen field. We believe that this course of study adequately and correctly focuses upon student development.

This course of study is recommended on:

## ***Warren County Career Center Vision Statement***

WCCC is the valued partner of choice within the educational and economic systems of our communities, by providing quality academic and career technical education.

We pave the way for a future of opportunities unique to each of our learners.

## ***Warren County Career Center Mission Statement***

To prepare youths and adults to make informed career choices and to successfully enter, compete, and advance in a changing work world.

## ***Warren County Career Values***

- Treating each other with respect, dignity, trust and mutual value
- Communicating openly and honestly
- Taking ownership of personal actions and being held accountable for results
- Upholding and demonstrating high ethical, educational and fiscal standards
- Exhibiting high levels of professionalism
- Providing high quality instruction and highly qualified staff to ensure success for all learners
- Making quality customer service a high priority
- Promoting partnerships and a team environment
- Celebrating team and individual achievements
- Using data to drive planning, decision making and actions

## *Course Design*

Courses are designed to reflect career-focused education, which combines high-level academics with real-life technical skills. The intent is to maximize a student's present and future academic and career success.

Career-focused education enhances the integration of academic and technical skills, designs programs that prepare students with transferable skills and promotes each student's career opportunities.

## *Course Philosophy*

We believe that

- Mathematics literacy is needed to make everyday decisions such as choosing which product to purchase, interpreting information in news reports, and selecting insurance or health plans.
- Mathematical thinking and problem solving are needed in the workplace, and those who understand and can use mathematics have significantly enhanced opportunities and options.
- Mathematics plays a central role in modern culture, including aesthetic and recreational aspects, and an essential role in the scientific and technical community.
- Set high expectations and strong support for mathematics achievement by ALL students.
- Represent mathematics knowledge and skills needed to make successful transitions to post-secondary education, workplace and daily life.
- Reflect sound application of research on how students learn mathematics.
- Align with national standards documents and major studies in GGGeomathematics
- Address mathematics content knowledge and mathematical processes, including problem-solving, mathematical reasoning, communication, representation and connections.
- Focus on important mathematics topics that are well-articulated through benchmarks and grade-level indicators.
- Represent rigorous progression across grades and in-depth study within each grade.
- Provide an appropriate balance among conceptual understanding, procedural knowledge and skills, and application and problem solving.
- Incorporate use of technology by ALL students in learning mathematics
- Serve as the basis for classroom, district and state assessments.
- Guide the development of local mathematics curriculum and instructional programs.

## ***Course Goals***

The course goals for Algebra I are to:

### **Number, Number Sense and Operations Standard**

Students demonstrate number sense, including an understanding of number systems and operations and how they relate to one another. Students compute fluently and make reasonable estimates using paper and pencil, technology-supported and mental methods.

### **Patterns, Functions and Algebra Standard**

Students use patterns, relations and functions to model, represent and analyze problem situations that involve variable quantities. Students analyze, model and solve problems using various representations such as tables, graphs and equations.

### **Data Analysis and Probability Standard**

Students pose questions and collect, organize, represent, interpret and analyze data to answer those questions. Students develop and evaluate inferences, predictions and arguments that are based on data.

## ***Course Description***

Algebra I include all essential topics needed to be successful in Algebra II. Topics covered are listed specifically under the scope and sequence for Algebra I and include: real numbers and their subsets; properties of real numbers; operations on real numbers; both finding square roots; generalize and find patterns and sequences; generalize patterns using functions or relationships; domain; range; use multiple representations; solve and graph linear equations; solve quadratic equations with real roots; solve systems of 2 by 2 equations; model and solve problems involving direct an indirect variation; describe and interpret rates of change; create, interpret and use graphical displays and statistical measures to describe data; find, use and interpret measures of center and spread; make inferences about relationships in bivariant data; counting techniques; compute probability of compound events; and theoretical and experimental probability.

Algebra meets for 45 minutes each day and the class last for the full school year. One mathematics credit is earned.

## ***Academic and Technical Integration***

Expectations of curriculum must be aligned with what is written, taught, assessed, and reported. Student expectations focus on active, project-centered learning—an approach to learning that emphasizes a connection between ideas in a discipline and the outside world. Educational programming and course content will clearly connect career and post-secondary opportunities. At the Warren County Career Center, the main goal is to design courses and projects that use strategies for authentic instruction. These characteristics of instruction focus on deep understanding, established opportunities for concept connections, provide anticipatory and abstract thinking, and emphasize genuine application.

The academic courses at the WCCC follow the state model curricula. They are designed to meet both associate school and state requirements. These standards respond to the need to improve student achievement, quality of curriculum and instruction, and strengthen school and community relationships.

## ***Technology***

The Warren County Career Center board and staff believe that technology skills are essential for all students to achieve in the 21<sup>st</sup> century. It is the goal of this district to infuse technology into all facets of education:

- Instruction
- Assessment
- Administration
- Career planning
- Course design
- Professional development

Strategies to incorporate technology into all facets of education are a priority of the district and there is commitment to a continual process to provide updated hardware, software, and professional development for staff members for the purpose of providing a high quality education, with the integration of technology, for all students.

## *Students Served*

The population served by this program is juniors and seniors.

# *Scope and Sequence*

## **Number, Number Sense and Operations Standard**

Benchmark A. Use scientific notation to express large numbers and numbers less than one.

Benchmark B. Identify subsets of the real number system.

Benchmark C. Apply properties of operations and the real number system, and justify when they hold for a set of numbers.

1. Identify and justify whether properties (closure, identity, inverse, commutative and associative) hold for a given set and operations; e.g., even integers and multiplication.

Benchmark D. Connect physical, verbal and symbolic representations of integers, rational numbers and irrational numbers.

Benchmark E. Compare, order and determine equivalent forms of real numbers.

1. Compare, order and determine equivalent forms for rational and irrational numbers.

Benchmark F. Explain the effects of operations on the magnitude of quantities.

1. Explain the effects of operations such as multiplication or division, and of computing powers and roots on the magnitude of quantities.

Benchmark G. Estimate, compute and solve problems involving real numbers, including ratio, proportion and percent, and explain solutions.

1. Demonstrate fluency in computations using real numbers.

Benchmark H. Estimate, compute and solve problems involving scientific notation, square roots and numbers with integer exponents.

1. Estimate the solutions for problem situations involving square and cube roots.

## **Patterns, Functions and Algebra Standard**

Benchmark A. Generalize and explain patterns and sequences in order to find the next term and the  $n$ th term.

1. Generalize patterns using functions or relationships (linear, quadratic and exponential), and freely translate among tabular, graphical and symbolic representations.

Benchmark B. Identify and classify functions as linear or nonlinear, and contrast their properties using tables, graphs or equations.

1. Define function with ordered pairs in which each domain element is assigned exactly one range element.
2. Describe problem situations (linear, quadratic and exponential) by using tabular, graphical and symbolic representations.

Benchmark C. Translate information from one representation (words, table, graph or equation) to another representation of a relation or function.

Benchmark D. Use algebraic representations, such as tables, graphs, expressions, functions and inequalities, to model and solve problem situations.

1. Use formulas to solve problems involving exponential growth and decay.
2. Add, subtract, multiply and divide monomials and polynomials (division of polynomials by monomials only).
3. Simplify rational expressions by eliminating common factors and applying properties of integer exponents.

Benchmark E. Analyze and compare functions and their graphs using attributes, such as rates of change, intercepts and zeros.

1. Demonstrate the relationship among zeros of a function, roots of equations, and solutions of equations graphically and in words.
2. Describe and compare characteristics of the following families of functions: linear, quadratic and exponential functions; e.g., general shape, number of roots, domain, range, rate of change, maximum or minimum.

Benchmark F. Solve and graph linear equations and inequalities.

1. Write and use equivalent forms of equations and inequalities in problem situations; e.g., changing a linear equation to the slope-intercept form.
2. Find linear equations that represent lines that pass through a given set of ordered pairs, and find linear equations that represent lines parallel or perpendicular to a given line through a specific point.

Benchmark G. Solve quadratic equations with real roots by graphing, formula and factoring.

1. Solve quadratic equations with real roots by factoring, graphing, using the quadratic formula and with technology.

Benchmark H. Solve systems of linear equations involving two variables graphically and symbolically.

1. Solve and interpret the meaning of 2 by 2 systems of linear equations graphically, by substitution and by elimination, with and without technology.

Benchmark I. Model and solve problem situations involving direct and inverse variation.

1. Model and solve problems involving direct and inverse variation using proportional reasoning.
2. Describe the relationship between slope and the graph of a direct variation and inverse variation.

Benchmark J. Describe and interpret rates of change from graphical and numerical data.

1. Describe how a change in the value of a constant in a linear or quadratic equation affects the related graphs.

### **Data Analysis and Probability Standard**

Benchmark A. Create, interpret and use graphical displays and statistical measures to describe data; e.g., box-and-whisker plots, histograms, scatterplots, measures of center and variability.

1. Classify data as univariate (single variable) or bivariate (two variables) and as quantitative (measurement) or qualitative (categorical) data.

2. Create a scatterplot for a set of bivariate data, sketch the line of best fit, and interpret the slope of the line of best fit.
3. Analyze and interpret frequency distributions based on spread, symmetry, skewness, clusters and outliers.

Benchmark B. Evaluate different graphical representations of the same data to determine which is the most appropriate representation for an identified purpose.

Benchmark C. Compare the characteristics of the mean, median and mode for a given set of data, and explain which measure of center best represents the data.

Benchmark D. Find, use and interpret measures of center and spread, such as mean and quartiles, and use those measures to compare and draw conclusions about sets of data.

Benchmark E. Evaluate the validity of claims and predictions that are based on data by examining the appropriateness of the data collection and analysis.

1. Describe and compare various types of studies (survey, observation, experiment), and identify possible misuses of statistical data.

Benchmark F. Construct convincing arguments based on analysis of data and interpretation of graphs.

1. Make inferences about relationships in bivariate data, and recognize the difference between evidence of relationship (correlation) and causation.

Benchmark G. Describe sampling methods and analyze the effects of method chosen on how well the resulting sample represents the population.

1. Describe characteristics and limitations of sampling methods, and analyze the effects of random versus biased sampling; e.g., determine and justify whether the sample is likely to be representative of the population.

Benchmark H. Use counting techniques, such as permutations and combinations, to determine the total number of options and possible outcomes.

1. Use counting techniques and the Fundamental Counting principle to determine the total number of possible outcomes for mathematical situations

Benchmark I. Design an experiment to test a theoretical probability, and record and explain results.

1. Describe, create and analyze a sample space and use it to calculate probability.

Benchmark J. Compute probabilities of compound events, independent events, and simple dependent events.

1. Identify situations involving independent and dependent events, and explain differences between, and common misconceptions about, probabilities associated with those events.

Benchmark K. Make predictions based on theoretical probabilities and experimental results.

1. Use theoretical and experimental probability, including simulations or random numbers, to estimate probabilities and to solve problems dealing with uncertainty; e.g., compound events, independent events, and simple dependent events.

# *Technology Standards*

## **Standard 1: Nature of Technology**

**Students develop an understanding of technology, its characteristics, scope, core concepts\* and relationships between technologies and other fields.**

Benchmark A: Synthesize information, evaluate and make decisions about technologies.

Benchmark B: Apply technological knowledge in decision-making.

Benchmark C: Examine the synergy between and among technologies and other fields of study when solving technological problems.

## **Standard 2: Technology and Society Interaction**

**Students recognize interactions among society, the environment and technology, and understand technology's relationship with history. Consideration of these concepts forms a foundation for engaging in responsible and ethical use of technology.**

Benchmark A: Interpret and practice responsible citizenship relative to technology.

Benchmark B: Demonstrate the relationship among people, technology and the environment.

Benchmark C: Interpret and evaluate the influence of technology throughout history, and predict its impact on the future.

Benchmark D: Analyze ethical and legal technology issues and formulate solutions and strategies that foster responsible technology usage.

Benchmark E: Forecast the impact of technological products and systems.

## **Standard 3: Technology for Productivity Applications**

**Students learn the operations of technology through the usage of technology and productivity tools.**

Benchmark A: Integrate conceptual knowledge of technology systems in determining practical applications for learning and technical problem-solving.

Benchmark B: Identify, select and apply appropriate technology tools and resources to produce creative works and to construct technology-enhanced models.

#### **Standard 4: Technology and Communication Applications**

**Students use an array of technologies and apply design concepts to communicate with multiple audiences, acquire and disseminate information and enhance learning.**

Benchmark A: Apply appropriate communication design principles in published and presented projects.

Benchmark B: Create, publish and present information, utilizing formats appropriate to the content and audience.

Benchmark C: Identify communication needs, select appropriate communication tools and design collaborative interactive projects and activities to communicate with others, incorporating emerging technologies.

#### **Standard 5: Technology and Information Literacy**

**Students engage in information literacy strategies, use the Internet, technology tools and resources, and apply information-management skills to answer questions and expand knowledge.**

Benchmark A: Determine and apply an evaluative process to all information sources chosen for a project.

Benchmark B: Apply a research process model to conduct research and meet information needs.

Benchmark C: Formulate advanced search strategies, demonstrating an understanding of the strengths and limitations of the Internet, and evaluate the quality and appropriate use of Internet resources.

Benchmark D: Evaluate choices of electronic resources and determine their strengths and limitations.

#### **Standard 6: Design**

**Students apply a number of problem-solving strategies demonstrating the nature of design, the role of engineering and the role of assessment.**

Benchmark A: Identify and produce a product or system using a design process, evaluate the final solution and communicate the findings.

Benchmark B: Recognize the role of teamwork in engineering design and of prototyping in the design process.

Benchmark C: Understand and apply research, development and experimentation to problem-solving.

## **Standard 7: Designed World**

**Students understand how the physical, informational and bio-related technological systems of the designed world are brought about by the design process. Critical to this will be students' understanding of their role in the designed world: its processes, products, standards, services, history, future, issues and career connections.**

Benchmark A: Classify, demonstrate, examine, and appraise energy and power technologies.

Benchmark B: Classify, demonstrate, examine and appraise transportation technologies.

Benchmark C: Classify, demonstrate, examine and appraise manufacturing technologies.

Benchmark D: Classify, demonstrate, examine and appraise construction technologies.

Benchmark E: Classify, demonstrate, examine and appraise information and communication technologies

Benchmark F: Classify, demonstrate, examine and appraise medical technologies.

Benchmark G: Classify, demonstrate, examine and appraise agricultural and related biotechnologies.

# *Performance Measures/Student Assessment/Instructional Strategies*

## **Assessments/Evaluations**

- Observations
- Demonstrations
- Portfolios
- Standardized Tests
- Class Assignment
- Quizzes/Tests/Exams

## **Instructional Strategies**

- Teacher-Directed & Student-Centered Activities
- Case Study Problem Solving
- Cooperative Learning
- Project-Based Learning
- Career-Based Learning (Internships/Shadowing/Placement)
- Community-Based Learning (CTSOs and Other)
- Exploratory Learning
- Independent Research
- Team Teaching

## **Content Specific Strategies**