Algebra II

Course Outcome Summary
Riverdale High School

Information
Course Title: Algebra II
Credits: 1
Contact Hours: 178
Instructional Area: Mathematics
Instructional Level: Adult High School
Organization: Riverdale High School
Department: Mathematics
Developer(s): Mary Ann Carmody
Development Date: 07/26/2009

Types of Instruction

<table>
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<th>Contact Hours</th>
<th>Outside Hours</th>
<th>Credits</th>
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Target Population
Four-year college or vocational/technical school bound students.

Description
Algebra II continues the study of algebraic concepts and skills developed in Algebra I. The content of the course is organized around families of functions, including linear, quadratic, exponential, logarithmic, radical and rational functions. As each family is studied, multiple ways of representation will be investigated as well as how the different families can be used to model real-world situations. Additional topics include probability and data analysis, conic sections, and sequences and series.

Prerequisites
1. Successful completion of Geometry.
2. Recommendation of instructor.

Textbooks

Supplies


General Education Outcomes
A. Use and interpret common mathematical symbols and concepts
B. Make logical decisions using critical thinking and problem solving skills.
C. Communicate clearly.
D. Apply problem solving steps
E. Perform computations using appropriate methods
F. Demonstrate knowledge and application of formulas
G. Demonstrate knowledge and application of measurement

Core Abilities
A. Use technology appropriately.
B. Apply effective problem solving strategies.
C. Communicate clearly and effectively.
D. Show respect for diversity.
E. Acquire the capacity and motivation for life-long learning.
F. Achieve desired results by interpreting and executing instructions, plans, models, and diagrams.
G. Develop numerical and logical reasoning skills.
H. Use problem solving skills and the application of mathematical concepts in solving real world situations.
I. Demonstrate a sense of personal, social, professional, and work ethics.

Competencies, Solve equations and inequalities involving one variable.

Linked Exit Learning Outcomes, and Performance Standards

WI.MA.A.12.1 Use reason and logic
WI.MA.A.12.3 Analyze non-routine problems and arrive at solutions by various means
WI.MA.A.12.4 Develop effective oral and written presentations employing correct mathematical terminology, notation, symbols, and conventions for mathematical arguments and display of data
WI.MA.A.12.5 Organize work and present mathematical procedures and results clearly, systematically, succinctly, and correctly
WI.MA.B.12.2 Compare real numbers
WI.MA.B.12.3 Perform and explain operations on real numbers
WI.MA.B.12.4 Select and use appropriate procedures in problem solving situations involving the application of different number systems (natural, integers, rational, and real)
WI.MA.D.12.1 Identify, describe, and use derived attributes (e.g., density, speed, acceleration, pressure) to represent and solve problem
situations
WI.MA.F.12.3 Solve linear and quadratic equations, linear inequalities, and systems of linear equations and inequalities

**Performance Standards**

*Students will demonstrate their competence:*

- On daily work, quizzes, chapter tests, notebook (notetaking guide/journal entries), performance based tasks/projects, and computer lab activities.
- Without the use of the textbook while taking quizzes and chapter tests.
- Without the use of the notebook while taking chapter tests.
- With a textbook provided for daily work.
- With the use of a graphic calculator.
- In classroom or computer lab under the guidance of the teacher.
- Through active participation in cooperative learning activities, computer based explorations, individual work and direct instruction.
- By the end of Chapter One.

*Students' performance will be successful when:*

- Learner computes the solutions to an equation or inequality in one unknown.
- Learner solves compound equations (absolute value) and inequalities in one unknown.
- Learner rearranges formulas.
- Learner graphs the solution to inequalities, compound sentences, and absolute value problems in one unknown on a number line.
- Learner solves application problems using linear equations/inequalities and absolute value equations/inequalities.

**Learning objectives**

*What you will learn as you master the competency:*

a. Identify properties and use operations with real numbers.
b. Graph and order real numbers.
c. Evaluate and simplify algebraic expressions by using order of operations and combining like terms.
d. Solve linear equations through the use of algebraic properties.
e. Apply linear equations to answer questions about real-life situations.
f. Incorporate a problem solving plan when solving a real-life problem.
g. Rewrite an equation/common formulas with more than one variable in terms on one of the variables.
h. Solve simple and compound inequalities and graph the solutions.
i. Solve absolute value equations and inequalities.
j. Employ absolute value equations and inequalities in real-life situations.

2. **Evaluate and graph linear relations and functions.**

*Properties*

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<td>Difficulty:</td>
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Importance: Essential

Linked External Standards

WI.MA.A.12.1 Use reason and logic
WI.MA.A.12.3 Analyze non-routine problems and arrive at solutions by various means
WI.MA.A.12.4 Develop effective oral and written presentations employing correct mathematical terminology, notation, symbols, and conventions for mathematical arguments and display of data
WI.MA.A.12.5 Organize work and present mathematical procedures and results clearly, systematically, succinctly, and correctly
WI.MA.B.12.3 Perform and explain operations on real numbers
WI.MA.C.12.4 Use the two-dimensional rectangular coordinate system and algebraic procedures to describe and characterize geometric properties and relationships such as slope, intercepts, parallelism, and perpendicularity
WI.MA.F.12.2 Use mathematical functions (e.g., linear, exponential, quadratic, power) in a variety of ways
WI.MA.F.12.3 Solve linear and quadratic equations, linear inequalities, and systems of linear equations and inequalities

Performance Standards

Students will demonstrate their competence:

- With a textbook provided for daily work.
- With the use of a graphic calculator.
- In classroom or computer lab under the guidance of the teacher.
- Through active participation in cooperative learning activities, computer based explorations, individual work and direct instruction.
- By the end of Chapter Two.

Students' performance will be successful when:

- Learner writes linear functions, relations and inequalities in slope-intercept form.
- Learner writes linear equations given two-points or point and slope.
- Learner converts linear equations in two-point form or point-slope form into both slope-intercept and standard forms.
- Learner graphs and writes general and transformed absolute value functions.
- Learner writes the equations of parallel and perpendicular lines.

Learning Objectives

What you will learn as you master the competency:

a. Identify and represent linear relations and functions.
b. Graph linear functions.
c. Evaluate functions for a given domain.
d. Calculate the slope of a line and rates of change.
e. Identify parallel and perpendicular lines based on their slopes or equations.
f. Apply slope in solving real-life problems.
g. Graph linear relations and functions by making a table of values or by using the slope/y-intercept graphical method.

h. Employ the slope-intercept form or the standard form of a linear equation in graphing a linear equation.

i. Write the equation of a line in two-point form, point-slope form, slope-intercept form or standard form.

j. Write and graph direct variation equations.

k. Use a scatter-plot to identify the correlation shown by a set of data.

l. Approximate manually and with calculator the line of best fit for data.

m. Graph and write transformed absolute value functions.

n. Graph linear inequalities in two variables and use to solve real-life problems.

3. Solve systems of linear equations and inequalities

Properties

Domain: Cognitive
Level: Synthesis
Difficulty: High
Importance: Essential

Linked External Standards

WI.MA.A.12.1 Use reason and logic
WI.MA.A.12.3 Analyze non-routine problems and arrive at solutions by various means
WI.MA.A.12.4 Develop effective oral and written presentations employing correct mathematical terminology, notation, symbols, and conventions for mathematical arguments and display of data
WI.MA.A.12.5 Organize work and present mathematical procedures and results clearly, systematically, succinctly, and correctly
WI.MA.B.12.3 Perform and explain operations on real numbers
WI.MA.B.12.6 Routinely assess the acceptable limits of error
WI.MA.F.12.2 Use mathematical functions (e.g., linear, exponential, quadratic, power) in a variety of ways
WI.MA.F.12.3 Solve linear and quadratic equations, linear inequalities, and systems of linear equations and inequalities
WI.MA.F.12.4 Model and solve a variety of mathematical and real-world problems by using algebraic expressions, equations, and inequalities

Performance Standards

Students will demonstrate their competence:

- With a textbook provided for daily work.
- With the use of a graphic calculator.
- In classroom or computer lab under the guidance of the teacher.
- Through active participation in cooperative learning activities, computer based explorations, individual work and direct instruction.
- By the end of Chapter Three.

Students' performance will be successful when:

- learner solves systems of linear equations in two and three variables
both manually and with technology.

- Learner graphically solves a system of linear inequalities in two variables.
- Learner identifies different types of systems.
- Learner solves application problems using systems of linear equations in two or three variables.
- Learner computes with matrices.

**Learning Objectives**

*What you will learn as you master the competency:*

1. Graph and solve systems of linear equations in two variables.
2. Apply linear systems to solve real-life problems.
3. Identify the three types of linear systems.
4. Solve linear systems in two variables by using linear combination and substitution.
5. Graph a system of linear inequalities of at most two variables to find the solutions of the systems.
6. Solve linear equations in three variables using elimination method or substitution.
7. Perform manually and on the calculator the basic operations (addition, subtraction, multiplication, and scalar multiplication) with matrices.
8. Evaluate manually and on the calculator the determinants of 2 X 2 and 3 X 3 matrices.
10. Determine both manually and on the calculator the identity and inverse matrices.
11. Use inverse matrices to solve 2 X 2 and 3 X 3 systems of linear equations.

**Solve quadratic functions.**

*Properties*

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<td>Level</td>
<td>Application</td>
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<td>Importance</td>
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*Linked External Standards*

- WI.MA.A.12.1 Use reason and logic
- WI.MA.A.12.3 Analyze non-routine problems and arrive at solutions by various means
- WI.MA.A.12.4 Develop effective oral and written presentations employing correct mathematical terminology, notation, symbols, and conventions for mathematical arguments and display of data
- WI.MA.A.12.5 Organize work and present mathematical procedures and results clearly, systematically, succinctly, and correctly
- WI.MA.B.12.3 Perform and explain operations on real numbers
- WI.MA.B.12.4 Select and use appropriate procedures in problem solving.
solving situations involving the application of different number systems (natural, integers, rational, and real)
WI.MA.F.12.2 Use mathematical functions (e.g., linear, exponential, quadratic, power) in a variety of ways
WI.MA.F.12.3 Solve linear and quadratic equations, linear inequalities, and systems of linear equations and inequalities

Performance Standards
Students will demonstrate their competence:
- With a textbook provided for daily work.
- With the use of a graphic calculator.
- In classroom or computer lab under the guidance of the teacher.
- Through active participation in cooperative learning activities, computer based explorations, individual work and direct instruction.
- By the end of Chapter Four.

Students’ performance will be successful when:
- Learner accurately graphs quadratic functions.
- Learner correctly solves quadratic equations using the most appropriate method.
- Learner computes correctly with complex numbers.
- Learner correctly determines the complex zeros of a quadratic function.
- Learner correctly solves quadratic inequalities in one or two variables.
- Learner correctly writes the quadratic functions associated with a given graph or set of points.

Learning objectives
What you will learn as you master the competency:

a. Graph quadratic functions in standard form.
b. Determine the maximum or minimum value of a quadratic function.
c. Graph quadratic functions in vertex or intercept form.
d. Solve quadratic equations by factoring.
e. Identify the zeros of quadratic functions.
f. Solve quadratic equations by finding square roots.
g. Perform operations with complex numbers.
h. Solve quadratic equations by completing the square.
i. Solve quadratic equations using the quadratic formula.
j. Determine the number and type of solutions of a quadratic equation based on its discriminant.
k. Graph and solve quadratic inequalities in one or two variables.
l. Write quadratic functions in vertex, intercept, or standard forms given characteristics of their graphs.

5. Combine polynomial expressions and solve polynomial equations.

Properties
Domain: Cognitive
Level: Synthesis
Difficulty: Medium
Importance: Essential
**Linked External Standards**

WI.MA.A.12.1 Use reason and logic
WI.MA.A.12.4 Develop effective oral and written presentations employing correct mathematical terminology, notation, symbols, and conventions for mathematical arguments and display of data
WI.MA.A.12.5 Organize work and present mathematical procedures and results clearly, systematically, succinctly, and correctly
WI.MA.F.12.2 Use mathematical functions (e.g., linear, exponential, quadratic, power) in a variety of ways
WI.MA.F.12.3 Solve linear and quadratic equations, linear inequalities, and systems of linear equations and inequalities
WI.MA.F.12.4 Model and solve a variety of mathematical and real-world problems by using algebraic expressions, equations, and inequalities

**Performance Standards**

*Students will demonstrate their competence:*

- With a textbook provided for daily work.
- With the use of a graphic calculator.
- In classroom or computer lab under the guidance of the teacher.
- Through active participation in cooperative learning activities, computer based explorations, individual work and direct instruction.
- By the end of Chapter Five.

*Students' performance will be successful when:*

- Learner correctly adds, subtracts, multiplies, divides and factors polynomials.
- Learner correctly find the complex zeros of a polynomial by factoring or from its graph.
- Learner accurately uses synthetic division to evaluate or divide polynomials.

**Learning objectives**

*What you will learn as you master the competency:*

- Apply the Laws of Exponents in simplifying and evaluating expressions involving powers.
- Employ exponents and scientific notation in solving problems.
- Evaluate polynomials by direct and synthetic substitution.
- Graph polynomials based on the degree, end-behavior and a table of values.
- Add, subtract and multiply polynomials.
- Divide polynomials using long synthetic division methods.
- Factor polynomials of degree greater than two.
- Determine the real zeros of a polynomial function.
- Apply the Fundamental Theorem of Algebra and Descartes' Rule of Signs to a polynomial function in determining the number of zeros and their nature.
- Approximate the real zeros of a polynomial function.
k. Analyze the graph of a polynomial function for intercepts, maximum or minimum points, real zeros, and least degree.

l. Employ finite differences in finding the degree of a polynomial that will fit a set of data.

m. Use polynomial operations, equations, and graphs in real-life situations.

6. **Relate rational exponents, roots, and radicals.**

   **Properties**
   
   **Domain:** Cognitive  
   **Level:** Application  
   **Difficulty:** High  
   **Importance:** Essential

   **Linked External Standards**
   
   WI.M.A.12.1 Use reason and logic  
   WI.M.A.12.4 Develop effective oral and written presentations employing correct mathematical terminology, notation, symbols, and conventions for mathematical arguments and display of data  
   WI.M.A.12.5 Organize work and present mathematical procedures and results clearly, systematically, succinctly, and correctly  
   WI.M.A.B.12.3 Perform and explain operations on real numbers  
   WI.M.A.B.12.4 Select and use appropriate procedures in problem solving situations involving the application of different number systems (natural, integers, rational, and real)  
   WI.M.A.B.12.6 Routinely assess the acceptable limits of error  
   WI.M.A.F.12.2 Use mathematical functions (e.g., linear, exponential, quadratic, power) in a variety of ways  
   WI.M.A.F.12.4 Model and solve a variety of mathematical and real-world problems by using algebraic expressions, equations, and inequalities

   **Performance Standards**

   **Students will demonstrate their competence:**
   
   o With a textbook provided for daily work.  
   o With the use of a graphic calculator.  
   o In classroom or computer lab under the guidance of the teacher.  
   o Through active participation in cooperative learning activities, computer based explorations, individual work and direct instruction.  
   o By the end of Chapter Six.

   **Students' performance will be successful when:**
   
   o Learner correctly simplifies, adds, subtracts, multiplies and divides radical expressions.  
   o Learner correctly computes with rational exponents.  
   o Learner accurately graph square root and cube root functions.  
   o Learner correctly solve radical equations.  
   o Learner correctly identifies relations and inverse relations that are functions.  
   o Learner accurately determines the inverse rule of a function.  
   o Learner correctly determines the composite of functions.
**Learning objectives**

*What you will learn as you master the competency:*

a. Evaluate nth roots of real numbers using radical and rational exponents.

b. Apply the properties of rational exponents in evaluating and simplifying expressions.

c. Perform the basic function operations plus composition.

d. Determine the inverses of linear and nonlinear relations.

e. Employ the horizontal line test in determining whether the inverse of a function is also a function.

f. Graph general and translated square and cube root functions.

g. Solve equations that contain radicals or rational exponents.

7. Solve exponential and logarithmic functions.

**Properties**

| Domain: Cognitive | Level: Application | Difficulty: High | Importance: Essential |

**Linked External Standards**

- WI.MA.A.12.1 Use reason and logic
- WI.MA.A.12.3 Analyze non-routine problems and arrive at solutions by various means
- WI.MA.A.12.4 Develop effective oral and written presentations employing correct mathematical terminology, notation, symbols, and conventions for mathematical arguments and display of data
- WI.MA.A.12.5 Organize work and present mathematical procedures and results clearly, systematically, succinctly, and correctly
- WI.MA.B.12.2 Compare real numbers
- WI.MA.B.12.6 Routinely assess the acceptable limits of error
- WI.MA.F.12.2 Use mathematical functions (e.g., linear, exponential, quadratic, power) in a variety of ways
- WI.MA.F.12.4 Model and solve a variety of mathematical and real-world problems by using algebraic expressions, equations, and inequalities

**Performance Standards**

*Students will demonstrate their competence:*

- With a textbook provided for daily work.
- With the use of a graphic calculator.
- In classroom or computer lab under the guidance of the teacher.
- Through active participation in cooperative learning activities, computer based explorations, individual work and direct instruction.
- By the end of Chapter Seven.

*Students' performance will be successful when:*

- learner correctly simplifies expressions and solves equations involving rational exponents.
- learner correctly write expressions in exponential and logarithmic forms.
learner accurately uses logarithms to solve exponential equations using basic logarithmic properties.

**Learning objectives**
*What you will learn as you master the competency:*

a. Graph and apply exponential growth functions.
b. Graph and apply exponential decay functions.
c. Use exponential growth/decay functions to model real-life situations such as compound interest and depreciation.
d. Investigate exponential functions with a base number of e.
e. Apply the definition of logarithms and the inverse properties in evaluating logarithmic functions.
f. Evaluate common and natural logarithms on the calculator.
g. Graph the general logarithm function and translations of it.
h. Apply the properties of logarithms in expanding, condensing or evaluating a logarithm.
i. Evaluate logarithms in terms of base 10 or base e by using the change-of-base formula.
j. Solve exponential and logarithmic equations.
k. Model data using exponential and power functions.

8. **Manipulate rational expressions and solve rational equations.**

*Properties*

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**Linked External Standards**

- WI.MA.A.12.1 Use reason and logic
- WI.MA.A.12.3 Analyze non-routine problems and arrive at solutions by various means
- WI.MA.A.12.4 Develop effective oral and written presentations employing correct mathematical terminology, notation, symbols, and conventions for mathematical arguments and display of data
- WI.MA.A.12.5 Organize work and present mathematical procedures and results clearly, systematically, succinctly, and correctly
- WI.MA.F.12.1 Analyze and generalize patterns of change (e.g., direct and inverse variation) and numerical sequences, and then represent them with algebraic expressions and equations
- WI.MA.F.12.2 Use mathematical functions (e.g., linear, exponential, quadratic, power) in a variety of ways
- WI.MA.F.12.4 Model and solve a variety of mathematical and real-world problems by using algebraic expressions, equations, and inequalities

**Performance Standards**
*Students will demonstrate their competence:*

- With a textbook provided for daily work.
- With the use of a graphic calculator.
In classroom or computer lab under the guidance of the teacher.
Through active participation in cooperative learning activities, computer based explorations, individual work and direct instruction.
By the end of Chapter Eight.

Students' performance will be successful when:
- learner correctly adds, subtracts, multiples and divides rational expressions.
- learner correctly writes and solves rational equations from application problems.
- learner correctly graphs rational functions with a graphing calculator.
- learner uses the graph of rational functions to solve real life problems.
- learner accurately solves inverse and joint variation problems.

Learning objectives
What you will learn as you master the competency:
- Write and apply inverse and joint variation models.
- Graph simple rational functions and their translations.
- Graph general rational functions with higher-degree polynomials
- Multiply and divide rational expressions.
- Add and subtract rational expressions.
- Simplify complex fractions.
- Solve rational equations.
- Use the graphs of rational functions, rational expressions, or rational equations to model real-life situations.

9. Write and graph the equations of quadratic relations and conic sections.

Properties
Domain: Cognitive
Level: Knowledge
Difficulty: High
Importance: Essential

Linked External Standards
WI.MA.A.12.1 Use reason and logic
WI.MA.A.12.3 Analyze non-routine problems and arrive at solutions by various means
WI.MA.A.12.4 Develop effective oral and written presentations employing correct mathematical terminology, notation, symbols, and conventions for mathematical arguments and display of data
WI.MA.A.12.5 Organize work and present mathematical procedures and results clearly, systematically, succinctly, and correctly
WI.MA.C.12.4 Use the two-dimensional rectangular coordinate system and algebraic procedures to describe and characterize geometric properties and relationships such as slope, intercepts, parallelism, and perpendicularity
WI.MA.D.12.3 Determine measurements indirectly
WI.MA.F.12.2 Use mathematical functions (e.g., linear, exponential, quadratic, power) in a variety of ways
WI.MA.F.12.3 Solve linear and quadratic equations, linear inequalities,
and systems of linear equations and inequalities

**Performance Standards**

*Students will demonstrate their competence:*

- With a textbook provided for daily work.
- With the use of a graphic calculator.
- In classroom or computer lab under the guidance of the teacher.
- Through active participation in cooperative learning activities, computer based explorations, individual work and direct instruction.
- By the end of Chapter Nine.

*Students' performance will be successful when:*

- Learner accurately graphs all conics (parabolas, circles, ellipses, and hyperbolas).
- Learner correctly writes the equations of all conics in standard form.
- Learner correctly identifies various conics.
- Learner correctly solves application problems using systems of conics.

**Learning Objectives**

*What you will learn as you master the competency:*

- Apply the distance and midpoint formulas.
- Graph and write in standard form the equations of parabolas that open left or right.
- Graph and write in standard form the equations of circles.
- Graph and write in standard form the equations of ellipses.
- Graph and write in standard form the equations of hyperbolas.
- Classify a conic section based on its equation.
- Graph and write in standard form the equations of translated conics.
- Solve a linear-quadratic system by both graphing and substitution.
- Solve a quadratic equation by elimination.
- Use the distance and midpoint formulas, the conic sections and quadratic systems to solve real-life problems.

**Solve problems using probability.**

**Properties**

Domain: Cognitive
Level: Synthesis
Difficulty: High
Importance: Essential

**Linked External Standards**

- WI.MA.A.12.1 Use reason and logic
- WI.MA.A.12.3 Analyze non-routine problems and arrive at solutions by various means
- WI.MA.A.12.4 Develop effective oral and written presentations employing correct mathematical terminology, notation, symbols, and conventions for mathematical arguments and display of data
- WI.MA.A.12.5 Organize work and present mathematical procedures and results clearly, systematically, succinctly, and correctly
- WI.MA.B.12.1 Use complex counting procedures such as union and
intersection of sets and arrangements (permutations and combinations) to solve problems

WI.MA.B.12.6 Routinely assess the acceptable limits of error
WI.MA.D.12.3 Determine measurements indirectly
WI.MA.E.12.5 Determine the likelihood of occurrence of complex events
WI.MA.F.12.1 Analyze and generalize patterns of change (e.g., direct and inverse variation) and numerical sequences, and then represent them with algebraic expressions and equations
WI.MA.F.12.4 Model and solve a variety of mathematical and real-world problems by using algebraic expressions, equations, and inequalities

Performance Standards
Students will demonstrate their competence:

- With a textbook provided for daily work.
- With the use of a graphic calculator.
- In classroom or computer lab under the guidance of the teacher.
- Through active participation in cooperative learning activities, computer based explorations, individual work and direct instruction.
- By the end of Chapter Ten.

Students' performance will be successful when:

- Learner correctly counts outcomes using the Basic Counting Principle.
- Learner correctly identifies either a permutation or combination.
- Learner correctly applies manually and on the calculator the formulas for combinations and permutations.
- Learner correctly calculates the probabilities of simple or compound events.
- Learner accurately compares the theoretical probability an event will occur with the experimental (actual) results.
- Learner accurately recreates Pascal's Triangle.
- Learner correctly uses the Binomial Theorem in expanding the power of a binomial.
- Learner correctly creates manually and interprets a binomial probability distribution.

Learning objectives
What you will learn as you master the competency:

a. Apply the fundamental counting principle and permutations to count the number of ways an event can happen.

b. Employ the permutations formula and the combinations formula.

c. Differentiate between permutations and combinations.

d. Use combinations to count the number of ways an event can happen.

e. Relate the coefficients of Pascal's triangle to combinations.

f. Use the binomial theorem to expand a binomial that is raised to a power.
g. Differentiate among theoretical, experimental, and geometric probabilities.
h. Determine theoretical, experimental, and geometric probabilities.
i. Find the probabilities of compound events.
j. Use complements to find the probability of an event.
k. Identify events as being independent or dependent.
l. Determine the probability of independent and dependent events.
m. Construct and interpret binomial distributions.
n. Classify distributions as symmetric or skewed.

11. Examine and describe sets of data.

Properties
Domain: Cognitive
Level: Analysis
Difficulty: Medium
Importance: Important

Linked External Standards
WI.MA.A.12.1 Use reason and logic
WI.MA.A.12.3 Analyze non-routine problems and arrive at solutions by various means
WI.MA.A.12.4 Develop effective oral and written presentations employing correct mathematical terminology, notation, symbols, and conventions for mathematical arguments and display of data
WI.MA.A.12.5 Organize work and present mathematical procedures and results clearly, systematically, succinctly, and correctly
WI.MA.E.12.1 Work with data in the context of real-world situations
WI.MA.E.12.2 Organize and display data from statistical investigations
WI.MA.E.12.3 Interpret and analyze information from organized and displayed data when given measures of dispersion, including standard deviation and variance; measures of reliability; and measures of correlation

Performance Standards
Students will demonstrate their competence:
  o With a textbook provided for daily work.
  o With the use of a graphic calculator.
  o In classroom or computer lab under the guidance of the teacher.
  o Through active participation in cooperative learning activities, computer based explorations, individual work and direct instruction.
  o By the end of Chapter Eleven.

Students' performance will be successful when:
  o learner correctly employs the formula or process for finding the mean, median, range and standard deviation for data sets with ten or less members.
  o learner correctly uses technology in finding the mean, median and standard deviation.
  o learner memorizes the percent of data in a normal distribution one, two or three standard deviations above and below the mean.
learner correctly determines the probability of a value in a normal distribution being within so may standard deviations of the mean.

- learner correctly determines the probability of a value in a standard normal distribution falling in a particular interval by using a z-score and a standard normal table.

- learner correctly identifies the sampling method (self-sufficient, systematic, convenience, and random) used for collecting a sample and evaluates each method for bias.

- learner correctly scrutinizes the scatter plot of a set of data and selects the appropriate calculator regression model (linear, exponential, or quadratic).

Learning objectives
What you will learn as you master the competency:

a. Describe data using statistical measures.

b. Calculate measures of central tendency and dispersion.

c. Investigate how transformations of data affect statistical measures.

d. State the properties of a normal distribution.

e. Calculate the probability of a value from a normal distribution and a standard normal distribution.

f. Evaluate different sampling methods for collecting data and identify which are biased and which are unbiased.

g. Determine the margin of error for a random sample,

h. Select the best model to represent a set of data.

Investigate arithmetic and geometric sequences and series.

Properties
Domain: Cognitive
Level: Analysis
Difficulty: High
Importance: Essential

Linked External Standards
WI.MA.A.12.1 Use reason and logic
WI.MA.A.12.3 Analyze non-routine problems and arrive at solutions by various means
WI.MA.A.12.4 Develop effective oral and written presentations employing correct mathematical terminology, notation, symbols, and conventions for mathematical arguments and display of data
WI.MA.A.12.5 Organize work and present mathematical procedures and results clearly, systematically, succinctly, and correctly
WI.MAD.D.12.3 Determine measurements indirectly
WI.MA.F.12.1 Analyze and generalize patterns of change (e.g., direct and inverse variation) and numerical sequences, and then represent them with algebraic expressions and equations

Performance Standards
Students will demonstrate their competence:

- With a textbook provided for daily work.
- With the use of a graphic calculator.
o In classroom or computer lab under the guidance of the teacher.

o Through active participation in cooperative learning activities, computer based explorations, individual work and direct instruction.

o By the end of Chapter Twelve.

**Students' performance will be successful when:**

o learner correctly finds the next term, nth-term, position and common difference in arithmetic sequences.

o learner correctly finds the next term, nth-term, position and common ratio in arithmetic sequences.

o learner correctly finds terms of a sequence using the explicit or recursive formula.

o learner correctly finds sums and missing terms of arithmetic and geometric series using the appropriate formula.

o learner accurately converts series to expanded and sigma notation.

**Learning objectives**

What you will learn as you master the competency:

a. Recognize and write rules for number patterns.

b. Interpret sequence rules.

c. Define and use sequences and series.

d. Incorporate summation notation in writing series and finding the sums of series.

e. Write rules for arithmetic sequences and find sums of arithmetic series.

f. Write rules for geometric sequences and find sums of geometric series.

g. Determine the sums of infinite geometric series.

h. Evaluate and write recursive rules for sequences.

i. Employ arithmetic sequence and series, geometric sequence and series, infinite geometric series, and recursion in solving real-life problems.

13. **Solve triangles using trigonometric ratios and functions.**

**Properties**

*Domain:* Cognitive

*Level:* Synthesis

*Difficulty:* High

*Importance:* Essential

**Linked External Standards**

WI.MA.A.12.1 Use reason and logic

WI.MA.A.12.3 Analyze non-routine problems and arrive at solutions by various means

WI.MA.A.12.4 Develop effective oral and written presentations employing correct mathematical terminology, notation, symbols, and conventions for mathematical arguments and display of data

WI.MA.A.12.5 Organize work and present mathematical procedures and results clearly, systematically, succinctly, and correctly

WI.MA.B.12.6 Routinely assess the acceptable limits of error

WI.MA.C.12.5 Identify and demonstrate an understanding of the three ratios used in right-triangle trigonometry (sine, cosine, tangent)

WI.MA.D.12.3 Determine measurements indirectly
WI.MA.F.12.4 Model and solve a variety of mathematical and real-world problems by using algebraic expressions, equations, and inequalities

**Performance Standards**

*Students will demonstrate their competence:*

- With a textbook provided for daily work.
- With the use of a graphic calculator.
- In classroom or computer lab under the guidance of the teacher.
- Through active participation in cooperative learning activities, computer based explorations, individual work and direct instruction.
- By the end of Chapter Thirteen.

*Students' performance will be successful when:*

- Learner memorizes the six right triangle trigonometric ratios and correctly applies in solving right triangles.
- Learner correctly applies the Law of Sines and/or the Law of Cosines to evaluate side lengths, angle measures, and areas.
- Learner accurately uses the properties of trigonometric functions to evaluate any angle measure or inverse trigonometric functions to determine an angle.
- Learner correctly determines angle measures or arc length in both degree and radian measure.

**Learning objectives**

*What you will learn as you master the competency:*

- Define the six trigonometric ratios.
- Determine the missing lengths of right triangles by using trigonometric functions.
- Measure angles in standard position using degree and radian measure.
- Determine arc length and area of a sector.
- Evaluate trigonometric functions of any angle or for any point on the terminal side.
- Evaluate inverse trigonometric functions.
- Employ the Law of Sines in finding the sides and angles of a triangle.
- Apply the Law of Cosines in finding the sides and angles of a triangle.
- Calculate the area of any triangle using trigonometric based area formulas.
- Applies trigonometric functions, inverse trigonometric functions, the Law of Sines, the Law of Cosines and trigonometric based area formulas in solving real-life problems.

**Explore trigonometric graphs, identities and equations.**

**Properties**

- **Domain:** Cognitive
- **Level:** Analysis
- **Difficulty:** High
- **Importance:** Important

**Linked External Standards**

- WI.MA.A.12.1 Use reason and logic
WI.MA.A.12.2 Communicate logical arguments and clearly show why a result does or does not make sense, why the reasoning is or is not valid, and an understanding of the difference between examples that support a conjecture and a proof of the conjecture
WI.MA.A.12.4 Develop effective oral and written presentations employing correct mathematical terminology, notation, symbols, and conventions for mathematical arguments and display of data
WI.MA.A.12.5 Organize work and present mathematical procedures and results clearly, systematically, succinctly, and correctly
WI.MA.C.12.1 Identify, describe, and analyze properties of figures, relationships among figures and relationships among their parts
WI.MA.C.12.2 Use geometric models to solve mathematical and real-world problems
WI.MA.C.12.3 Present convincing arguments by means of demonstration, informal proof, counter-examples, or any other logical means
WI.MA.F.12.2 Use mathematical functions (e.g., linear, exponential, quadratic, power) in a variety of ways
WI.MA.F.12.4 Model and solve a variety of mathematical and real-world problems by using algebraic expressions, equations, and inequalities

**Performance Standards**
*Students will demonstrate their competence:*

- With a textbook provided for daily work.
- With the use of a graphic calculator.
- In classroom or computer lab under the guidance of the teacher.
- Through active participation in cooperative learning activities, computer based explorations, individual work and direct instruction.
- By the end of Chapter Fourteen.

*Students' performance will be successful when:*

- Learner correctly incorporate amplitude, period, intercepts, phase shift and the midline in graphing sine, cosine and tangent functions.
- Learner memorizes the trigonometric definitions and Pythagorean identities.
- Learner correctly applies the trigonometric definitions and Pythagorean identities in verifying other identities.
- Learner accurately finds the general solution and the solution in an interval of a trigonometric equation.
- Learner correctly writes sine or cosine functions to model a given graph or the given maximum and minimum points.
- Learner accurately finds on the calculator a sinusoidal regression that models a set of data.

**Learning objectives**
*What you will learn as you master the competency:*

- Graph sine, cosine, and tangent functions.
b. Graph translations and reflections of sine, cosine, and tangent graphs.
c. Use trigonometric identities to simplify trigonometric expressions and to verify other identities.
d. Solve trigonometric equations including real-life equations.
e. Use a sine or cosine function to model data both manually and on the calculator.
f. Apply the trigonometric sum and difference formulas for two angles.
g. Evaluate expressions using double- and half-angle formulas.
h. Solve real-life problems using trigonometric identities, sum/difference angle formulas, and double-/half angle formulas.