Title of Planned Instruction: Algebra II

Subject Area: Mathematics    Grade Level: Grades 9-12

Prerequisites: Algebra I with a grade of A, B, or C

Course Description: This course builds on the concepts and skills learned in Algebra I. Advancements in understanding how to solve equations and graph functions form the basis for this course. Modeling real life situations using algebraic techniques allows the students to see how algebra is applied in today’s ever changing world.

Required Time: 180 days

Major Text(s) and Resources: Merrill Algebra 2 with Trigonometry: Applications and Connections, Copyright 1992 by Glencoe Macmillan/McGraw-Hill

Names of District Subject Area Curriculum Writing Committee:

Daniel F. Bartos, Lewistown High School
Sonya D. Curry, Indian Valley High School
Margaret J. Fisher, Indian Valley High School
Randy J. Loht, Lewistown High School

Date of Board Approval: July 24, 2003
**Major Topics**
- Non-linear equations
- Matrices
- Graphing
- Quadratics
- Powers
- Probability
- Systems
- Applications

**Course Objectives and Performance Indicators**

**Strand**: 2.1  
**Standard**: Numbers, Number Systems and Relationships  
**Course**: Algebra II

<table>
<thead>
<tr>
<th>Course Objectives</th>
<th>Performance Indicators</th>
<th>Assessments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use algebraic operations.</td>
<td>• Use properties of real numbers to simplify expressions.</td>
<td>• Observation</td>
</tr>
<tr>
<td></td>
<td>• Use properties of powers to simplify powers.</td>
<td>• Evaluate written work</td>
</tr>
<tr>
<td></td>
<td>• Find the greatest monomial factor of an algebraic expression.</td>
<td>• Performance assessments</td>
</tr>
<tr>
<td></td>
<td>• Multiply and divide monomials.</td>
<td>• Tests, quizzes</td>
</tr>
<tr>
<td></td>
<td>• Add, subtract, and multiply polynomials.</td>
<td>• Problem solving</td>
</tr>
<tr>
<td></td>
<td>• Divide polynomials using synthetic division and long division.</td>
<td>• journal/activity</td>
</tr>
<tr>
<td></td>
<td>• Factor polynomials.</td>
<td>• Evaluate oral response</td>
</tr>
<tr>
<td></td>
<td>• Find roots of equations.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Multiply and divide radicals.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Add, subtract, multiply, and divide radical expressions.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Calculate determinants.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Find the sum and product of the roots of the quadratic.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Add, subtract, multiply, and divide complex and imaginary numbers.</td>
<td></td>
</tr>
<tr>
<td>Course Objectives</td>
<td>Performance Indicators</td>
<td>Assessments</td>
</tr>
<tr>
<td>-------------------</td>
<td>------------------------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| **2.2.11A**       | Develop and use computation concepts, operations and procedures with real numbers in problem-solving situations. | • Perform calculations that require multiple procedures and operations involving real numbers. | • Observation  
• Evaluate written work  
• Performance assessments  
• Tests, quizzes  
• Problem solving journal/activity  
• Evaluate oral response |
| **2.2.11B**       | Use estimation to solve problems for which an exact answer is not needed. | • Perform multi-step estimates involving real numbers.  
• Estimate the answer to problems that contain radicals. | • Observation  
• Evaluate written work  
• Performance assessments  
• Tests, quizzes  
• Problem solving journal/activity  
• Evaluate oral response |
| **2.2.11C**       | Construct and apply mathematical models, including lines and curves of best fit, to estimate values of related quantities. | • Identify the graphical representation that best approximates a line of best fit for a given scatter-plot.  
• Extrapolate an answer from a given scatter-plot.  
• Interpolate an answer from a given scatter-plot.  
• Find maximum or minimum values for a given situation using linear programming techniques. | • Observation  
• Evaluate written work  
• Performance assessments  
• Tests, quizzes  
• Problem solving journal/activity  
• Evaluate oral response |
<table>
<thead>
<tr>
<th>Course Objectives</th>
<th>Performance Indicators</th>
<th>Assessments</th>
</tr>
</thead>
</table>
| **2.2.11D** Describe and explain the amount of error that may exist in a computation using estimates. | - Use a prediction equation derived from a scatter plot to predict a result and then compare it to the actual data.  
- Use technology (graphing calculator) to find the correlation coefficient of the regression line and explain what the number means. | - Observation  
- Evaluate written work  
- Performance assessments  
- Tests, quizzes  
- Problem solving journal/activity  
- Evaluate oral response |
| **2.2.11E** Recognize that the degree of precision needed in calculating a number depends on how the results will be used and the instruments used to generate the measure. | - Compare and contrast the solution(s) of an equation solved by graphing (hand and graphing calculator) the related function and solved using other techniques. | - Observation  
- Evaluate written work  
- Performance assessments  
- Tests, quizzes  
- Problem solving journal/activity  
- Evaluate oral response |
| **2.2.11F** Demonstrate skills for using scientific and graphing calculators.      | - Use scientific and graphing calculators to answer questions.                                                                                                                                                    | - Observation  
- Evaluate written work  
- Performance assessments  
- Tests, quizzes  
- Problem solving journal/activity  
- Evaluate oral response |
### Strand: 2.3
**Standard:** Measurement and Estimation
**Course:** Algebra II

<table>
<thead>
<tr>
<th>Course Objectives</th>
<th>Performance Indicators</th>
<th>Assessments</th>
</tr>
</thead>
</table>
| 2.3.11A           | Select and use appropriate units to measure to the degree of accuracy required in particular situations. | • Determine reasonable estimates for multi-step problems that involve conversion of units of measure. | • Observation  
• Evaluate written work  
• Performance assessments  
• Tests, quizzes  
• Problem solving journal/activity  
• Evaluate oral response |

### Strand: 2.4
**Standard:** Mathematical Reasoning and Connections
**Course:** Algebra II

<table>
<thead>
<tr>
<th>Grade Level Objectives</th>
<th>Performance Indicators</th>
<th>Assessments</th>
</tr>
</thead>
</table>
| 2.4.11A                | Use proof by contradiction to validate conjectures. | • Make conjectures about graphical transformations and use a graphing calculator to validate or contradict (e.g., given parent graph f(x) = |x|, guess how graph would change for 3f(x), f(3x), f(x+3), and f(x)+3). | • Observation  
• Evaluate written work  
• Performance assessments  
• Tests, quizzes  
• Problem solving journal/activity  
• Evaluate oral response |
<table>
<thead>
<tr>
<th>Course Objectives</th>
<th>Performance Indicators</th>
<th>Assessments</th>
</tr>
</thead>
</table>
| 2.4.11B Construct valid arguments from stated facts. | • Solve algebraic equations using appropriate techniques. | • Observation  
• Evaluate written work  
• Performance assessments  
• Tests, quizzes  
• Problem solving journal/activity  
• Evaluate oral response |
| 2.4.11E Demonstrate mathematical solutions to problems. | • Use algebraic techniques to solve problem situations involving formulas used in science (e.g., volume, distance, business). | • Observation  
• Evaluate written work  
• Performance assessments  
• Tests, quizzes  
• Problem solving journal/activity  
• Evaluate oral response |
Strand: 2.5  
Standard: Mathematical Problem Solving and Communication  
Course: Algebra II

<table>
<thead>
<tr>
<th>Grade Level Objectives</th>
<th>Performance Indicators</th>
<th>Assessments</th>
</tr>
</thead>
</table>
| 2.5.11A | Select and use appropriate mathematical concepts and techniques from different areas of mathematics and apply them to solving non-routine and multi-step problems. | • Select, use, and display all of the mathematical procedures that are necessary to the solution of a problem situation and achieve the correct answer. | • Observation  
• Evaluate written work  
• Performance assessments  
• Tests, quizzes  
• Problem solving journal/activity  
• Evaluate oral response |
| 2.5.11B | Use symbols, mathematical terminology, standard notation, mathematical rules, graphing and other types of mathematical representations to communicate observations, predictions, concepts, procedures, generalizations, ideas and results. | • Communicate all of the mathematical procedures concepts, conclusions, etc. necessary to the solution of a problem situation using correct and appropriate mathematical representations. | • Observation  
• Evaluate written work  
• Performance assessments  
• Tests, quizzes  
• Problem solving journal/activity  
• Evaluate oral response |
### MIFFLIN COUNTY SCHOOL DISTRICT
### ALGEBRA II

#### Course Objectives | Performance Indicators | Assessments
--- | --- | ---
2.5.11C | Present all of the procedures important to the solution of a problem in ways that are understandable. | • Observation  
• Evaluate written work  
• Performance assessments  
• Tests, quizzes  
• Problem solving journal/activity  
• Evaluate oral response

| 2.5.11D | Conclude a solution process with a summary of results and evaluate the degree to which the results obtained represent an acceptable response to the initial problem and why the reasoning is valid | • Explain how a problem was solved and why the chosen procedures were used. | • Observation  
• Evaluate written work  
• Performance assessments  
• Tests, quizzes  
• Problem solving journal/activity  
• Evaluate oral response

**Strand:** 2.6  
**Standard:** Statistics and Data Analysis  
**Course:** Algebra II

#### Course Objectives | Performance Indicators | Assessments
--- | --- | ---
2.6.11C | Find lines of regression using a graphing calculator or graphing on paper by drawing a scatter plot. | • Observation  
• Evaluate written work  
• Performance assessments  
• Tests, quizzes  
• Problem solving journal/activity  
• Evaluate oral response
**MIFFLIN COUNTY SCHOOL DISTRICT**

**ALGEBRA II**

**Strand:** 2.7  
**Standard:** Probability and Predictions  
**Course:** Algebra II

<table>
<thead>
<tr>
<th>Course Objectives</th>
<th>Performance Indicators</th>
<th>Assessment Options</th>
</tr>
</thead>
</table>
| **2.7.11A**  
Compare odds and probability. | • Compare the odds of an event and the probability of an event. | • Observation  
• Evaluate written work  
• Performance assessments  
• Tests, quizzes  
• Problem solving journal/activity  
• Evaluate oral response |
| **2.7.11B**  
Apply probability and statistics to perform an experiment involving a sample and generalize its results to a given population. | • Perform an experiment involving a sample and apply probability and statistics to describe and generalize the results to a given population. | • Observation  
• Evaluate written work  
• Performance assessments  
• Tests, quizzes  
• Problem solving journal/activity  
• Evaluate oral response |
| **2.7.11C**  
Draw and justify a conclusion regarding the validity of a probability or statistical argument. | • Determine a conclusion for a probability or statistical argument.  
• Justify the validity of the conclusion for a probability or statistical argument. | • Observation  
• Evaluate written work  
• Performance assessments  
• Tests, quizzes  
• Problem solving journal/activity  
• Evaluate oral response |
### Course Objectives

#### 2.7.11D
Use experimental and theoretical probability distributions to make judgments about the likelihood of various outcomes in uncertain situations.

- Predict outcomes for given situations using theoretical probability distributions.
- Predict outcomes for given situations using information gathered from experimental probability distributions.

#### 2.7.11E
Solve problems involving independent simple and compound events.

- Draw diagrams and charts to help find probability.
- Solve problems involving simple events.
- Solve problems involving compound events.

### Performance Indicators

- **Draw diagrams and charts to help find probability.**
- **Solve problems involving simple events.**
- **Solve problems involving compound events.**

### Assessment Options

- **Observation**
- **Evaluate written work**
- **Performance assessments**
- **Tests, quizzes**
- **Problem solving journal/activity**
- **Evaluate oral response**

---

**Strand:** 2.8  
**Standard:** Algebra and Functions  
**Course:** Algebra II

---

### Grade Level Objectives

#### 2.8.11A
Analyze a given set of data for the existence of a pattern and represent the pattern algebraically and graphically.

- Given a table of values, find a relationship between two variables.
- Represent the relationship between two variables by graphing and by equation.

### Assessments

- **Observation**
- **Evaluate written work**
- **Performance assessments**
- **Tests, quizzes**
- **Problem solving journal/activity**
- **Evaluate oral response**
<table>
<thead>
<tr>
<th>Course Objectives</th>
<th>Performance Indicators</th>
<th>Assessments</th>
</tr>
</thead>
</table>
| 2.8.11B Give examples of patterns that occur in data from other disciplines. | • Find examples of patterns that occur in data from science, business, or other areas. | • Observation  
• Evaluate written work  
• Performance assessments  
• Tests, quizzes  
• Problem solving journal/activity  
• Evaluate oral response |
| 2.8.11C Use patterns to solve routine and non-routine problems. | • Find the next number in a sequence. | • Observation  
• Evaluate written work  
• Performance assessments  
• Tests, quizzes  
• Problem solving journal/activity  
• Evaluate oral response |
| 2.8.11D Formulate expressions, equations, inequalities, systems of equations, systems of inequalities and matrices to model routine and non-routine problem situations. | • Transform word expressions into algebraic expressions, equations, and inequalities.  
• Write systems of equations and inequalities given information about a situation. | • Observation  
• Evaluate written work  
• Performance assessments  
• Tests, quizzes  
• Problem solving journal/activity  
• Evaluate oral response |
| 2.8.11E Use equations to represent curves (e.g., lines, parabolas). | • Given a graph of a function or relation, write the equation. | • Observation  
• Evaluate written work  
• Performance assessments  
• Tests, quizzes  
• Problem solving journal/activity  
• Evaluate oral response |
<table>
<thead>
<tr>
<th>Course Objectives</th>
<th>Performance Indicators</th>
<th>Assessments</th>
</tr>
</thead>
</table>
| 2.8.11F Identify whether systems of equations and inequalities are consistent or inconsistent. | • Graph a system of linear equations.  
• Indicate the number of solutions to a system.  
• Classify a system as consistent and independent, consistent and dependent, or inconsistent.  
• Classify a system without graphing. | • Observation  
• Evaluate written work  
• Performance assessments  
• Tests, quizzes  
• Problem solving journal/activity  
• Evaluate oral response |
| 2.8.11G Analyze and explain systems of equations, systems of inequalities and matrices. | • Given a real world situation, write a system of equations and inequalities.  
• Solve a system of equations by graphing, elimination, substitution, or Cramer’s Rule.  
• Interpret the solution to a system. | • Observation  
• Evaluate written work  
• Performance assessments  
• Tests, quizzes  
• Problem solving journal/activity  
• Evaluate oral response |
| 2.8.11H Select and use an appropriate strategy to solve systems of equations and inequalities using graphing calculators. | • Solve a system of linear or quadratic equations (or inequalities) by graphing. Use both a graphing calculator and its utilities and graphing by hand to find the solution.  
• Solve a system of equations by applying Cramer’s Rule.  
• Solve a system of equations by using algebraic techniques. | • Observation  
• Evaluate written work  
• Performance assessments  
• Tests, quizzes  
• Problem solving journal/activity  
• Evaluate oral response |
| 2.8.11I Use matrices to organize and manipulate data, including matrix addition, subtraction, multiplication and scalar multiplication. | • Solve a system of equations in two variables using Cramer’s rule. | • Observation  
• Evaluate written work  
• Performance assessments  
• Tests, quizzes  
• Problem solving journal/activity  
• Evaluate oral response |
<table>
<thead>
<tr>
<th>Course Objectives</th>
<th>Performance Indicators</th>
<th>Assessments</th>
</tr>
</thead>
</table>
| 2.8.11J  Demonstrate the connections between algebraic equations and inequalities and the geometry of relations in the coordinate plane. | • Use equations to help draw linear, greatest integer, absolute value, and quadratic functions or relations.  
• Use intercepts to help graph functions or solve related equations. | • Observation  
• Evaluate written work  
• Performance assessments  
• Tests, quizzes  
• Problem solving journal/activity  
• Evaluate oral response |
| 2.8.11K  Select, justify and apply appropriate technique to graph a linear function in two variables, including slope-intercept, x-and y-intercepts, graphing by transformations and the use of a graphing calculator. | • Write linear equations in standard form, and then graph using intercepts.  
• Write equations in slope-intercept form, and then graph using slope and y-intercept  
• Use graphing calculators to explore linear transformations.  
• Graph linear equations by applying concepts of transformations.  
• Given a linear equation, choose a method to graph and justify the chosen method. | • Observation  
• Evaluate written work  
• Performance assessments  
• Tests, quizzes  
• Problem solving journal/activity  
• Evaluate oral response |
| 2.8.11L  Write the equation of a line when given the graph of the line, two points on the line, or the slope of the line and a point on the line. | • Given a graph, two points, one point and the slope, write the equation of the line using point-slope form and/or slope-intercept form. | • Observation  
• Evaluate written work  
• Performance assessments  
• Tests, quizzes  
• Problem solving journal/activity  
• Evaluate oral response |
<table>
<thead>
<tr>
<th>Course Objectives</th>
<th>Performance Indicators</th>
<th>Assessments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2.8.11M</strong></td>
<td>Given a set of data points, write an equation for a line of best fit.</td>
<td>• Draw a scatter plot and a line of best fit. • Write a prediction equation.</td>
</tr>
<tr>
<td><strong>2.8.11N</strong></td>
<td>Solve linear, non-linear, and quadratic equations both symbolically and graphically.</td>
<td>• Solve linear and non-linear equations by making a table of ordered pairs or by using algebraic techniques. • Solve linear and non-linear equations by graphing the related function. • Solve a quadratic equation by graphing the related function and/or by using algebraic techniques.</td>
</tr>
<tr>
<td><strong>2.8.11O</strong></td>
<td>Determine the domain and range of a relation, given a graph or set of ordered pairs.</td>
<td>• State the domain and range of a relation when given a graph, a set of ordered pairs, or a mapping.</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>Performance Indicators</td>
<td>Assessments</td>
</tr>
<tr>
<td>-------------------</td>
<td>-------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>2.8.11P</td>
<td>• Identify the best graphical representation of a relation of direct or inverse variation. • Represent a relation of direct or inverse variation using an algebraic equation.</td>
<td>• Observation • Evaluate written work • Performance assessments • Tests, quizzes • Problem solving journal/activity • Evaluate oral response</td>
</tr>
<tr>
<td>2.8.11Q</td>
<td>• Graph a relation and determine if the relation is a function. • Use a table to identify ordered pairs for a function. • Write equations for parallel and perpendicular lines. • Determine slope and intercepts from tables, graphs, and equations.</td>
<td>• Observation • Evaluate written work • Performance assessments • Tests, quizzes • Problem solving journal/activity • Evaluate oral response</td>
</tr>
<tr>
<td>2.8.11R</td>
<td>• Use linear programming procedures to solve problems. • Use graphs to represent real life situations and to help find solutions to questions about those situations. • Use equations to represent situations and to help find solutions to questions about those situations. • Collect data from a problem situation, and construct a scatter plot which can be used to find the equation that represents the data.</td>
<td>• Observation • Evaluate written work • Performance assessments • Tests, quizzes • Problem solving journal/activity • Evaluate oral response</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>Performance Indicators</td>
<td>Assessment Options</td>
</tr>
<tr>
<td>--------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>2.8.11S</strong> Analyze properties and relationships of functions.</td>
<td>• Graph linear, quadratic, absolute value, and greatest integer functions.</td>
<td>• Observation</td>
</tr>
<tr>
<td></td>
<td>• Identify distinguishing characteristics of linear and quadratic functions.</td>
<td>• Evaluate written work</td>
</tr>
<tr>
<td></td>
<td>• Identify relationships between variables in linear and quadratic functions.</td>
<td>• Performance assessments</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Tests, quizzes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Problem solving journal/activity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Evaluate oral response</td>
</tr>
</tbody>
</table>

| **2.8.11T** Analyze and categorize functions by their characteristics. | • Given a graph of a function, identify it as linear, quadratic, absolute value, or greatest integer function. | • Observation                                                                    |
|                                                                 | • Given an equation, identify it as linear, quadratic, absolute value, or greatest integer function. | • Evaluate written work                                                          |
|                                                                 |                                                                                                   | • Performance assessments                                                        |
|                                                                 |                                                                                                   | • Tests, quizzes                                                                 |
|                                                                 |                                                                                                   | • Problem solving journal/activity                                                |
|                                                                 |                                                                                                   | • Evaluate oral response                                                          |
## Course Objectives

<table>
<thead>
<tr>
<th>Course Objectives</th>
<th>Performance Indicators</th>
<th>Assessment Options</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2.11.11A</strong></td>
<td>Find the maximum and minimum values of a function defined for a polygonal convex set.</td>
<td>Observation, Evaluate written work, Performance assessments, Tests, quizzes, Problem solving journal/activity, Evaluate oral response</td>
</tr>
<tr>
<td><strong>2.11.11B</strong></td>
<td>Solve linear programming problems that involve maximum and minimum values.</td>
<td>Observation, Evaluate written work, Performance assessments, Tests, quizzes, Problem solving journal/activity, Evaluate oral response</td>
</tr>
</tbody>
</table>

**Strand:** 2.11  
**Standard:** Concepts of Calculus  
**Course:** Algebra II
<table>
<thead>
<tr>
<th>District Recommended Instructional Approaches For the Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>To Drive Teacher’s Instructional Activities</td>
</tr>
</tbody>
</table>

- Whole group instruction
- Small group instruction
- Projects
- Class discussion
- Peer evaluation
- Teacher and peer conferencing
- Oral presentations
- Individual instruction
- Research
- Dramatization
- Role playing
- Independent reading
- Read aloud
- Directed reading-thinking activities
- Modeling process
- Games
- Self-reflection
- Self-evaluation
- Independent study
- Guest speaker
- Guest reading
- Writing activities
- Thematic units
- Study guides
- Notebooks
- Computer technology