**Course Title:** Algebra II

**Topic/Concept:** Foundational Algebra & Introduction to Functions

**Time Allotment:** 15 days

**Unit Sequence:** 1

## Major Concepts to be learned:

1. To classify what system of numbers a number belongs.
2. Use properties of real numbers.
3. Simplify expressions involving exponents and square roots.
4. Introduce functions and explore transformations.

## Expected Skills to be demonstrated:

1. When given a value, be able to classify that number for each number system that it belongs to.
2. Use the properties of Additive Inverse, Additive Identity, Multiplicative Inverse, Multiplicative Identity, Distributive Property, Commutative Property, Associative Property, Product property of square roots and the Quotient property of square roots.
3. Simplify algebraic and numeric expressions involving any real number, exponents, square roots, and absolute value.
4. Be able to graph and identify functions and relations and write them using function notation.
5. Explore how changing values in a function changes the appearance of the graph (transformations).

## PA Standards/Anchors:

M11.A.1.1
M11.A.1.3
M11.A.2.2
M11.A.3.1
M11.A.3.2
M11.B.2.2
M11.C.1.4
M11.D.1.1

## Eligible Content:

- M11.A.1.1.1-3
- M11.A.1.3.2
- M11.A.2.2.1,2
- M11.A.3.1.1
- M11.A.3.2.1
- M11.B.2.2.2,3
- M11.C.1.4.1
- M11.D.1.1.2,3
- M11.D.2.1.2

## Instructional Strategies:

Problem solving activities
Group discussion
Hands-on activity
Evaluating
Lecture
Graphic Calculators
Note Taking
Math Binders

## Assessments:

- Tests & quizzes
- Activities (exploration with and without the calculator)
- Math binder

**Course Title:** Algebra II

**Topic/Concept:** Linear Functions

**Time Allotment:** 13-14 days

**Unit Sequence:** 2

## Major Concepts to be learned:

1. Solve linear equations/inequalities in one variable.
2. Use proportions to solve problems.
3. Graph and write linear functions under given conditions.
4. Graph/solve linear inequalities.
5. Graph/solve absolute value functions.

## Expected Skills to be demonstrated:

1. Solve equations and inequalities, using properties of equality, in terms of one variable.
2. Apply proportional reasoning to a variety of practical applications (ex. percents, geometry-indirect measurement, dilations).
3. Be able to graph linear functions using x- and y-intercepts and slope.
4. Write a linear equation in slope-intercept form and identity the slope and y-intercept.
5. Calculate the slope given two ordered pairs.
6. Write an equation of a line that is parallel or perpendicular to a given line.
7. Graph and solve inequalities in two variables.
8. Perform transformations on linear functions.
9. Determine lines of best fit for given data.
10. Make a scatterplot for given data and determine what type, if any, ralationship exists.
11. Apply techniques of solving equations to solve absolute value equations and inequalities.

## PA Standards/Anchors:

M11.A.2.1
M11.C.1.3
M11.D.1.1
M11.D.3.1
M11.E.4.2
M11.A.3.2
M11.C.3.1
M11.D.2.1
M11.D.3.2

## Eligible Content:

- M11.A.2.1.1 -3
- M11.A.3.2.1
- M11.C.1.3.1
- M11.C.3.1.2
- M11.D.1.1.3
- M11.D.2.1.1 -3
- M11.D.3.1.1
- M11.D.3.1.2
- M11.D.3.2.1,2

## Instructional Strategies:

Coooperative groups
Lecture
Performance task
Note Taking
Math Binders
Problem solving activities
Group discussion
Hands-on activity
Evaluating
Graphic Calculators

## Assessments:

- Tests and quizzes.
- Graphing calculator activities.
- Bungee Barbie activity.
- Math Binder

**Course Title:** Algebra II

**Topic/Concept:** Linear Systems

**Time Allotment:** 12 days

**Unit Sequence:** 3

## Major Concepts to be learned:

1. Solve systems of linear equations (in two variables) using various methods.
2. Solving systems of linear inequalities and applications.
3. Solve systems of equations (in three variables) using elimination and substitution.

## Expected Skills to be demonstrated:

1. Solve a system of equations using the graphing method.
2. Solve a system of equations using the substitution method.
3. Solve a system of equations using the elimination method.
4. Solve systems of linear inequalities.
5. Apply techniques of systems of linear inequalities to solve linear programing problems.
6. Use techniques of elimination and substitution to solve systems of equations with three variables.

| PA Standards/Anchors: | Eligible Content: |
|---|---|
| M11.A.3.2<br>M11.C.1.2<br>M11.D.2.1 | • M11.A.3.2.1<br>• M11.C.1.2.1<br>• M11.C.1.2.2<br>• M11.C.1.2.3<br>• M11.D.2.1.3<br>• M11.D.2.1.4 |

| Instructional Strategies: | | Assessments: |
|---|---|---|
| Coooperative groups<br>Lecture<br>Performance task<br>Note Taking<br>Math Binders | Problem solving activities<br>Group discussion<br>Hands-on activity<br>Evaluating<br>Graphic Calculators | • Tests and quizzes.<br>• Systems of equations lab using the graphing calulators.<br>• Math Binder |

**Course Title:** Algebra II

**Topic/Concept:** Quadratic functions

**Time Allotment:** 20 days

**Unit Sequence:** 4

## Major Concepts to be learned:

1. Write quadratic equations in standard and vertex form.
2. Graph quadratic equations and apply transformations.
3. Solve quadratic equations by various methods.
4. Solve quadratic inequalities.

## Expected Skills to be demonstrated:

1. Be able to go from vertex form to standard form and standard form to vertex form.
2. Be able to graph quadratic functions using a table of values and by locating the vertex, axis of symmetry, and direction of opening.
3. Be able to solve quadratic equations by graphing, factoring, completing the square, and using the quadratic formula.
4. Be able to solve quadratic inequalities by graphing and checking test point values.

| PA Standards/Anchors: | Eligible Content: |
|---|---|
| M11.A.1.2<br>M11.B.2.2<br>M11.D.2.1<br>M11.D.3.1 | • M11.A.1.2.1<br>• M11.B.2.2.3<br>• M11.B.2.2.4<br>• M11.D.2.1.1<br>• M11.D.2.1.2<br>• M11.D.2.1.5<br>• M11.D.3.1.2 |

| Instructional Strategies: | | Assessments: |
|---|---|---|
| Coooperative groups<br>Lecture<br>Hands-on activity<br>Evaluating<br>Graphic Calculators | Problem solving activities<br>Group discussion<br>Note Taking<br>Math Binders | • Tests and quizzes<br>• Hanging Chains Activity<br>• Math binder |

**Course Title:** Algebra II

**Topic/Concept:** Polynomial functions

**Time Allotment:** 20 days

**Unit Sequence:** 5

## Major Concepts to be learned:

1. Classify polynomials and monomials.
2. Factor polynomials.
3. Perform operations on polynomials and monomials.
4. Solve polynomial equations.

## Expected Skills to be demonstrated:

1. Know the basic vocabulary of polynomials.
2. Be able to identify monomials from polynomials.
3. Perform the basic operations on polynomials.
4. Factor polynomials.
5. Solve polynomial functions using a variety of methods.
6. Use synthetic and long polynomial division to find zeros of the functions and for factoring.
7. Use the Fundamental Theorem of Algebra to find solutions to polynomial functions.

| PA Standards/Anchors: | Eligible Content: |
|---|---|
| M11.A.3.2<br>M11.B.2.2<br>M11.D.1.1<br>M11.D.2.1<br>M11.D.2.2<br>M11.D.3.1 | • M11.A.3.2.1<br>• M11.B.2.2.1 ,2,4<br>• M11.D.1.1.1 ,3<br>• M11.D.2.1.2<br>• M11.D.2.2.1 ,2<br>• M11.D.3.1.2 |

| Instructional Strategies: | | Assessments: |
|---|---|---|
| Coooperative groups<br>Lecture<br>Note Taking<br>Math Binders | Problem solving activities<br>Group discussion<br>Evaluating<br>Graphic Calculators | • Tests and quizzes<br>• Math Binder |

**Course Title:** Algebra II

**Topic/Concept:** Rational and Radical functions

**Time Allotment:** 20 days

**Unit Sequence:** 6

## Major Concepts to be learned:

1. Define and identify rational and radical functions.
2. Perform the basic operations on rational and radical functions.
3. Graph rational and radical functions.
4. Solve rational and radical functions.

## Expected Skills to be demonstrated:

1. Be able to add, subtract, divide, and multiply rational and radical functions.
2. Be able to graph rational and radical functions.
3. Write radical expressions with rational exponents.
4. Solve rational equations/inequalities.
5. Solve radical equations/inequalities.

## PA Standards/Anchors:

| | |
|---|---|
| M11.A.3.2 | M11.B.2.2 |
| M11.B.2.3 | M11.D.1 |
| M11.D.2.1 | M11.D.2.2 |
| M11.D.3.1 | |

## Eligible Content:

- M11.A.3.2.1
- M11.B.2.2.1 ,2
- M11.B.2.3.1
- M11.D.1.1.3
- M11.D.2.1.2 ,3
- M11.D.3.1.2

## Instructional Strategies:

| | |
|---|---|
| Coooperative groups | Lecture |
| Group discussion | Note Taking |
| Evaluating | Math Binders |
| Graphic Calculators | |

## Assessments:

- Tests and quizzes
- Calculator activities
- Math binder

**Course Title:** Algebra II

**Topic/Concept:** Probability and Statistics

**Time Allotment:** 15 days

**Unit Sequence:** 7

## Major Concepts to be learned:

1. Determine the number of arrangements of objects.
2. Calculate probabilities.
3. Identify the difference between independent and dependent events.
4. Calculate the measures of central tendency and variation.

## Expected Skills to be demonstrated:

1. Determine the number of arrangements of objects using the fundamental counting principle, permutations, and combinations.
2. Calculate experimental and theorical probability.
3. Perform experiments and calculate probabilities. Use the formulas to calculate the probabilities for independent and dependent events.
4. Calculate the averages: mean, median, and mode.
5. Examine how these values can be manipulated and what the effects are.
6. Calculate the variations: quartiles, standard deviation, and outliers.
7. Examine how these values can be manipulated and what the effects are.

## PA Standards/Anchors:

M11.A.3.2
M11.E.2.1
M11.E.3.2
M11.C.1.4
M11.E.1.1
M11.E.3.1
M11.E.4.1

## Eligible Content:

- M11.A.3.2.1
- M11.E.1.1.1
- M11.E.2.1.1 -3
- M11.E.3.1.1 ,2
- M11.E.3.2.1
- M11.E.4.1.1 ,2
- M11.C.1.4.1

## Instructional Strategies:

Coooperative groups
Lecture
Hands-on activity
Summarizing
Math Binders
Problem solving activities
Performance task
Note Taking
Evaluating
Graphic Calculators

## Assessments:

- Tests and quizzes
- Math binders
- Data analysis projects of real life data
- Calculator and navigator activities.

**Course Title:** Algebra II

**Topic/Concept:** Quadratic Functions-conic sections

**Time Allotment:** 17 days

**Unit Sequence:** 8

## Major Concepts to be learned:

1. Identify and graph conic sections.
2. Solve nonlinear systems of equations.
3. Apply algebraic techniques to put conic sections in standard form and find particular attributes of each type of conic section.

## Expected Skills to be demonstrated:

1. Identify and graph circles.
2. Determine the center, radius, and standard form.
3. Identify and graph ellipses.
4. Determine the center, foci, minor and major axis, and standard form.
5. Identify and graph hyperbolas.
6. Determine the foci, asymptotes, conjugate and transverse axis, and standard form.
7. Identify and graph parabolas.
8. Determine the vertex, focus, axis of symmetry, directrix, and standard form.
9. Solve systems of nonlinear equations.

## PA Standards/Anchors:

M11.A.1.2
M11.A.3.2
M11.B.2.2
M11.D.2.1
M11.D.3.1

## Eligible Content:

- M11.A.1.2.1
- M11.A.3.2.1
- M11.B.2.2.3,4
- M11.D.2.1.1,2,5
- M11.D.3.1.2

## Instructional Strategies:

Coooperative groups
Group discussion
Hands-on activity
Summarizing
Math Binders
Lecture
Performance task
Note Taking
Graphic Calculators

## Assessments:

- Tests and quizzes
- Math binders
- Calculator/navigator activities that explore conic sections
- Parabolic cooker project

**Course Title:** Algebra II

**Topic/Concept:** Matrices

**Time Allotment:** 14 days

**Unit Sequence:** 9

## Major Concepts to be learned:

1. Define and understand the properties of matrices.
2. Perform the basic operations on matrices.
3. Use matrix operations to solve systems of equations.

## Expected Skills to be demonstrated:

1. Define a matrix by its dimensions and know when appropriate to add, subtract, or multiply.
2. Be able to add, subtract, and multiply matrices together.
3. Apply matrix operations to transform geometric figures.
4. Use Cramer's Rule to solve systems of equations.
5. To solve systems of equations by using inverse matrices.

| PA Standards/Anchors: | Eligible Content: |
|---|---|
| M11.A.3.2<br>M11.E.1.1.2 | • M11.A.3.2.1<br>• M11.E.1.1.2 |

| Instructional Strategies: | Assessments: |
|---|---|
| Coooperative groups<br>Problem solving activities<br>Lecture<br>Group discussion<br>Performance task<br>Note Taking<br>Evaluating<br>Math Binders<br>Graphic Calculators | • Tests and quizzes<br>• Application activity involving using matrices in encoding/decoding<br>• Math binder |

**Course Title:** Algebra II

**Topic/Concept:** Sequences and series

**Time Allotment:** 10 days

**Unit Sequence:** 10

## Major Concepts to be learned:

1. Identify different types of sequences and complete patterns.
2. Determine the sum of a series of numbers.
3. Apply the formulas for arithmetic and geometric sequences.

## Expected Skills to be demonstrated:

1. Identify a pattern and continue it.
2. Find missing values in a sequence of values.
3. Determine the sum of a series of numbers using summation notation and formulas.
4. Identify arithmetic sequences and find the nth term of that sequence.
5. Identify geometric sequences and the nth term of that sequence.

| PA Standards/Anchors: | Eligible Content: |
|---|---|
| M11.A.3.2<br>M11.D.1.1 | • M11.A.3.2.1<br>• M11.D.1.1.1<br>• M11.D.1.1.3 |

| Instructional Strategies: | | Assessments: |
|---|---|---|
| Coooperative groups | Problem solving activities | • Tests and quizzes |
| Lecture | Group discussion | • Graphing calculator and navigator activities |
| Performance task | Hands-on activity | • Math binders |
| Note Taking | Summarizing | |
| Evaluating | Math Binders | |
| Graphic Calculators | | |