PARK RIDGE SCHOOL DISTRICT

Park Ridge, New Jersey
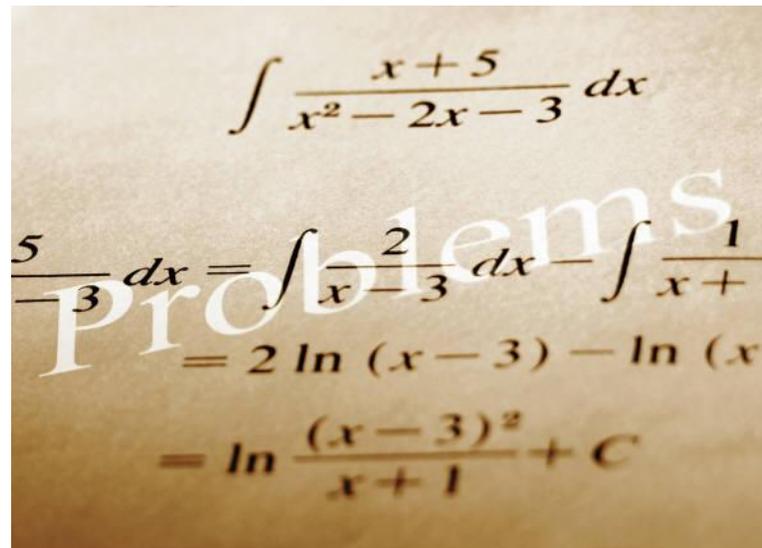
Algebra IB Curriculum Guide

Approved by Park Ridge Board of Education – August 27, 2012

Grades 9-12 Mathematics Writing Committee

All high school mathematics teachers participated in the high school mathematics curriculum revision process, thereby affording opportunities for teachers to add their knowledge and professional experiences to the process.   Teachers on the mathematics writing committee based the curriculum on teacher input and recommendations collected from collaboration efforts.   The curriculum writing committee members will act as a resource to their department colleagues.   Opportunities to discuss the curriculum implementation, teaching strategies, resources, as well as reflections and concerns will be provided during the 2011-12 school year.

I am grateful to the mathematics curriculum committee members for the many hours and expertise they devoted to writing this curriculum guide.   The committee members are commended for their efforts and interest in providing the Park Ridge School District with a thorough high school mathematics curriculum that aligns with the Common Core State Standards for Mathematics.

According to the 2010 Common Core State Standards Initiative, "The Common Core State Mathematical Standards are designed to provide a clear understanding of what students are expected to learn, so teachers and parents know what they need to do to help them. The standards are designed to be robust and relevant to the real world, reflecting the knowledge and skills that our young people need for success in college and careers."

Dr. Cathy Timpone
Director of Curriculum & Instruction

High School Mathematics Curriculum Writing Committee:

Lynne Lupfer revised:
Mathematics Prep, Geometry Honors, Algebra II Honors,
Pre-Calculus, Pre-Calculus Honors, SAT Prep Math curriculum guides

Rachel Berger revised:
Pre-Algebra, Algebra II, Algebra II Honors curriculum guides

Erin Havel revised:
Algebra I, Algebra I Honors curriculum guides

Roseanne Wates revised:
Geometry, Statistics curriculum guides

Dana Caine revised:
Statistics curriculum guide

Anna Marie Schoenkopf revised:
Life Skills Math curriculum guide

Debbie Strammiello revised:
Life Skills Math curriculum guides

Debra Aach, Mathematics Supervisor

Administration:

Troy Lederman, Principal, Park Ridge High School
Dr. Cathy Timpone, Director of Curriculum and Instruction
Dr. Robert Gamper, Superintendent

Board Approved August 27, 2012

PARK RIDGE SCHOOL DISTRICT
Park Ridge, NJ

MATH DEPARTMENT, 2011-2012

COURSE TITLE/GRADE & SUBJECT: Algebra IB   **COURSE # 2239**
PREREQUISITE: 7th grade math/Algebra 1A
TIME ALLOCATION: One school year
TEXTS: McDougal Littell Algebra I/Larson, Boswell, Kanold and Stiff © 2004
COURSE PHILOSOPHY (grades 7-12):

This Algebra IB course is designed to provide students with a foundation in the operations of signed numbers, solving and graphing equations and inequalities, simplifying and evaluating rational expressions and polynomials. Students will be encouraged to perform at a high level of abstraction in addition to the emphasis on creating algebraic models to represent real life phenomena. It will build on algebraic topics with vocabulary, skills and applications to real-life and algebraic situations where students develop critical thinking skills and problem solving techniques.

OVERARCHNG ENDURING UNDERSTANDINGS (grade 7-12):
1. Algebra models can represent real life phenomena.
2. Mathematical situations develop critical thinking skills and problem solving techniques

OVERARCHING ESSENTIAL QUESTIONS (grades 7-12):
1. How is algebra applied to the real world?
2. How can we use algebra to problem solve?

TABLE OF CONTENTS (UNITS OF STUDY):

Unit 1: Equations (Algebra 1A)	Unit 5: Factoring	Unit 9: Graphing
Unit 2: Linear Inequalities (Algebra 1A)	Unit 6: Quadratics	Unit 10: Systems
Unit 3: Properties of Exponents (Algebra 1A)	Unit 7: Radicals	Unit 11: Matrices
Unit 4: Polynomials	Unit 8: Rational Expressions	

UNIT ONE: Equations

UNIT SUMMARY:
As an overview:
1. Students solve equations, and problems involving equations, using deductive reasoning, the distributive property, and variables on both sides. They define variables in terms of other variables.
2. Each unit of the course is built off of this one unit. The steps used to solve a simple equation will be continued through the course. The main purpose is the same, but difficulty increases as the year goes on.
3. The rationale of this unit is not only to have students be able to solve equations, which will be used throughout the entire school year, but also to model real-life situations and know how to solve them using problem solving.

21ST CENTURY THEMES:

☐ Global Awareness
☒ Financial, Economic, Business and Entrepreneurial Literacy
☐ Civic Literacy
☐ Health Literacy

PRIMARY INTERDISCIPLINARY CONNECTIONS:
1. Creating word problems that represent equations can be connected to just about every subject area.
2. Writing the word problems works on literacy in math.

STANDARDS
Create equations that describe numbers or relationships
A-CED.1. Create equations and inequalities in one variable and use them to solve problems.
A-CED.3. Represent constraints by equations or inequalities, and by system of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.
A-CED.4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
Understand solving equations as a process of reasoning and explain the reasoning
A-REI.1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
Solve equations and inequalities in one variable
A-REI.3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
Interpret the structure of expressions
A-SSE.1. Interpret expressions that represent a quantity in terms of its context.
    a.   Interpret parts of an expression, such as terms, factors, and coefficients.

b. Interpret complicated expressions by viewing one or more of their parts as a single entity.

A-SSE.2. Use the structure of an expression to identify ways to rewrite it.

21st Century Standards

The ability to recognize a problem and apply critical thinking and problem-solving skills to solve the problem is a lifelong skill that develops over time.

9.1.12.A.1. Apply critical thinking and problem-solving strategies during structured learning experiences.

Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative thinking.

9.1.12.B.3 Assist in the development of innovative solutions to an onsite problem by incorporating multiple perspectives and applying effective problem-solving strategies during structured learning experiences, service learning, or volunteering.

Leadership abilities develop over time through participation in groups and/or teams that are engaged in challenging or competitive activities.

9.1.12.C.5. Assume a leadership position by guiding the thinking of peers in a direction that leads to successful completion of a challenging task or project.

Ethical behaviors support human rights and dignity in all aspects of life.

9.1.12.F.2. Demonstrate a positive work ethic in various settings, including the classroom and during structured learning experiences.

- Remaining 8th grade standards are taught in the math 8 cycle classes.

UNIT ESSENTIAL QUESTIONS:	UNIT ENDURING UNDERSTANDINGS:
▪ What is an equation? ▪ What are variables? ▪ How do we solve equations? ▪ What types of equations exist? ▪ How do equations relate to the real world? ▪ What is an absolute value equation? ▪ How do you solve an absolute value equation? ▪ What type of solutions do you get when you solve both linear and absolute value equations? ▪ Why make models before solving a problem?	▪ A linear equation has a variable that is raised to the first power and does not occur in the denominator, inside a square root symbol, or inside absolute value symbols. ▪ An equation is a statement that is formed when an equal sign is placed between two expressions. ▪ Equations can be used in the real world. ▪ There are different types of solutions when solving equations.

TIME ALLOTMENT	CONTENT	SKILLS	ASSESSMENT
2-3 Weeks	Students will:	Students will be able to:	▪ **Formative Assessments**: 1. Knowledge rating sheet

▪ Know the steps used to solve linear equations.
▪ Know the steps used to solve absolute value equations.
▪ Understand the relationship between the type of equation you have and the type of solutions you can come out with.
	▪ Solve multi-step linear equations.
	▪ Recall the different types of solutions a linear equation can produce.
	▪ Solve multi-step absolute value equations.
	▪ Recall the different types of solutions an absolute value equation can produce.
	▪ Create equations.
	▪ Make the connection between equations and the real world.
		2. Exit slips
		3. Homework
		4. Smartboard/Board
		5. Volunteers
		6. Questions/Answers
		7. Individual desk work
		8. Think/Pair/Share
		9. Cooperative learning groups
		10. BINGO
		▪ Summative Assessments
		  1. Performance assessment tasks
		  2. Haunted House Project.
		  3. Quizzes
		  4. Tests

TEACHER RESOURCES	TEACHER NOTES/REFLECTIONS
▪ McDougal Littell Algebra I Text ▪ McDougal Littell Algebra I Workbooks ▪ Kuta Software ▪ Pizzazz Algebra	• **This unit is to be completed as part of the 8th grade Algebra 1A course. Teacher should review content to formulate a baseline for future instruction.**

UNIT TWO: Inequalities

UNIT SUMMARY:

As an overview:

1. Students extend the skills of the previous unit, related to solving various kinds of equations, to the solving of inequalities.

2. Many of the procedures used are the same, reflecting the fact that the properties for inequalities are very similar to those for equations. Students solve and graph inequalities using addition, subtraction, multiplication, and division, progressing from one-step to multi-step inequalities, first with the variable on one side only, and then with variables on both sides. They also solve compound inequalities as well as inequalities containing absolute values.

3. The rationale of this unit is not only to have students be able to solve equations, which will be used throughout the entire school year, but also to model real-life situations and know how to solve them using problem solving.

21ST CENTURY THEMES:

☐ Global Awareness
☒ Financial, Economic, Business and Entrepreneurial Literacy
☐ Civic Literacy
☐ Health Literacy

PRIMARY INTERDISCIPLINARY CONNECTIONS:

1. Musical instruments produce vibrations in the air that we hear as music. Not all instruments produce these vibrations in the same way, and different instruments produce sounds in different frequencies. An inequality can be used to represent different frequency ranges.
2. Creating word problems that represent equations can be connected to just about every subject area.
3. Writing the word problems works on literacy in math.

STANDARDS

Create equations that describe numbers and relationships

A-CED.1. Create equations and inequalities in one variable and use them to solve problems.

A-CED.3. Represent constraints by equations or inequalities, and by system of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.

Solve equations and inequalities in one variable

A-REI.3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

21st Century Standards

The ability to recognize a problem and apply critical thinking and problem-solving skills to solve the problem is a lifelong skill that develops over time.

9.1.12.A.1. Apply critical thinking and problem-solving strategies during structured learning experiences.

Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative thinking.

9.1.12.B.3 Assist in the development of innovative solutions to an onsite problem by incorporating multiple perspectives and applying effective problem-solving strategies during structured learning experiences, service learning, or volunteering.

Leadership abilities develop over time through participation in groups and/or teams that are engaged in challenging or competitive activities.

9.1.12.C.5. Assume a leadership position by guiding the thinking of peers in a direction that leads to successful completion of a challenging task or project.

Ethical behaviors support human rights and dignity in all aspects of life.

9.1.12.F.2. Demonstrate a positive work ethic in various settings, including the classroom and during structured learning experiences.

UNIT ESSENTIAL QUESTIONS:	UNIT ENDURING UNDERSTANDINGS:
- How can change be best represented mathematically? - How can patterns, relations, and functions be used as tools to best describe and help explain real-life situations? - How will students utilize algebraic procedures to solve problems?	- Functional relationships can be expressed in real contexts, graphs, algebraic equations, tables, and words; each representation of a given function is simply a different way of expressing the same data. - The value of a particular representation depends on its purpose. - A variety of families of functions can be used to model and solve real world situations.

TIME ALLOTMENT	CONTENT	SKILLS	ASSESSMENT
2-3 weeks	Students will: - Understand the relationship between verbal and algebraic expressions. - Know the steps involved in solving inequalities in one variable. - Know the steps involved in solving absolute value inequalities.	- Solve one step and multi-step inequalities. - Recall when to switch the direction of the inequality symbol. - Solve compound inequalities. - Graph the solutions of inequalities on a number line. - Recall the rules for solving absolute value inequalities. - Solve absolute value inequalities.	**Formative Assessments** - Extended constructed response questions - Short constructed response questions - Exit slips - Communicator board - Homework - Volunteers **Summative Assessments** - Performance assessment tasks - Tests

			3. Quizzes

TEACHER RESOURCES	TEACHER NOTES/REFLECTIONS
▪ McDougal Littell Algebra I Text ▪ McDougal Littell Algebra I Workbooks ▪ Kuta Software ▪ Pizzazz Algebra	• **This unit is to be completed as part of the 8th grade Algebra 1A course. Teacher should review content to formulate a baseline for future instruction.**

UNIT THREE: Exponents

UNIT SUMMARY:
As an overview:
1. Students will use properties of exponents to rewrite expressions.
2. This unit introduces using zero and negative exponents, and evaluating exponential equations. Scientific notation illustrates a common use for exponents. Problems using scientific notation and other exponential expressions illustrate multiplying and dividing powers, raising a power to a power, and raises products and quotients to a power.
3. The rationale behind this unit is to start off at the basic level with exponents by using the properties, but then use a higher order of thinking when students get to units like radicals and rational expressions to be able to apply these same properties without be told how or when.

21ST CENTURY THEMES:

⊠ Global Awareness
⊠ Financial, Economic, Business and Entrepreneurial Literacy
☐ Civic Literacy
⊠ Health Literacy

PRIMARY INTERDISCIPLINARY CONNECTIONS:
1.Exponents and scientific notation are directly connected to science. Whether it's atoms or exponential growth or decay, this unit is parallel with the sciences.
2.Shifting into high gear helps a racer increase speed on level or downhill surfaces, but pedaling becomes more difficult. When the racer exerts energy the brain send a message to increase the rate and depth of breathing. This relationship in health can be represented with an exponential model.

STANDARDS

Write expressions in equivalent forms to solve problems
A-SSE.3.c. Use the properties of exponents to transform expressions for exponential functions.
Interpret the structure of expressions
A-SSE.2. Use the structure of an expression to identify ways to rewrite it.
21st Century Standards
The ability to recognize a problem and apply critical thinking and problem-solving skills to solve the problem is a lifelong skill that develops over time.
9.1.12.A.1. Apply critical thinking and problem-solving strategies during structured learning experiences.
Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative

thinking.

9.1.12.B.3 Assist in the development of innovative solutions to an onsite problem by incorporating multiple perspectives and applying effective problem-solving strategies during structured learning experiences, service learning, or volunteering.

Leadership abilities develop over time through participation in groups and/or teams that are engaged in challenging or competitive activities.

9.1.12.C.5. Assume a leadership position by guiding the thinking of peers in a direction that leads to successful completion of a challenging task or project.

Ethical behaviors support human rights and dignity in all aspects of life.

9.1.12.F.2. Demonstrate a positive work ethic in various settings, including the classroom and during structured learning experiences.

UNIT ESSENTIAL QUESTIONS:	UNIT ENDURING UNDERSTANDINGS:
▪ How is algebra used to model real situations and answer questions about them? ▪ How can numeric operations be extended to algebraic objects? ▪ Why is it useful to represent real-life situations algebraically?	▪ Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole. ▪ Variables are symbols that take the place of numbers or ranges of numbers; they have different meanings depending on how they are being used.

TIME ALLOTMENT	CONTENT	SKILLS	ASSESSMENT
2 weeks	Students will: ▪ Know and apply the laws of exponents.	Students will be able to: ▪ Apply the laws of exponents to numerical and algebraic expressions with integral exponents to rewrite them in different but equivalent forms.	▪ **Formative Assessments** 1. Extended constructed response questions 2. Short constructed response questions 3. Knowledge rating sheet 4. Exit slips 5. Homework 6. Smartboard/Board 7. Volunteers 8. Questions/Answers 9. Individual desk work 10. Think/Pair/Share 11. Cooperative learning groups 12. BINGO

			▪ **Summative Assessments**
			  1. Performance assessment tasks
			  2. Tests
			  3. Quizzes

TEACHER RESOURCES
  ▪ McDougal Littell Algebra I Text
  ▪ McDougal Littell Algebra I Workbooks
  ▪ Kuta Software
  ▪ Pizzazz Algebra
  ▪ Understanding math
	TEACHER NOTES/REFLECTIONS
	  ● **This unit is to be completed as part of the 8th grade Algebra 1A course. Teacher should review content to formulate a baseline for future instruction.**

UNIT SUMMARY:
As an overview:
1. The main goal for students will begin to identify polynomials and classify them to get them prepared to factor with always having the final goal of solving a given quadratic.
2. These skills include combining monomials, binomials, and polynomials using the operations of addition, subtraction, multiplication, and division.
3. This unit helps students build knowledge and skills relative to polynomials-the basic building blocks of algebraic expressions.

21ˢᵀ CENTURY THEMES:	**PRIMARY INTERDISCIPLINARY CONNECTIONS:**
☒ Global Awareness ☒ Financial, Economic, Business and Entrepreneurial Literacy ☐ Civic Literacy ☐ Health Literacy	1. The cross section of many radio telescopes can be modeled by a polynomial equation whose graph is a parabola and can be connected to history and/or science. 2. Polynomials can be used to figure out the area for things such as tiling, painting, mowing lawns, construction, etc.

STANDARDS

Interpret the structure of expressions
A-SSE.1. Interpret expressions that represent a quantity in terms of its context.
a. Interpret parts of an expression, such as terms, factors, and coefficients.
A-SSE.2. Use the structure of an expression to identify ways to rewrite it.
Perform arithmetic operations on polynomials
A-APR.1. Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.
Use polynomial identities to solve problems
A-APR.4. Prove polynomial identities and use them to describe numerical relationships**.**
A-APR.5. Know and apply the Binomial Theorem for the expansion of $(x + y)^n$ in powers of x and y for a positive integer n, where a and y are any numbers, with coefficients determined for example by Pascal's Triangle.
21ˢᵗ Century Standards
The ability to recognize a problem and apply critical thinking and problem-solving skills to solve the problem is a lifelong skill that develops over time.
9.1.12.A.1. Apply critical thinking and problem-solving strategies during structured learning experiences.

Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative thinking.

9.1.12.B.3 Assist in the development of innovative solutions to an onsite problem by incorporating multiple perspectives and applying effective problem-solving strategies during structured learning experiences, service learning, or volunteering.

Leadership abilities develop over time through participation in groups and/or teams that are engaged in challenging or competitive activities.

9.1.12.C.5. Assume a leadership position by guiding the thinking of peers in a direction that leads to successful completion of a challenging task or project.

Ethical behaviors support human rights and dignity in all aspects of life.

9.1.12.F.2. Demonstrate a positive work ethic in various settings, including the classroom and during structured learning experiences.

UNIT ESSENTIAL QUESTIONS:	UNIT ENDURING UNDERSTANDINGS:
▪ What is a polynomial? ▪ How do we simplify polynomials?	▪ A polynomial is an expression which is the sum of terms of the form ax^k where k is a nonnegative integer.

TIME ALLOTMENT	CONTENT	SKILLS	ASSESSMENT

3 weeks	Students will:
	
	▪ Know how to perform operations with polynomials.
		Students will be able to:
		
		▪ Identify different parts of a polynomial.
		▪ Classify a polynomial by its degree and number of terms.
		▪ Write polynomials in standard form.
		▪ Add polynomials.
		▪ Subtract polynomials.
		▪ Multiply polynomials by the distributive property and FOIL method.
		▪ Recognize special product patterns.
		▪ Divide polynomials.
			▪ **Formative Assessments**
			  1. Extended constructed response questions
			  2. Short constructed response questions
			  3. Knowledge rating sheet
			  4. Exit slips
			  5. Homework
			  6. Smartboard/Board
			  7. Volunteers
			  8. Questions/Answers
			  9. Individual desk work
			  10. Think/Pair/Share
			  11. Cooperative learning groups
			  12. BINGO
			
			▪ **Summative Assessments**
			  1. Performance assessment tasks
			  2. Tests

| | | | 3. Quizzes |
| | | | 4. Dog Cage/Gardening Project |

TEACHER RESOURCES	TEACHER NOTES/REFLECTIONS
▪ McDougal Littell Algebra I Text ▪ McDougal Littell Algebra I Workbooks ▪ Kuta Software ▪ Pizzazz Algebra ▪ Understanding math	

UNIT 5: Factoring

UNIT SUMMARY:

As an overview:
1. Students explore several methods for factoring quadratic polynomials. This will prepare them for solving.
2. They will factor when the leading coefficient is 1, not 1, prime, composite, special polynomials, and binomials.
3. This exploration leads them to the quadratic formula in the next unit. They will also factor higher degree polynomials.

21ST CENTURY THEMES:	**PRIMARY INTERDISCIPLINARY CONNECTIONS:**
☒ Global Awareness ☒ Financial, Economic, Business and Entrepreneurial Literacy ☐ Civic Literacy ☐ Health Literacy	1.Polynomials can be used to figure out the area for things such as tiling, painting, mowing lawns, construction, etc.

STANDARDS

Interpret the structure of expressions

A-SSE.2. Use the structure of an expression to identify ways to rewrite it.

Write expressions in equivalent forms to solve problems.

A-SSE.3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

a. Factor a quadratic expression to reveal the zeros of the function it defines.

Understand the relationship between zeros and factors of polynomials.

A-APR.2. Know and apply the remainder Theorem: For a polynomial p(x) and a number a, the remainder on division by x − a is p(a), so p(a) = 0 if and only if (x − a) is a factor of p(x).

A-APR.3. Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.

21st Century Standards

The ability to recognize a problem and apply critical thinking and problem-solving skills to solve the problem is a lifelong skill that develops over time.

9.1.12.A.1. Apply critical thinking and problem-solving strategies during structured learning experiences.

Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative thinking.

9.1.12.B.3 Assist in the development of innovative solutions to an onsite problem by incorporating multiple perspectives and applying effective problem-solving strategies during structured learning experiences, service learning, or volunteering.
Leadership abilities develop over time through participation in groups and/or teams that are engaged in challenging or competitive activities.
9.1.12.C.5. Assume a leadership position by guiding the thinking of peers in a direction that leads to successful completion of a challenging task or project.
Ethical behaviors support human rights and dignity in all aspects of life.
9.1.12.F.2. Demonstrate a positive work ethic in various settings, including the classroom and during structured learning experiences.

UNIT ESSENTIAL QUESTIONS:	UNIT ENDURING UNDERSTANDINGS:
▪ What is factoring and why do we use it in algebra? ▪ How can a polynomial be factored?	▪ In order to get a polynomial ready to be solved for a given variable, it can be factored.

TIME ALLOTMENT	CONTENT	SKILLS	ASSESSMENT

3 weeks	Students will:
	
	▪ Understand that when you have a quadratic or a higher degree polynomial, factoring needs to be used to eventually solve for the variable.
		Students will be able to:
		
		▪ Find factors.
		▪ Factor by the guess and check method.
		▪ Factor by using a difference of two squares.
		▪ Factor by grouping only when involving 4 terms.
		▪ Factor when the leading coefficient is positive 1.
		▪ Factor when the leading coefficient is not a positive 1.
		▪ Write expressions in standard form.
		▪ Recognize perfect square trinomials to make factoring easier.
		▪ Factor higher degree polynomials.
			▪ **Formative Assessments**
			  1. Extended constructed response questions
			  2. Short constructed response questions
			  3. Knowledge rating sheet
			  4. Exit slips
			  5. Homework
			  6. Smartboard/Board
			  7. Volunteers
			  8. Questions/Answers
			  9. Individual desk work
			  10. Think/Pair/Share
			  11. Cooperative learning groups
			  12. BINGO
			
			▪ **Summative Assessments**
			  1. Performance assessment tasks
			  2. Tests
			  3. Quizzes

TEACHER RESOURCES			**TEACHER NOTES/REFLECTIONS**	
▪ McDougal Littell Algebra I Text ▪ McDougal Littell Algebra I Workbooks ▪ Kuta Software ▪ Pizzazz Algebra ▪ Understanding math				

UNIT 6: Quadratics

UNIT SUMMARY:
As an overview:
1. In the last unit, students learned how to factor quadratics using a variety of methods. These methods lead to one of the most recognizable formulas in algebra: the quadratic formula which will be used to solve quadratics.
2. They will now use this formula to solve quadratic equations that are not factorable.
3. They will also apply this formula to real world applications.

21ST CENTURY THEMES:

- [ ] Global Awareness
- [x] Financial, Economic, Business and Entrepreneurial Literacy
- [ ] Civic Literacy
- [ ] Health Literacy

PRIMARY INTERDISCIPLINARY CONNECTIONS:
1. Vertical motion models can be used to figure out how long it will take an object to reach the ground. Velocity can be applied to one of the two formulas used. Science plays a big role in these two formulas.

STANDARDS

Solve equations and inequalities in one variable
A-REI. 4. Solve quadratic equations in one variable.
b. Solve quadratic equations by inspection, taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as a +/- bi for real numbers a and b.
21st Century Standards
The ability to recognize a problem and apply critical thinking and problem-solving skills to solve the problem is a lifelong skill that develops over time.
9.1.12.A.1. Apply critical thinking and problem-solving strategies during structured learning experiences.
Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative thinking.
9.1.12.B.3 Assist in the development of innovative solutions to an onsite problem by incorporating multiple perspectives and applying effective problem-solving strategies during structured learning experiences, service learning, or volunteering.
Leadership abilities develop over time through participation in groups and/or teams that are engaged in challenging or competitive activities.
9.1.12.C.5. Assume a leadership position by guiding the thinking of peers in a direction that leads to successful completion of a challenging task or

project.
Ethical behaviors support human rights and dignity in all aspects of life.
9.1.12.F.2. Demonstrate a positive work ethic in various settings, including the classroom and during structured learning experiences.

UNIT ESSENTIAL QUESTIONS:	UNIT ENDURING UNDERSTANDINGS:
▪ If a quadratic equation isn't factorable, how is it solved?	▪ Quadratic equations are solved by factoring or by using the quadratic formula. ▪ If the quadratic equation is factorable, and you use the quadratic formula, you will always get the same solution.

TIME ALLOTMENT	CONTENT	SKILLS	ASSESSMENT

2 weeks	Students will:
	
	▪ Understand how to rewrite a quadratic equation in standard form to solve for a given variable.
	▪ Understand that when a quadratic equation can't be factored, in order to solve it for the given variable, the quadratic formula needs to be used.
		Students will be able to:
		
		▪ Solve a quadratic by factoring first, then solve for the given variable.
		▪ Use the discriminant to figure out if the quadratic is factorable or not.
		▪ Use the quadratic formula to solve a quadratic equation if it's not factorable.
		▪ Solve word problems involving quadratics.
			▪ **Formative Assessments**
			  1. Extended constructed response questions
			  2. Short constructed response questions
			  3. Knowledge rating sheet
			  4. Exit slips
			  5. Homework
			  6. Smartboard/Board
			  7. Volunteers
			  8. Questions/Answers
			  9. Individual desk work
			  10. Think/Pair/Share
			  11. Cooperative learning groups
			  12. BINGO
			
			▪ **Summative Assessments**
			  1. Performance assessment tasks
			  2. Tests
			  3. Quizzes

TEACHER RESOURCES	TEACHER NOTES/REFLECTIONS
- McDougal Littell Algebra I Text - McDougal Littell Algebra I Workbooks - Kuta Software - Pizzazz Algebra - Understanding math	

UNIT 7: Radicals

UNIT SUMMARY:
As an overview:
1. Students will investigate radicals in this unit.
2. They will simplify expression involving radicals and they will solve radical equations. They will be introduced to the distance formula. They will also perform operations with radicals.
3. This unit's rationale is to not only teach the basics, but to enforce the importance of rationalizing and also bring up the discussion of taking the square root of a negative number. This discussion will lead to complex numbers.

21ST CENTURY THEMES:

☐ Global Awareness
☒ Financial, Economic, Business and Entrepreneurial Literacy
☐ Civic Literacy
☐ Health Literacy

PRIMARY INTERDISCIPLINARY CONNECTIONS:
1. Some amusement park rides spin so fast that the riders "stick" to the walls of the rides. The force exerted by the wall on the ride is called centripetal force. To design an amusement park ride, engineers must figure out the dimensions of the ride and how many times per minute it will spin. Learning how to calculate the force generated by such a ride is connected to science.

STANDARDS

Interpret the structure of expressions
A-SSE.2. Use the structure of an expression to identify ways to rewrite it.
Understand solving equations as a process of reasoning and explain the reasoning
A-REI.2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
21st Century Standards
The ability to recognize a problem and apply critical thinking and problem-solving skills to solve the problem is a lifelong skill that develops over time.
9.1.12.A.1. Apply critical thinking and problem-solving strategies during structured learning experiences.
Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative thinking.
9.1.12.B.3 Assist in the development of innovative solutions to an onsite problem by incorporating multiple perspectives and applying effective problem-solving strategies during structured learning experiences, service learning, or volunteering.
Leadership abilities develop over time through participation in groups and/or teams that are engaged in challenging or competitive activities.
9.1.12.C.5. Assume a leadership position by guiding the thinking of peers in a direction that leads to successful completion of a challenging task or

project.
Ethical behaviors support human rights and dignity in all aspects of life.
9.1.12.F.2. Demonstrate a positive work ethic in various settings, including the classroom and during structured learning experiences.

UNIT ESSENTIAL QUESTIONS:	UNIT ENDURING UNDERSTANDINGS:
▪ What are the properties of radicals and how are they used to evaluate, simplify and solve?	▪ The properties of radicals are similar to the properties of integers exponents and are used in a similar manner to simplify and solve.

TIME ALLOTMENT	CONTENT	SKILLS	ASSESSMENT
3 weeks	Students will: ▪ Understand when a radical is in simplest form. ▪ Understand how to perform operations with radicals.	Students will be able to: ▪ Simplify radical. ▪ Recognize perfect squares. ▪ Add radicals. ▪ Subtract radicals. ▪ Multiply radicals. ▪ Rationalize. ▪ Solve radical equations and check for extraneous solutions.	▪ **Formative Assessments** 1. Extended constructed response questions 2. Short constructed response questions 3. Knowledge rating sheet 4. Exit slips 5. Homework 6. Smartboard/Board 7. Volunteers 8. Questions/Answers 9. Individual desk work 10. Think/Pair/Share 11. Cooperative learning groups 12. BINGO ▪ **Summative Assessments** 1. Performance assessment tasks 2. Tests 3. Quizzes 4. Distance formula Task

TEACHER RESOURCES	TEACHER NOTES/REFLECTIONS

▪ McDougal Littell Algebra I Text ▪ McDougal Littel Algebra I Workbooks ▪ Kuta Software ▪ Pizzazz Algebra ▪ Understanding math	

UNIT 8: Rational Expressions and Equations

UNIT SUMMARY:

As an overview:
1. In this unit, students work with expressions that involve polynomials and rational expressions.
2. They learn to solve and apply proportions. Students learn to add and subtract rational expressions. They will learn how to rewrite a rational expression in order to simplify it.   They will also explore how to multiply and divide rational expressions in order to once again, simplify them. Finally, students solve rational equations.
3. The rationale of this unit is to have students use prior knowledge to problem solve in this unit.

21ST CENTURY THEMES:	**PRIMARY INTERDISCIPLINARY CONNECTIONS:**
⊠ Global Awareness ⊠ Financial, Economic, Business and Entrepreneurial Literacy ⊠ Civic Literacy ☐ Health Literacy	1.An architectural scale model is a smaller, three-dimensional representation of a structure. Models can be built for a single building or an entire city. Architects, builders, and city planners use them. The dimensions of a scale model can be determined by solving a proportion and other rational equations.

STANDARDS

Understand solving equations as a process of reasoning and explain the reasoning

A-REI.2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

Rewrite rational expressions

A-APR.6. Rewrite simple rational expressions in different forms using inspection, long division, or, for the more complicated examples, a computer algebra system.

A-APR.7. Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expressions; add, subtract, multiply, and divide rational expressions.

Interpret the structure of expressions

A-SSE 2. Use the structure of an expression to identify ways to rewrite it.

21st Century Standards

The ability to recognize a problem and apply critical thinking and problem-solving skills to solve the problem is a lifelong skill that develops over time.

9.1.12.A.1. Apply critical thinking and problem-solving strategies during structured learning experiences.

Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative thinking.

9.1.12.B.3 Assist in the development of innovative solutions to an onsite problem by incorporating multiple perspectives and applying effective problem-solving strategies during structured learning experiences, service learning, or volunteering.
Leadership abilities develop over time through participation in groups and/or teams that are engaged in challenging or competitive activities.
9.1.12.C.5. Assume a leadership position by guiding the thinking of peers in a direction that leads to successful completion of a challenging task or project.
Ethical behaviors support human rights and dignity in all aspects of life.
9.1.12.F.2. Demonstrate a positive work ethic in various settings, including the classroom and during structured learning experiences.

UNIT ESSENTIAL QUESTIONS:	UNIT ENDURING UNDERSTANDINGS:
▪ How is mathematics communicated through patterns, functions and concepts? ▪ How can the formal language of algebra describe functions?	▪ Algebra is a symbolic language used to express mathematical relationships, patterns, functions and concepts.

TIME ALLOTMENT	CONTENT	SKILLS	ASSESSMENT
3 weeks	Students will: ▪ Know values of a variable for which an algebraic fraction id defined. ▪ Communicate verbally and in writing a correct, compete, coherent, and clear explanation for the steps used in solving a problem.	Students will be able to: ▪ Simplify rational expressions. ▪ Multiply and divide rational expressions. ▪ Add and subtract rational expressions. ▪ Solve rational equations and check for extraneous solutions.	▪ **Formative Assessments** 1. Extended constructed response questions 2. Short constructed response questions 3. Knowledge rating sheet 4. Exit slips 5. Homework 6. Smartboard/Board 7. Volunteers 8. Questions/Answers 9. Individual desk work 10. Think/Pair/Share 11. Cooperative learning groups 12. BINGO ▪ **Summative Assessments** 1. Performance assessment tasks 2. Tests 3. Quizzes

TEACHER RESOURCES	TEACHER NOTES/REFLECTIONS
- McDougal Littell Algebra I Text - McDougal Littell Algebra I Workbooks - Kuta Software - Pizzazz Algebra - Understanding math	

UNIT 9: Graphing

UNIT SUMMARY:
As an overview:
1. Students will now make a connection between the solutions of a given equation and its graph.
2. Students will graph linear, exponential, quadratic, absolute value and linear inequality functions. They will learn how to analyze each type of function.
3. They will see how these graphs can relate to the real world.

21ST CENTURY THEMES:

☐ Global Awareness
☒ Financial, Economic, Business and Entrepreneurial Literacy
☐ Civic Literacy
☐ Health Literacy

PRIMARY INTERDISCIPLINARY CONNECTIONS:
1.Before 1873, public transportation in San Francisco was provided by horse-drawn wagons. To design a transportation system, people needed a mathematical way to describe and measure steepness which is directly connected to history.

STANDARDS

Represent and solve equations and inequalities graphically
A-REI.10. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).
A-REI.12. Graph the solutions to linear inequalities in two variables as a half-plane (excluding the boundary in the case of a strict inequality).
Create equations that describe numbers or relationships
A-CED.2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
Understand the concept of a function and use function notation.
F.IF.1 Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$.
F.IF.2 Use function notation and evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
Analyze functions using different representations.
F-IF.7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

a. Graph linear and quadratic functions and shoe intercepts, maxima, and minima.

b. Graph absolute value functions.

F-IF.8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of the context.

Interpret Linear Models

S-ID.7. Interpret the slope and the intercept of a linear model in the context of the data.

21st Century Standards

The ability to recognize a problem and apply critical thinking and problem-solving skills to solve the problem is a lifelong skill that develops over time.

9.1.12.A.1. Apply critical thinking and problem-solving strategies during structured learning experiences.

Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative thinking.

9.1.12.B.3 Assist in the development of innovative solutions to an onsite problem by incorporating multiple perspectives and applying effective problem-solving strategies during structured learning experiences, service learning, or volunteering.

Leadership abilities develop over time through participation in groups and/or teams that are engaged in challenging or competitive activities.

9.1.12.C.5. Assume a leadership position by guiding the thinking of peers in a direction that leads to successful completion of a challenging task or project.

Ethical behaviors support human rights and dignity in all aspects of life.

9.1.12.F.2. Demonstrate a positive work ethic in various settings, including the classroom and during structured learning experiences.

Money management is reliant on developing and maintaining personal budgets.

9.2.12.B.4. Analyze how income and spending plans are affected by age, needs, and resources.

UNIT ESSENTIAL QUESTIONS:	UNIT ENDURING UNDERSTANDINGS:
▪ What is a coordinate plane? ▪ What are the different types of functions? ▪ How can functions be graphed on a coordinate plane? ▪ How does a graph relate to the real world? ▪ Can a function be created given certain information or even a graph?	▪ There is a relationship between the graph of a function and the real world.

TIME	CONTENT	SKILLS	ASSESSMENT

ALLOTMENT			
4 weeks	Students will: ■ Understand that there are different types of graphs depending on the type of function. ■ Understand how to graph different functions given certain information. ■ Understand the relationship between the function and its graph. ■ Recognize what type of equation to write given certain information.	Students will be able to: ■ Describe the coordinate plane. ■ Identify the quadrants. ■ Plot points. ■ Identify ordered pairs. ■ Graph a linear equation by using slope-intercept form. ■ Graph a linear function by finding the x and y intercepts. ■ Recall point-slope form. ■ Solve problems using direct variation. ■ Write equations given specific information. ■ Write equations given a graph. ■ Graph absolute value functions. ■ Graph exponential functions. ■ Solve linear equations graphically. ■ Graph quadratic functions using factoring and the vertex. ■ Graph linear inequalities.	■ **Formative Assessments** 1. Extended constructed response questions 2. Short constructed response questions 3. Knowledge rating sheet 4. Exit slips 5. Homework 6. Smartboard/Board 7. Volunteers 8. Questions/Answers 9. Individual desk work 10. Think/Pair/Share 11. Cooperative learning groups 12. BINGO ■ **Summative Assessments** 1. Performance assessment tasks 2. Tests 3. Quizzes 4. Cell phone project

TEACHER RESOURCES	**TEACHER NOTES/REFLECTIONS**
■ McDougal Littell Algebra I Text ■ McDougal Littell Algebra I Workbooks ■ Kuta Software ■ Pizzazz Algebra ■ Understanding math	

UNIT 10: Systems

UNIT SUMMARY:
As an overview:
1. This unit introduces systems of linear equations and inequalities.
2. Students will solve a system of two linear equations by using graphing, substitution and linear combination. The choice of method for solving a particular linear system is considered and linear systems that have one solutions, no solution, or infinite solutions are defined. Systems of linear inequalities are solved by graphing.
3. Real-life models can be used to show linear systems.

21ST CENTURY THEMES:

☒ Global Awareness
☒ Financial, Economic, Business and Entrepreneurial Literacy
☐ Civic Literacy
☐ Health Literacy

PRIMARY INTERDISCIPLINARY CONNECTIONS:
1. To see how the need for low-income rental housing has changed over time, you can look at a model.

STANDARDS

Create equations that describe numbers or relationships
A-CED.3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.
Solve systems of equations
A-REI.5. Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.
A-REI.6. Solve systems of linear equations exactly and approximately, focusing on pairs of linear equations in two variables (with graphs).
Represent and solve equations and inequalities graphically
A-REI.12. Graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.
21st Century Standards
The ability to recognize a problem and apply critical thinking and problem-solving skills to solve the problem is a lifelong skill that develops over time.
9.1.12.A.1. Apply critical thinking and problem-solving strategies during structured learning experiences.
Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative

thinking.

9.1.12.B.3 Assist in the development of innovative solutions to an onsite problem by incorporating multiple perspectives and applying effective problem-solving strategies during structured learning experiences, service learning, or volunteering.

Leadership abilities develop over time through participation in groups and/or teams that are engaged in challenging or competitive activities.

9.1.12.C.5. Assume a leadership position by guiding the thinking of peers in a direction that leads to successful completion of a challenging task or project.

Ethical behaviors support human rights and dignity in all aspects of life.

9.1.12.F.2. Demonstrate a positive work ethic in various settings, including the classroom and during structured learning experiences.

UNIT ESSENTIAL QUESTIONS:	UNIT ENDURING UNDERSTANDINGS:
▪ What is the significance of a solution to a linear system of equations and inequalities?	▪ A solution to a linear system of equations is the intersection point of the lines. ▪ A solution to a linear system of inequalities is the region that they have in common.

TIME ALLOTMENT	CONTENT	SKILLS	ASSESSMENT
3 weeks	Students will: ▪ Understand the significance of a solution to a linear system of equations and inequalities**.**	Students will be able to: ▪ Solve a system of equations graphically. ▪ Solve a system algebraically. ▪ Solve a system of inequalities graphically. ▪ Validate solutions and judge the reasonableness of the solution.	▪ **Formative Assessments** 1. Extended constructed response questions 2. Short constructed response questions 3. Knowledge rating sheet 4. Exit slips 5. Homework 6. Smartboard/Board 7. Volunteers 8. Questions/Answers 9. Individual desk work 10. Think/Pair/Share 11. Cooperative learning groups 12. BINGO

			▪ **Summative Assessments**
			   1. Performance assessment tasks
			   2. Tests
			   3. Quizzes

TEACHER RESOURCES	**TEACHER NOTES/REFLECTIONS**
▪ McDougal Littell Algebra I Text ▪ McDougal Littell Algebra I Workbooks ▪ Kuta Software ▪ Pizzazz Algebra ▪ Understanding math	

UNIT 11: Matrices

UNIT SUMMARY:
As an overview:
1. Students will learn about matrices in this unit.
2. They will learn how to add, subtract and perform scalar multiplication with matrices. They will learn when an answer is undefined.
3. They will explore how a matrix can be used to organize data in the real world.

21ST CENTURY THEMES:

☒ Global Awareness
☒ Financial, Economic, Business and Entrepreneurial Literacy
☒ Civic Literacy
☒ Health Literacy

PRIMARY INTERDISCIPLINARY CONNECTIONS:
1. In history, looking at political data can be put into matrix format to better understand what is being looked at.
2. Health surveys can also be done to analyze childhood obesity

STANDARDS

Perform operations on matrices and use matrices in applications.
N-VM.6. Use matrices to represent and manipulate data.
N-VM.7. Multiply matrices by scalars to produce new matrices.
N-VM.8. Add, subtract and multiply matrices of appropriate dimensions.
21st Century Standards
The ability to recognize a problem and apply critical thinking and problem-solving skills to solve the problem is a lifelong skill that develops over time.
9.1.12.A.1. Apply critical thinking and problem-solving strategies during structured learning experiences.
Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative thinking.
9.1.12.B.3 Assist in the development of innovative solutions to an onsite problem by incorporating multiple perspectives and applying effective problem-solving strategies during structured learning experiences, service learning, or volunteering.
Leadership abilities develop over time through participation in groups and/or teams that are engaged in challenging or competitive activities.

9.1.12.C.5. Assume a leadership position by guiding the thinking of peers in a direction that leads to successful completion of a challenging task or project.
Ethical behaviors support human rights and dignity in all aspects of life.
9.1.12.F.2. Demonstrate a positive work ethic in various settings, including the classroom and during structured learning experiences.

UNIT ESSENTIAL QUESTIONS:	UNIT ENDURING UNDERSTANDINGS:
▪ What is a matrix and how it be used?	▪ A matrix is a rectangular arrangement of rows and columns. ▪ It can be used to organize data and to perform geometric transformations.

TIME ALLOTMENT	CONTENT	SKILLS	ASSESSMENT
1 weeks	Students will: ▪ Understand matrices are representations of real-world situations.	Students will be able to: ▪ Perform the operations of addition, subtraction, and scalar multiplication for a set of matrices.	▪ **Formative Assessments** 1. Extended constructed response questions 2. Short constructed response questions 3. Knowledge rating sheet 4. Exit slips 5. Homework 6. Smartboard/Board 7. Volunteers 8. Questions/Answers 9. Individual desk work 10. Think/Pair/Share 11. Cooperative learning groups 12. BINGO ▪ **Summative Assessments** 1. Performance assessment tasks 2. Tests 3. Quizzes

TEACHER RESOURCES	TEACHER NOTES/REFLECTIONS
■ McDougal Littell Algebra I Text ■ McDougal Littell Algebra I Workbooks ■ Kuta Software	