

Glen Ridge Public Schools –Mathematics Curriculum



Course Title: Functions and Relations

Subject: Mathematics

Grade Level: 11th

Duration: Full Year

Prerequisite: Applied Geometry or Geometry Grade “C” or higher

Elective or Required: Required

Mathematics Mission Statement

Mathematics is an integral part of our lives. Students must be actively involved in their mathematics education through the use of modeling and demonstrating the ability to persevere through problem solving. The mathematics curricula will emphasize critical thinking skills through a balance of logic and reasoning, attention to precision by utilizing patterns and structure, and bridging these ideas to cross-curricular learning. Students will be engaged and challenged in a student-centered learning environment that is developmentally appropriate and will communicate mathematical ideas, both in a verbal and written form. Through effectively applying hands-on manipulatives, basic computation skills and the use of technical writing to justify their processes, students will critique the work of themselves and others.

Course Description:

Functions and Relations extends the investigation of mathematical functions, their graphs, and their properties. This course starts off by examining linear and quadratic functions and relations in the 1st half of the year. In the second half of the year we will examine polynomial and rational functions. Students will analyze graphs of functions to determine their characteristics and transformations. Multiple strategies are explored in order to solve linear and quadratic equations along with systems of equations. There is an infusion of technology in this course where students will use the graphing calculator in a way that enhance their learning experience in order to solve more complex mathematical concepts.

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Date Submitted: Summer 2017

Functions and Relations

I Equation and Inequality Review

Approximate # Of Weeks: 5

Essential Questions:

- How is solving equations similar to solving inequalities?
- How is solving equations different than solving inequalities?
- How can you solve an equation using a graphing calculator?
- How can you check a solution to an equation by hand?
- How can you check a solution to an equation on the calculator?
- How is solving linear equations similar to solving literal equations?
- How is solving linear equations different than solving literal equations.
- How do “And” and “Or” compound inequalities differ?

Upon completion of this unit students will be able to:

- Solve equations using the properties of equality.
- Solve literal equations.
- Generate tables of values for literal equations using technology.
- Evaluate expressions involving absolute values.
- Graph and solve absolute value equations by hand and on the calculator •
- Solve multi-step inequalities.
- Solve compound inequalities.
- Graph and solve absolute value inequalities.

NJ Student Learning Standards:

- CC.9-12.ASSE.1, 2
- CC.9-12.ACED.1, 3

Interdisciplinary Standards (njcccs.org)

- Standard 5.1 – Science Practices
- Standard 8.1 -- Computer and Information Literacy
- Standard 8.2 – Technology Education
- Standard 9.1 – 21st - Century Life & Career Skills

Activities – include 21st Century Technologies:

- TI-Calculator discovery activities
- Smart notebook lessons
- Online quizzes from textbook website
- Online videos from textbook website
- Enrichment – United States Gross National Product
- Enrichment – Equivalence Relations
- Open-ended discussion questions on google classroom
- Class lecture and discussion
- Khan Academy
- Youtube videos

Enrichment Activities:

- Study Guide and Intervention
- Skills Practice
- Word Problem Practice
- Practice
- Mathbits activities

Methods of Assessments/Evaluation:

- Thumbs up/down
- Think-pair-share
- Dry erase response
- Find the mistake
- Kahoot
- Homework
- Graded classwork
- Partner activities
- Google Classroom exit ticket/question
- Chapter Test
- Individual problem assessment during lesson
- Graphing calculator check
- Self-Assessment (4-3-2-1)
- Open-ended question
- Skyward quizzes

Resources/Including Online Resources

- Online Textbook Information: connected.mcgraw-hill.com
- Google Classroom
- Various Youtube channels
- TI-83/84 Graphing Calculator

Prerequisite Learning Goals Self-Assessment Chart

Learning Level	Objectives	Assessment 4 I can teach others 3 I can pass an assessment 2 I need more practice 1 I don't understand
1	<ul style="list-style-type: none"> ● Solve one step equations ● Solve inequalities that don't require multiplying or dividing by a negative 	
2	<ul style="list-style-type: none"> ● Solve two-step equations ● Solve inequalities that don't require sign flip 	
3	<ul style="list-style-type: none"> ● Solve multi-step equations and inequalities ● Solve compound inequalities ● Solve absolute value equations and inequalities ● Check solutions by hand and on the graphing calculator. ● Transform literal equations into slope-intercept form. 	
4	<ul style="list-style-type: none"> ● Write and solve equations and inequalities for real world situations ● Write and solve compound inequalities for real world situations ● Solve absolute value equations and inequalities by hand and on the graphing calculator. 	

II Linear Relations and Functions

Approximate # Of Weeks: 6

Essential Questions:

- What makes a relation a function?
- How can we use mapping to determine whether a relation is a function?
- How can we use the vertical line test to determine whether a relation is a function?
- How can linear relationships be modeled graphically?
- How can we find the slope and y-intercept when an equation is given?
- How can you determine which form is better to use when the slope and points of a line are given?
- How do you graph a piecewise function?
- Which form does the equation have to be in to graph on the graphing calculator?
- How can you tell if two lines are parallel, perpendicular, or neither by looking at the equations in slope-intercept form?

Upon completion of this unit students will be able to:

- Identify linear relations and functions.
- Write linear equations in standard form.
- Find rate of change.
- Determine the slope of a line
- Write an equation of a line given the slope and a point on the line using point-slope form and slope-intercept form
- Write an equation of a line parallel or perpendicular to a given line.
- Graph a piecewise function.
- Use scatter plots and prediction equations.
- Model data using lines of regression.
- Describe transformations of functions.
- Graph linear inequalities.

NJ Student Learning Standards:

- CC.9-12. A.SSE.1
- CC.9-12. A.CED.2
- CC.9-12. F.IF.4-6, 9

Interdisciplinary Standards (njcccs.org)

- Standard 5.1 – Science Practices
- Standard 8.1 -- Computer and Information Literacy
- Standard 8.2 – Technology Education
- Standard 9.1 – 21st - Century Life & Career Skills
- Standard 9.3 – Career Awareness, Exploration, and Preparation

Activities – include 21st Century Technologies:

- SmartBoard powerpoint presentations
- Lecture and class discussion
- Word Problem Practice – Relations and Functions
- Word Problem Practice – Linear Relations and Functions
- Word Problem Practice – Rate of Change and Slope
- Word Problem Practice – Writing Linear Equations
- Word Problem Practice – Scatter Plots and Lines of Regression
- Word Problem Practice – Graphing Linear and Absolute Value Inequalities
- Enrichment – Real Number Relations and Functions
- Enrichment – The Increase in Greenhouse Gases
- Enrichment – Median-Fit Lines • Enrichment – Limits
- TI-Calculator Activity – Graphing Linear Functions
- TI-Calculator Activity – Exploring Linear Functions
- TI-Calculator Activity – Graphing Linear Inequalities
- TI-Calculator Activity – Graphing Absolute Value Inequalities
- Online quizzes from textbook website
- Online videos from textbook website

Enrichment Activities:

- Study Guide and Intervention
- Skills Practice
- Word Problem Practice
- Practice
- Mathbits activities

Methods of Assessments/Evaluation:

- Thumbs up/down
- Think-pair-share
- Dry erase response
- Find the mistake
- Kahoot
- Homework
- Graded classwork
- Partner activities
- Google Classroom exit ticket/question
- Chapter Test
- Individual problem assessment during lesson
- Graphing calculator check
- Self-Assessment (4-3-2-1)
- Open-ended question
- Skyward quizzes

Resources/Including Online Resources

- Online Textbook Information: connected.mcgraw-hill.com
- Google Classroom
- Various Youtube channels
- TI-83/84 Graphing Calculator

Prerequisite Learning Goals Self-Assessment Chart

Learning Level	Objectives	Assessment
		4 I can teach others 3 I can pass an assessment 2 I need more practice 1 I don't understand
1	<ul style="list-style-type: none"> • Recognize a linear function when in slope-intercept form and graphically 	
2	<ul style="list-style-type: none"> • Identify the slope and y-intercept when a linear function is in slope-intercept form. • Find the slope and y-intercept of a graph when a line is given. • Graph when a linear function is in slope-intercept form 	
3	<ul style="list-style-type: none"> • Put a linear function into slope-intercept form and graph on a coordinate plane. • Find the rate of change of a function more than one way 	
4	<ul style="list-style-type: none"> • Find the rate of change using all forms of representation • Use linear functions for real world situations 	

III Quadratic Functions

Approximate # Of Weeks: 10

Essential Questions:

- How can you tell if a function is linear or quadratic by looking at the graph?
- How can you tell if a function is linear or quadratic by looking at the equation?
- How can you tell how wide or narrow the graph of a quadratic will be by looking at the equation in standard form?
- How can you tell if a graphs opens upward or downward?
- How can you tell if a quadratic function has a maximum or minimum by looking at the equation in standard form?
- How can you convert a quadratic equation from vertex form to standard form?
- How do you determine where the graph of a quadratic function crosses the x-axis?
- How do you determine if a graph of a quadratic function crosses the x-axis?
- When in vertex form what does the a, h, and k tell you about the function?
- What type of real life situations are best modeled by quadratic functions.

Upon completion of this unit students will be able to:

- Graph quadratic functions.
- Be able to describe the graph of a quadratic function by looking at the equation.
- Be able to compare a quadratic function to the parent function.
- Find and interpret the maximum and minimum values of a quadratic function.
- Solve quadratic equations by graphing.
- Estimate solutions of quadratic equations by graphing.
- Write quadratic equations in standard form.
- Solve quadratic equations by factoring.
- Solve quadratic equations by using the Quadratic Formula.
- Use the discriminant to determine the number and type of roots of a quadratic equation.
- Solving quadratic equations by completing the square.

- Write a quadratic function in vertex form.
- Transform graph of quadratics that are in vertex form.
- Graph quadratic inequalities in two variables.
- Solve quadratic inequalities in one variable.

NJ Student Learning Standards:

- CC.9-12.ACED.2
- CC.9-12.ASSE.1,2
- CC.9-12. A.REI.11
- CC.9-12.F.IF.4, 8
- CC.9-12.N.CN.1,2, 7

Interdisciplinary Standards (njcccs.org)

- Standard 5.1 – Science Practices
- Standard 8.1 -- Computer and Information Literacy
- Standard 8.2 – Technology Education
- Standard 9.1 – 21st - Century Life & Career Skills
- Standard 9.3 – Career Awareness, Exploration, and Preparation

Activities – include 21st Century Technologies:

- SmartBoard powerpoint presentations
- Lecture and class discussion
- Word Problem Practice – Graphing Quadratic Functions
- Word Problem Practice – Solving Quadratic Equations by Graphing
- Word Problem Practice – Completing the Square
- Word Problem Practice – The Quadratic Formula and the Discriminant
- Word Problem Practice – Quadratic Inequalities
- Enrichment – Finding the x-intercepts of a Parabola
- Enrichment – Graphing Absolute Value Equations
- Enrichment – The Golden Quadratic Equations
- The Vertex: The Fireworks Fiasco Activity (Glencoe)
- TI-Calculator Activity – Graphing Quadratic Functions
- TI-Calculator Activity – Exploring Quadratic Functions
- Online quizzes from textbook website
- Online videos from textbook website

Enrichment Activities:

- Study Guide and Intervention
- Skills Practice
- Word Problem Practice
- Practice
- Mathbits activities

Methods of Assessments/Evaluation:

- Thumbs up/down
- Think-pair-share

- Dry erase response
- Find the mistake
- Kahoot
- Homework
- Graded classwork
- Partner activities
- Google Classroom exit ticket/question
- Chapter Test
- Individual problem assessment during lesson
- Graphing calculator check
- Self-Assessment (4-3-2-1)
- Open-ended question
- Skyward quizzes

Resources/Including Online Resources

- Online Textbook Information: connected.mcgraw-hill.com
- Google Classroom
- Various Youtube channels
- TI-83/84 Graphing Calculator

Prerequisite Learning Goals Self-Assessment Chart

Learning Level	Objectives	Assessment 4 I can teach others 3 I can pass an assessment 2 I need more practice 1 I don't understand
1	<ul style="list-style-type: none"> • Identify solutions to quadratic functions when graphed on a coordinate plane 	
2	<ul style="list-style-type: none"> • Use transformations to graph basic quadratic functions • Be able to solve quadratics using any method 	
3	<ul style="list-style-type: none"> • Be able to graph quadratics in standard form • Be able to solve quadratic functions using multiple methods • Use the determinant to determine how many solutions a quadratic has. 	
4	<ul style="list-style-type: none"> • Be able to solve quadratic functions using all methods • Use quadratic functions for real world situations 	

IV Polynomial Functions

Approximate # Of Weeks: 7

Essential Questions:

- What is a polynomial function?
- How do you add and subtract polynomial functions?
- How do you multiply polynomials?
- How do you divide a polynomial by a monomial?
- How do you divide a polynomial by a polynomial with two or more terms?
- How do you graph a polynomial?
- How can we find solutions to polynomials?
- How do you graph factorable polynomials?

- How can you find the zeros of polynomial functions?
- How can we use polynomial functions to model real life situations?

Upon completion of this unit students will be able to:

- Identify and classify various types of polynomials.
- Multiply, divide, and simplify monomials and expressions involving powers
- Add, subtract, and multiply polynomials.
- Divide polynomials by monomials.
- Divide polynomials using long division
- Divide polynomials using synthetic division.
- Graph polynomials.
- Identify the zeros of a polynomial.
- Use the Factor Theorem to determine factors of a polynomial.
- Analyze, describe, and graph polynomials by looking at end behavior.
- Identify relative maxima and minima of polynomial functions

NJ Student Learning Standards:CC.9-12.A.APR.1-6

- CC.9-12.ACED.2
- CC.9-12.ASSE.1,2
- CC.9-12. A.REI.11
- CC.9-12.F.IF.4, 8
- CC.9-12.N.CN.1,2, 7

Interdisciplinary Standards (njcccs.org)

- Standard 5.1 – Science Practices
- Standard 8.1 -- Computer and Information Literacy
- Standard 8.2 – Technology Education
- Standard 9.1 – 21st - Century Life & Career Skills
- Standard 9.3 – Career Awareness, Exploration, and Preparation

Activities – include 21st Century Technologies:

- SmartBoard powerpoint presentations
- Lecture and class discussion
- Textbook Activity – Operations with Polynomial
- Textbook Activity – Applying Polynomial Functions
- TI-Calculator Activity – Graphing Higher Degree Polynomials
- TI-Calculator Activity – Identifying End Behavior
- TI-Calculator Activity – Identifying all Real Roots
- TI-Calculator Activity – Curve Fitting with Polynomial Models
- Desmos/Geogebra online graphing exploration
- Khan Academy
- Youtube videos
- Online quizzes from textbook website
- Online videos from textbook website

Enrichment Activities:

- Study Guide and Intervention
- Skills Practice
- Word Problem Practice
- Practice
- Mathbits activities

Methods of Assessments/Evaluation:

- Thumbs up/down
- Think-pair-share
- Dry erase response
- Find the mistake
- Kahoot
- Homework
- Graded classwork
- Partner activities
- Google Classroom exit ticket/question
- Chapter Test
- Individual problem assessment during lesson
- Graphing calculator check
- Self-Assessment (4-3-2-1)
- Open-ended question
- Skyward quizzes

Resources/Including Online Resources

- Online Textbook Information: connected.mcgraw-hill.com
- Google Classroom
- Various Youtube channels
- TI-83/84 Graphing Calculator
- Khan Academy
- Desmos

Prerequisite Learning Goals Self-Assessment Chart

Learning Level	Objectives	Assessment 4 I can teach others 3 I can pass an assessment 2 I need more practice 1 I don't understand
1	<ul style="list-style-type: none"> ● None 	
2	<ul style="list-style-type: none"> ● Name polynomials by degree and terms ● Add and Subtract polynomials ● Divide a polynomial by a monomial ● Graph polynomials when the domain is given 	
3	<ul style="list-style-type: none"> ● Multiply polynomials ● Divide polynomials using long and synthetic division ● Graph polynomials ● Identify relative maxima and minima of polynomial functions 	
4	<ul style="list-style-type: none"> ● Analyze, describe, and graph polynomials by looking at end behavior. ● Identify and use the relative maxima and minima of polynomial functions to solve real world situations. 	

V Radical and Rational Functions and Relations (If time permits)

Approximate # Of Weeks: 6

Essential Questions:

- How can you solve radical equations?
- What methods are there for solving rational equations?
- Do every radical and rational equation have one answer?
- How do you find the inverse of a rational function?
- Why is factoring important when simplifying rational expressions?
- How do you know if a rational expression is completely simplified?

Upon completion of this unit students will be able to:

- Solve equations containing radicals
- Give examples showing how extraneous solution may arise
- Simplify rational expressions
- Find the inverse of a rational function
- Simplify complex fractions
- Graph radical functions
- Graph simple rational functions
- Identify the zeros, holes, and asymptotes of a rational function by the graph.
- Solve rational equations

NJ Student Learning Standards:

- CC.9-12.A.APR.7
- CC.9-12.ASSE.1
- CC.9-12. A.REI.2
- CC.9-12.A.CED.1-3

Interdisciplinary Standards (njcccs.org)

- Standard 5.1 – Science Practices
- Standard 8.1 -- Computer and Information Literacy
- Standard 8.2 – Technology Education
- Standard 9.1 – 21st - Century Life & Career Skills
- Standard 9.3 – Career Awareness, Exploration, and Preparation

Activities – include 21st Century Technologies:

- SmartBoard powerpoint presentations
- Lecture and class discussion
- Word Problem Practice – Rational Equations and Inequalities
- Word Problem Practice – Multiplying and Dividing Rational Expressions
- Enrichment – Truth Tables.
- Online quizzes from textbook website
- Online videos from textbook website

Enrichment Activities:

- Study Guide and Intervention
- Skills Practice
- Word Problem Practice
- Practice
- Mathbits activities

Methods of Assessments/Evaluation:

- Thumbs up/down
- Think-pair-share
- Dry erase response
- Find the mistake
- Kahoot
- Homework
- Graded classwork
- Partner activities
- Google Classroom exit ticket/question
- Chapter Test
- Individual problem assessment during lesson
- Graphing calculator check
- Self-Assessment (4-3-2-1)
- Open-ended question
- Skyward quizzes

Resources/Including Online Resources

- Online Textbook Information: connected.mcgraw-hill.com
- Google Classroom
- Various Youtube channels
- TI-83/84 Graphing Calculator

Prerequisite Learning Goals Self-Assessment Chart

Learning Level	Objectives	Assessment 4 I can teach others 3 I can pass an assessment 2 I need more practice 1 I don't understand
1	<ul style="list-style-type: none"> ● None 	
2	<ul style="list-style-type: none"> ● Solve equations containing radicals ● Graph radical functions 	
3	<ul style="list-style-type: none"> ● Solve rational equations ● Find the inverse of a rational function 	
4	<ul style="list-style-type: none"> ● Identify the zeros, holes, and asymptotes of a rational function looking at the graph. 	