Hoboken Public Schools

Algebra I Honors Curriculum

Algebra One Honors

HOBOKEN PUBLIC SCHOOLS

Course Description

Algebra I Honors reflects the New Jersey learning standards at the high school level and is designed to give students the requisite skills for all future mathematics courses through real world problem solving. Students will explore writing, solving and graphing linear equations and inequalities, powers and exponents, quadratic equations, polynomials, factoring and statistics. The first unit in this curriculum is the basis of Algebra I and a review of learning in 8th grade curricula. Teachers will also pace assessments at an accelerated rate throughout this course as appropriate to student readiness. The graphing calculator will be used as a tool to enhance instruction and the PARCC exam will be administered in the spring. Algebra I Honors provides the logic and modeling skills necessary to solve real world situations and scenarios vital to success in our continually changing global society. Algebra I Hones offers the foundation for success in future, higher-level math courses. Students will develop an understanding of and appreciation for using mathematics to analyze patterns and explain solutions to complex real world problems in precise and logical detail, using modern technology where appropriate. Special Note: Instruction will be more rigorous in this class that the entry level Algebra I course. Students will be responsible for independent and self reflective practices.

Course Resources

OnCore Mathematics Algebra 1 Workbook
Khan Academy
Kuta Software
Edmentum Assessment

References & Suggested Instructional Websites

http://illuminations.nctm.org/Lessons-Activities.aspx (choose grade level and connect to search lessons)
http://www.yummymath.com/birds-eye-of-activities/
http://map.mathshell.org/tasks.php?collection=9&unit=HE06
http://www.shmoop.com/common-core-standards/math.html
http://www.njcore.org/standards?processing=true#
https://hcpss.instructure.com/courses/99
https://www.desmos.com/
http://www.geogebra.org/

Pacing Guide

Unit Titles	Time Frame
Unit One: Modeling with Linear Equations and Inequalities	**6-8 Weeks**
Unit Two: Modeling with Linear Functions, Linear Systems, & Exponential Functions	**6-8 Weeks**
Unit Three: Quadratic Equations, Functions, & Polynomials	**6-8 Weeks**
Unit Four: Modeling with Statistics	**6-8 Weeks**

Unit 1 – Modeling with Linear Equations and Inequalities

Six to Eight Weeks

Unit 1 Overview

In this unit, students will be able to solve linear equations and inequalities in one variable. Students will be able to understand solving equations as a process of reasoning and explain the reasoning. Students will be able to represent and solve equations graphically.

Essential Questions

- How can we use mathematics to model and solve real world scenarios and situations?
- How can students interpret parts of an expression?
- How will students rewrite algebraic expressions by combining like terms?
- How can students reason quantitatively and use units to solve problems?
- How can students write equations and inequalities from a given context?
- How can students solve a linear equation and inequality in one variable?
- How can students solve literal equations for any given variable?

Essential Learning Outcomes

- Students will be able to solve linear equations and inequalities in one variable
- Students will be able to understand solving equations as a process of reasoning and explain the reasoning
- Students will be able to represent and solve equations graphically

Technology Infusion

8.1.12.A.1, 8.1.12.A.2

Standards Addressed:

N.Q.A.1, N.Q.A.2., N.Q.A.3., A.REI.B.3., A.REI.A.1., A.CED.A.4., A.SSE.A.1., A.CED.A.1., A.REI.A.1., A.CED.A.2., A.REI.D.10., S.ID.B.6., S.ID.C.7., S.ID.C.8., S.ID.C.9., A.REI.D.11

Differentiation

- Relate the concepts of scale factor and unit conversion to previously learned skills such as proportions to make the concept more accessible for students.
- Develop notes/Google Docs or Anchor charts which describe concepts and skills using context and high interest examples for students to use as a reference while problem solving.
- Practice the thinking and procedure involved in isolating/highlighting a variable in a formula with students.
- Model the thinking process and steps involved when solving linear equations in context.
- Encourage students to justify their reasoning.
- Provide students with sentence stems if needed.
- Model how to determine what the parts of an expression mean in context by decomposing the expression. Work toward students being able to provide this explanation with little or no prompting.
- Provide opportunities for students to practice rewriting expressions in equivalent forms. Make sure to use context-based problems to facilitate understanding and retention.

- Provide detailed notes and multiple examples to illustrate the different ways to approach factoring and why they are useful and do not change the value of the expressions.
- Model how to approach contextualized problems using available resources and linking to previous learning.
- Encourage students to refer to the resources provided when constructing algebraic models to solve problems.
- Support and strengthen students' ability to justify reasoning by modeling, providing resources, praising students and providing them with sentence stems if needed.
- Demonstrate for students how the concept of creating algebraic equations and expressions for real life situations progresses and grows with graphing.
- Develop mnemonic devices for students to remember key concepts related to graphing equations.
- Provide students with resources for creating algebraic representations and graphing real life situations that they can refer to while working on contextualized problems.
- Use graphing calculators or computer models, to demonstrate and help students visualize the differences between linear, exponential and quadratic functions.
- Create Notes/Google Docs/Anchor Charts with students that use real life examples to demonstrate the characteristics and analyze the meaning of linear, exponential and quadratic functions and their respective graphs.
- Use high interest examples to illustrate the meaning of slope and y intercept.
- Model the thinking process of how to distinguish correlation versus causation.
- Use examples that reflect interest of students.
- Use questioning strategies to encourage students to verbalize their thinking and level of understanding.
- Model the thinking behind this concept for students multiple ways using contextualized examples.
- Spend the time to explain the progression from concrete to abstract for students.
- Develop a way of remembering what $f(x) = g(x)$ means with students to make retention and application more likely.

Assessments

- Describe Learning Vertically
- Identify Key Building Blocks
- Make Connections (between and among key building blocks)
- Short/Extended Constructed Response Items
- Multiple-Choice Items (where multiple answer choices may be correct)
- Drag and Drop Items
- Use of Equation Editor
- Quizzes/Tests
- Journal Entries/Reflections/Quick-Writes
- Accountable talk
- Projects
- Portfolio
- Observation
- Graphic Organizers/ Concept Mapping
- Presentations
- Role Playing
- Teacher-Student and Student-Student Conferencing
- Homework

21st Century Learning Connection

- 9.1.12.A.1
  Apply critical thinking and problem-solving strategies during structured learning experiences.
- 9.4.12A.16 Employ critical thinking skills independently and in teams to solve problems and make decisions, (e.g., analyze, synthesize, and evaluate).

Unit 2 Modeling with Linear Functions, Linear Systems, & Exponential Functions

Six to Eight Weeks

Unit 2 Overview

In this unit, students will be able to solve systems of equations and inequalities graphically and algebraically. Students will be able to construct and compare linear and exponential models. Students will be able to understand the concept of a function and use function notation. Students will build a function to model the relationship between two quantities.

Essential Questions

- How are the different parts of the expressions represent in the context of the problem?
- How can the graphical model of a system of equations/inequalities be used to reason and draw conclusions?
- How can functions be used to find solutions to real-world problems and predict outcomes?
- How are the differentiating characteristics of linear vs. exponential functions identified?

Essential Learning Outcomes

- Students will be able to solve systems of equations and inequalities graphically and algebraically.
- Students will be able to construct and compare linear and exponential models.
- Students will be able to understand the concept of a function and use function notation. Students will build a function to model the relationship between two quantities.

Technology Infusion

8.1.12.A.1, 8.1.12.A.2

Standards Addressed:

A.REI.C.6, A.CED.A.3, A.REI.C.5, A.REI.D.12, A.CED.A.3, F.IF.A.1, F.IF.A.2, F.LE.A.1, F.LE.A.1a, F.LE.A.1b, F.LE.A.1c, F.LE.A.2, F.IF.A.3, F.BF.A.1, A.SSE.A.1, A.SSE.A.1a, A.SSE.A.1b, A.SSE.B.3, A.SSE.B.3c, F.IF.B.4, F.LE.B.5, F.IF.C.9, F.IF.B.6, F.IF.C.7, F.IF.C.7a, F.IF.C.7b

Differentiation

- Relate the concepts of scale factor and unit conversion to previously learned skills such as proportions to make the concept more accessible for students.
- Develop notes/Google Docs or Anchor charts which describe concepts and skills using context and high interest examples for students to use as a reference while problem solving.
- Practice the thinking and procedure involved in isolating/highlighting a variable in a formula with students.
- Model the thinking process and steps involved when solving linear equations in context.

- Encourage students to justify their reasoning.
- Provide students with sentence stems if needed.
- Model how to determine what the parts of an expression mean in context by decomposing the expression. Work toward students being able to provide this explanation with little or no prompting.
- Provide opportunities for students to practice rewriting expressions in equivalent forms. Make sure to use context-based problems to facilitate understanding and retention.
- Provide detailed notes and multiple examples to illustrate the different ways to approach factoring and why they are useful and do not change the value of the expressions.
- Model how to approach contextualized problems using available resources and linking to previous learning.
- Encourage students to refer to the resources provided when constructing algebraic models to solve problems.
- Support and strengthen students' ability to justify reasoning by modeling, providing resources, praising students and providing them with sentence stems if needed.
- Demonstrate for students how the concept of creating algebraic equations and expressions for real life situations progresses and grows with graphing.
- Develop mnemonic devices for students to remember key concepts related to graphing equations.
- Provide students with resources for creating algebraic representations and graphing real life situations that they can refer to while working on contextualized problems.
- Use graphing calculators or computer models, to demonstrate and help students visualize the differences between linear, exponential and quadratic functions.
- Create Notes/Google Docs/Anchor Charts with students that use real life examples to demonstrate the characteristics and analyze the meaning of linear, exponential and quadratic functions and their respective graphs.
- Use high interest examples to illustrate the meaning of slope and y intercept.
- Model the thinking process of how to distinguish correlation versus causation.
- Use examples that reflect interest of students.
- Use questioning strategies to encourage students to verbalize their thinking and level of understanding.
- Model the thinking behind this concept for students multiple ways using contextualized examples.
- Spend the time to explain the progression from concrete to abstract for students.
- Develop a way of remembering what $f(x) = g(x)$ means with students to make retention and application more likely.

Assessments

- Describe Learning Vertically
- Identify Key Building Blocks
- Make Connections (between and among key building blocks)
- Short/Extended Constructed Response Items
- Multiple-Choice Items (where multiple answer choices may be correct)
- Drag and Drop Items
- Use of Equation Editor
- Quizzes/Tests
- Journal Entries/Reflections/Quick-Writes
- Accountable talk
- Projects
- Portfolio
- Observation
- Graphic Organizers/ Concept Mapping
- Presentations

- Role Playing
- Teacher-Student and Student-Student Conferencing
- Homework

21st Century Learning Connection

- 9.1.12.A.1
  Apply critical thinking and problem-solving strategies during structured learning experiences.
- 9.4.12A.16 Employ critical thinking skills independently and in teams to solve problems and make decisions, (e.g., analyze, synthesize, and evaluate).

Unit 3 – Quadratic Equations, Functions, & Polynomials

Six to Eight Weeks

Unit 3 Overview

In this unit, students will be able to perform arithmetic operations on polynomials. Students will be able to solve quadratic equations using a method most advantageous to the situation. Students will use quadratic relationships to model and solve real world problems. Students will be able to construct and compare linear, exponential and quadratic models.

Essential Questions

- How can students use polynomial operations of addition, subtraction, and multiplication in real-world situations?
- How do you determine which method is best for solving a quadratic equation?
- How are the zeros of a polynomial related to its graph?
- How can quadratic polynomials be written in different forms to find the zeros, vertex and axis/lines of symmetry?
- How are the strategies and methods used to construct and compare linear, quadratic and exponential models and solve problems?
- How do functions change based on transformations? Can students represent vertical and horizontal shifts?

Essential Learning Outcomes

- Students will be able to perform arithmetic operations on polynomials.
- Students will be able to solve quadratic equations using a method most advantageous to the situation. Students will use quadratic relationships to model and solve real world problems.
- Students will be able to construct and compare linear, exponential and quadratic models.

Technology Infusion

8.1.12.A.1, 8.1.12.A.2

Standards Addressed:

A.APR.A.1, A.SSE.A.2, A.REI.B.4, A.CED.A.1, F.IF.B.4, F.IF.B.5, A.SSE.B.3, F.BF.A.1, F.IF.C.7, F.IF.C.8, F.IF.C.9, F.IF.B.6, F.LE.A.3, F.BF.B.3, A.REI.D.11, A.APR.B.3, N.RN.B.3

Differentiation

- Relate the concepts of scale factor and unit conversion to previously learned skills such as proportions to make the concept more accessible for students.
- Develop notes/Google Docs or Anchor charts which describe concepts and skills using context and high interest examples for students to use as a reference while problem solving.
- Practice the thinking and procedure involved in isolating/highlighting a variable in a formula with students.
- Model the thinking process and steps involved when solving linear equations in context.
- Encourage students to justify their reasoning.
- Provide students with sentence stems if needed.
- Model how to determine what the parts of an expression mean in context by decomposing the expression. Work toward students being able to provide this explanation with little or no prompting.
- Provide opportunities for students to practice rewriting expressions in equivalent forms. Make sure to use context-based problems to facilitate understanding and retention.
- Provide detailed notes and multiple examples to illustrate the different ways to approach factoring and why they are useful and do not change the value of the expressions.
- Model how to approach contextualized problems using available resources and linking to previous learning.
- Encourage students to refer to the resources provided when constructing algebraic models to solve problems.
- Support and strengthen students' ability to justify reasoning by modeling, providing resources, praising students and providing them with sentence stems if needed.
- Demonstrate for students how the concept of creating algebraic equations and expressions for real life situations progresses and grows with graphing.
- Develop mnemonic devices for students to remember key concepts related to graphing equations.
- Provide students with resources for creating algebraic representations and graphing real life situations that they can refer to while working on contextualized problems.
- Use graphing calculators or computer models, to demonstrate and help students visualize the differences between linear, exponential and quadratic functions.
- Create Notes/Google Docs/Anchor Charts with students that use real life examples to demonstrate the characteristics and analyze the meaning of linear, exponential and quadratic functions and their respective graphs.
- Use high interest examples to illustrate the meaning of slope and y intercept.
- Model the thinking process of how to distinguish correlation versus causation.
- Use examples that reflect interest of students.
- Use questioning strategies to encourage students to verbalize their thinking and level of understanding.
- Model the thinking behind this concept for students multiple ways using contextualized examples.
- Spend the time to explain the progression from concrete to abstract for students.
- Develop a way of remembering what $f(x) = g(x)$ means with students to make retention and application more likely.

Assessments

- Describe Learning Vertically
- Identify Key Building Blocks
- Make Connections (between and among key building blocks)
- Short/Extended Constructed Response Items
- Multiple-Choice Items (where multiple answer choices may be correct)
- Drag and Drop Items

- Use of Equation Editor
- Quizzes/Tests
- Journal Entries/Reflections/Quick-Writes
- Accountable talk
- Projects
- Portfolio
- Observation
- Graphic Organizers/ Concept Mapping
- Presentations
- Role Playing
- Teacher-Student and Student-Student Conferencing
- Homework

21st Century Learning Connection

- 9.1.12.A.1
  Apply critical thinking and problem-solving strategies during structured learning experiences.
- 9.4.12A.16 Employ critical thinking skills independently and in teams to solve problems and make decisions, (e.g., analyze, synthesize, and evaluate).

Unit 4 – Modeling with Statistics

Six to Eight Weeks

Unit 4 Overview

In this unit, students will be able to use probability and statistics to represent real world situations and interpret and communicate results, using technology when needed. Students will be able to summarize, represent and interpret data.

Essential Questions

- How can students accurately represent data on a real number line using dot plots, histograms or box plots?
- How can students make determinations based on the shape of the data distribution?
- How can students calculate standard deviation for a set of data?
- How can students use the shape, center, and spread to interpret the differences of the data?
- How are two-way frequency tables used to interpret joint, marginal and conditional relative frequencies of categorical data?
- How can using technology to fit a function to data help students learn more about functions?

Essential Learning Outcomes

- Students will be able to use probability and statistics to represent real world situations and interpret and communicate results, using technology when needed.
- Students will be able to summarize, represent and interpret data.

Technology Infusion

8.1.12.A.1, 8.1.12.A.2

Differentiation

- Relate the concepts of scale factor and unit conversion to previously learned skills such as proportions to make the concept more accessible for students.
- Develop notes/Google Docs or Anchor charts which describe concepts and skills using context and high interest examples for students to use as a reference while problem solving.
- Practice the thinking and procedure involved in isolating/highlighting a variable in a formula with students.
- Model the thinking process and steps involved when solving linear equations in context.
- Encourage students to justify their reasoning.
- Provide students with sentence stems if needed.
- Model how to determine what the parts of an expression mean in context by decomposing the expression. Work toward students being able to provide this explanation with little or no prompting.
- Provide opportunities for students to practice rewriting expressions in equivalent forms. Make sure to use context-based problems to facilitate understanding and retention.
- Provide detailed notes and multiple examples to illustrate the different ways to approach factoring and why they are useful and do not change the value of the expressions.
- Model how to approach contextualized problems using available resources and linking to previous learning.
- Encourage students to refer to the resources provided when constructing algebraic models to solve problems.
- Support and strengthen students' ability to justify reasoning by modeling, providing resources, praising students and providing them with sentence stems if needed.
- Demonstrate for students how the concept of creating algebraic equations and expressions for real life situations progresses and grows with graphing.
- Develop mnemonic devices for students to remember key concepts related to graphing equations.
- Provide students with resources for creating algebraic representations and graphing real life situations that they can refer to while working on contextualized problems.
- Use graphing calculators or computer models, to demonstrate and help students visualize the differences between linear, exponential and quadratic functions.
- Create Notes/Google Docs/Anchor Charts with students that use real life examples to demonstrate the characteristics and analyze the meaning of linear, exponential and quadratic functions and their respective graphs.
- Use high interest examples to illustrate the meaning of slope and y intercept.
- Model the thinking process of how to distinguish correlation versus causation.
- Use examples that reflect interest of students.
- Use questioning strategies to encourage students to verbalize their thinking and level of understanding.
- Model the thinking behind this concept for students multiple ways using contextualized examples.
- Spend the time to explain the progression from concrete to abstract for students.
- Develop a way of remembering what $f(x) = g(x)$ means with students to make retention and application more likely.

Assessments

- Describe Learning Vertically
- Identify Key Building Blocks
- Make Connections (between and among key building blocks)
- Short/Extended Constructed Response Items
- Multiple-Choice Items (where multiple answer choices may be correct)
- Drag and Drop Items

- Use of Equation Editor
- Quizzes/Tests
- Journal Entries/Reflections/Quick-Writes
- Accountable talk
- Projects
- Portfolio
- Observation
- Graphic Organizers/ Concept Mapping
- Presentations
- Role Playing
- Teacher-Student and Student-Student Conferencing
- Homework

21st Century Learning Connection

- 9.1.12.A.1
  Apply critical thinking and problem-solving strategies during structured learning experiences.
- 9.4.12A.16 Employ critical thinking skills independently and in teams to solve problems and make decisions, (e.g., analyze, synthesize, and evaluate).