# Washington Township School District

*The mission of the Washington Township Public Schools is to provide a safe, positive, and progressive educational environment that provides opportunity for all students to attain the knowledge and skills specified in the NJ Learning Standards at all grade levels, so as to ensure their full participation in an ever-changing world as responsible, self-directed and civic-minded citizens.*

| Course Title: | Algebra 1 |
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| Grade Level(s): | 9-12 |
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| Duration: | *Full Year:* | **X** | *Semester:* | | *Marking Period:* | |
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| Course Description: | The fundamental purpose of this course is to formalize and extend the mathematics that students learned in the middle grades. The critical areas, deepen and extend understanding of linear and exponential relationships by contrasting them with each other and by applying linear models to data that exhibit a linear trend, and students engage in methods for analyzing, solving, and using quadratic functions. The Mathematical Practice Standards apply throughout the course and, together with the content standards, prescribe that students experience mathematics as a coherent, useful, and logical subject that makes use of their ability to make sense of problem situations. Each lesson begins with an Essential Question, followed by an Exploration. Once the inquiry section is completed, students begin the direct instruction lesson, helping them to reason and make sense of their answers based on the knowledge they gained during discovery. |
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| Grading Procedures: | Each semester will be a composite of quiz scores, test scores, homework, and participation reflecting a student's mastery of the areas outlined above. The student can pass the course with an overall average of 70%. The individual teacher will explain the grading system to the student. |
| Primary Resources: | **Algebra 1 with Big Ideas Learning Textbook**<br>**NJ Common Core State Standards**<br>**NJ Student Learning Standards** |

# Washington Township Principles for Effective Teaching and Learning

- Implementing a standards-based curriculum
- Facilitating a learner-centered environment
- Using academic target language and providing comprehensible instruction
- Adapting and using age-appropriate authentic materials
- Providing performance-based assessment experiences
- Infusing 21st century skills for College and Career Readiness in a global society

| Designed by: | Heather Nicholas & Kaitlyn Filipiak |
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| Written: | July 2022 |
| Revised: | |
| BOE Approval: | |

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**Unit 1: Chapter 1: Solving Linear Equations**

**Unit Description:** This unit gives the foundations of solving linear equations by connecting it to students' prior skills with properties of equality. The unit starts with basic equations and builds on these solving skills so that students can apply them to more complex linear equations. The second part of the unit uses these skills as a bridge to solving absolute value equations. The unit concludes with using properties of equality to rewrite formulas and equations to help students solve real life problems

**Unit Duration: 13 Days**

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## Desired Results

**Standard(s):**

> **A-CED: A-** Create equations that describe numbers or relationships.

> **A-REI: A-** Understand solving equations as a process of reasoning and explain the reasoning.
> **A-REI: B-** Solve equations and inequalities in one variable.

**Practices:**
**MP1:** Make sense of problems and persevere in solving them.
**MP2:** Reason abstractly and quantitatively.
**MP4:** Model with Mathematics.
**MP6:** Attend to precision.
**MP7:** Look for and make use of structure.

**Indicators:**
**HSA-CED.A.1**: Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.
**HSA-REI.A.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
**HSA-REI.B.3**: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

| **Understandings:** | **Essential Questions:** |
|---|---|
| *Students will understand that…* | • How can you use simple equations to solve real-life problems? |
| • Creating equations can solve real-life problems | • How can you use multi-step equations to solve real-life problems? |
| • Isolating the variable is key to solving linear equations | • How can you solve an equation that has variables on both sides? |

| | |
|---|---|
| • Properties of equality can be used to solve equations that are not linear such as absolute value<br>• Applying equation solving strategies to formulas is essential to solving problems. | • How can you solve an absolute value equation? |

## Assessment Evidence

**Performance Tasks:**
• Classwork Assignments (Practice worksheets, online assignments, activities, explorations/investigations, etc.)
• Homework Assignments (Worksheets, online assignments, etc.)
• Class Participation and Preparation
• Class Discussion
• Quizzes
• Test
•Benchmark Assessment

**Other Evidence:**

• Use of digital platforms (Quizizz, Formative, quizlet live, kahoot, Schoology, Big Ideas Platform, etc.)

• Conferences

• Student Performance during group activities

• Activities i.e. stations, group work, independent practice, card sorts, task cards, etc.

• Project Based Assessment (optional)

**\*Additional or alternative performance tasks may be used**

**Benchmarks:** Successful completion of quizzes and tests.

## Learning Plan

**Learning Activities: Guided Notes, worksheets, EdPuzzles, Do Nows, Formative, etc.**

**1.1: Solving Simple Equations  (1 day)**
- Solving Equations Using Addition and Subtraction
- Solving Equations Using Multiplication and Division
- Modeling Real Life

**1.2: Solving Multi-Step Equations (2 days)**
- Solving a Two-Step Equation
- Combining like Terms to Solve an Equation
- Using Structure to solve a Multi-Step equation
- Modeling Real Life

**1.3: Modeling Quantities (optional)**
- Using Ratios
- Using Rates
- Converting Units of Measure
- Modeling Real Life

**1.4: Accuracy with Measurements  (optional)**
- Estimating Measurements
- Estimating Results
- Modeling Real Life

**1.5: Solving Equations with Variables on Both Sides ( 2 days)**
- Solving and Equation With Variables on Both Sides
- Solving an Equation With Grouping Symbols
- Solving an Equation with Variables on Both Sides (Special Solutions)

- Modeling Real Life

**1.6: Solving Absolute Value Equations (3 days)**
- Solving Absolute Value Equations
- Solving Multi-Step Absolute Value Equations
- Modeling Real Life (optional)
- Solving Equations With Two Absolute Values
- Identifying Extraneous Solutions (optional)

**1.7: Rewriting Equations and Formulas (optional/complete with chapter 3)**
- Rewriting a Literal Equation
- Rewriting a Formula for Surface Area
- Modeling Real Life (Word Problems)

**Test Review ( 1 day)**
**Test (1 Day)**

*Additional 3 days used for extra practice, review and quiz days *

**Resources: Textbook, online resources, etc.**

| Unit Modifications for Special Population Students | |
|---|---|
| **Advanced Learners** | • Ask reflective and extension questions to build on classroom knowledge to develop a deeper understanding<br>• Use enrichment and extension activities<br>• Have them complete additional critical thinking exercise to develop a deeper understanding |
| **Struggling Learners** | • Read Problems aloud frequently<br>• Rephrase questions for student clarification<br>• Preferential Seating – close proximity to teacher<br>• Redirect student attention to the step-by-step explanation of each concept.<br>• Use of Dynamic Monitoring Tool to practice basic skills<br>• Have student view re-teaching videos |
| **English Language Learners** | • Have student view re-teaching videos<br>• Rephrase questions for student clarification<br>• Easy access to language dictionary, instructor, or any other means to help interpret any language/communication difficulties<br>• Allow use of translator device<br>• Provide vocabulary flash cards<br>• For Spanish speaking students view re-teaching videos in Spanish |
| **Special Needs Learners** | Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items |

| | the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org |
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| **Learners with a 504** | Refer to page four in the Parent and Educator Resource Guide to Section 504 to assist in the development of appropriate plans. |

## Interdisciplinary Connections

**Indicators:**

**New Jersey Student Learning Standards for English Language Arts**
**RST.9-10.3**. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
**RST.9-10.4**. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.

**New Jersey Student Learning Standards for Technology Education**
**9.4.12.O.11**: Apply active listening skills to obtain and clarify information.
**9.4.12.O.17**: Employ critical thinking skills (e.g., analyze, synthesize, and evaluate) independently and in teams to solve problems and make decisions.

## Integration of 21st Century Skills

**Indicators:**

The P21 organization conducted research that identified deeper learning competencies and skills they called the Four Cs of 21st century learning:

Collaboration
Communication
Critical thinking

| **Unit 2: Chapter 2: Solving Linear Inequalities** |
|---|
| **Unit Description:** This unit uses the techniques and skills that students learned in Unit 1 to solve linear inequalities. The unit focuses on writing and real-life problems. The lessons provide progressively more complex problems to solve. The last two lessons focus on compound inequalities and their necessity to solving absolute value inequalities. Connections to real life problems and career applications are woven throughout. |
| **Unit Duration: 14 Days** |

## Desired Results

**Standard(s):**

**A-CED:A-** Create equations that describe numbers or relationships.
**A-REI: B-** Solve equations and inequalities in one variable.

**Practices:**
**MP1:** Make sense of problems and persevere in solving them.
**MP2:** Reason abstractly and quantitatively.
**MP3:** Construct viable arguments and critique the reasoning of others..
**MP5:** Use appropriate tools strategically.
**MP6:** Attend to precision.
**MP7:** Look for and make use of structure.

**Indicators:**

**HSA-CED.A.1**: Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.
**HSA-REI.B.3**: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

| **Understandings:** | **Essential Questions:** |
|---|---|
| *Students will understand that…* <br> • Inequalities can be represented on a number line. <br> • Linear inequalities can be solved using the same techniques used to solve linear equations. <br> • Compound inequalities describe two different but related constraints. <br> • Absolute value inequalities are described using compound inequalities. <br> • Many real-life situations are described using linear inequalities. | • How can you use an inequality to describe real-life statements? <br> • How can you use addition or subtraction to solve an inequality? <br> • How can you use division to solve an inequality? <br> • How can you solve a multi-step inequality? <br> • How can you use inequalities to describe intervals on the real number line? <br> • How can you solve an absolute value inequality? |

## Assessment Evidence

| **Performance Tasks:** | **Other Evidence:** |
|---|---|
| • Classwork Assignments (Practice worksheets, online assignments, activities, explorations/investigations, etc.) <br> • Homework Assignments (Worksheets, online assignments, etc.) | • Use of digital platforms (Quizizz, Formative, quizlet live, kahoot, Schoology, Big Ideas Platform, etc.) <br> • Conferences <br> • Student Performance during group activities |

| • Class Participation and Preparation<br>• Class Discussion<br>• Quizzes<br>• Test<br>• Benchmark Assessment | • Activities i.e. stations, group work, independent practice, card sorts, task cards, etc.<br>• Project Based Assessment (optional)<br>**\*Additional or alternative performance tasks may be used** |
|---|---|

**Benchmarks:** Successful completion of quizzes and tests.

## Learning Plan

**Learning Activities: Guided Notes, worksheets, EdPuzzles, Do Nows, Formative, etc.**

**2.1: Writing and Graphing Inequalities (1 day)**
- Writing Inequalities
- Checking Solutions of Inequalities (optional)
- Graphing Inequalities
- Writing an Inequality from a Graph (optional)
- Interpreting an Inequality (optional)

**2.2: Solving Inequalities Using Addition or Subtraction (1/2 day)**
- Solving an Inequality Using Addition
- Solving Inequalities Using Subtraction
- Modeling Real Life (Optional)

**2.3: Solving Inequalities using Multiplication or Division (1/2 day)**
- Multiplying or Dividing by Positive Numbers
- Multiplying or Dividing by Negative Numbers
- Modeling Real Life (Optional)

**2.4: Solving Multi-Step Inequalities (2 days)**
- Solving Multi-Step Inequalities
- Solving and Inequality with Variables on Both Sides
- Inequalities with Special Solutions
- Modeling Real Life

**2.5: Solving Compound Inequalities (3 days)**
- Writing and Graphing Compound Inequalities
- Solving Compound Inequalities With "And"
- Solving Compound Inequalities With "Or"
- Modeling Real Life (optional)

**2.6: Solving Absolute Value Inequalities (3 days)**
- Solving Absolute Value Inequalities
- Modeling Real Life (optional)

**Test Review ( 1 day)**
**Test (1 Day)**

*Additional 2 days used for review and quiz days *

**Resources: Textbook, online resources, etc.**

## Unit Modifications for Special Population Students

| | |
|---|---|
| **Advanced Learners** | • Ask reflective and extension questions to build on classroom knowledge to develop a deeper understanding<br>• Use enrichment and extension activities<br>• Have them complete additional critical thinking exercise to develop a deeper understanding |
| **Struggling Learners** | • Read Problems aloud frequently<br>• Rephrase questions for student clarification<br>• Preferential Seating – close proximity to teacher<br>• Redirect student attention to the step-by-step explanation of each concept.<br>• Use of Dynamic Monitoring Tool to practice basic skills<br>• Have student view re-teaching videos |
| **English Language Learners** | • Have student view re-teaching videos<br>• Rephrase questions for student clarification<br>• Easy access to language dictionary, instructor, or any other means to help interpret any language/communication difficulties<br>• Allow use of translator device<br>• Provide vocabulary flash cards<br>• For Spanish speaking students view re-teaching videos in Spanish |
| **Special Needs Learners** | Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org |
| **Learners with a 504** | Refer to page four in the Parent and Educator Resource Guide to Section 504 to assist in the development of appropriate plans. |

| **Interdisciplinary Connections** |
|---|

**Indicators:**
**New Jersey Student Learning Standards for English Language Arts**
**RST.9-10.3**. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
**RST.9-10.4**. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.

**RST.9-10.7**. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
**New Jersey Student Learning Standards for Technology Education**
**9.3.ST-ET.5**: Apply the knowledge learned in STEM to solve problems.
**9.4.12.O.17**: Employ critical thinking skills (e.g., analyze, synthesize, and evaluate) independently and in teams to solve problems and make decisions.

## Integration of 21st Century Skills

**Indicators:**
The P21 organization conducted research that identified deeper learning competencies and skills they called the Four Cs of 21st century learning:

Collaboration
Communication
Critical thinking

| **Unit 3: Chapter 3: Graphing Linear Functions** |
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| **Unit Description:** This unit starts by building on students' prior knowledge of functions and extends it to function notation, determining functions, and distinguishing between discrete and continuous functions. This understanding of functions focuses on linear functions given in two different forms, slope-intercept and standard. Emphasis is placed on graphing lines given in these two forms. The unit concludes with applying transformations to graphs of linear and absolute value functions. |
| **Unit Duration: 11 days** |

| Desired Results |
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**Standard(s):**
- **A-CED:A-** Create equations that describe numbers or relationships.
- **A-REI: D-** Represent and solve equations and inequalities graphically.
- **F-IF-A:** Understand the concept of a function and use function notation
- **F-IF-B:** Interpret functions that arise in applications in terms of the context
- **F-IF-C:** Analyze functions using different representations
- **F-LE: A-** Construct and compare linear and exponential models and solve problems.

**Practices:**
**MP1:** Make sense of problems and persevere in solving them.
**MP4:** Model with Mathematics.
**MP5:** Use appropriate tools strategically.
**MP6:** Attend to precision.
**MP8:** Look for and express regularity in repeated reasoning.

**Indicators:**

**F-LE: B-** Interpret expressions for functions in terms of the situation they model.

**HSA-CED.A.2**: Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

**HSA-REI.D.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).

**HSF-IF.A.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 $y = f(x)$.

**HSF-IF.A.2**: Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

**HSF-IF.B.4**: For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.*

**HSF-IF.B.5**: Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.*

**HSF-IF.C.7a**: Graph linear and quadratic functions and show intercepts, maxima, and minima.

**HSF-IF.C.9**: Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.

**HSF-LE.A.1b**: Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.

**HSF-LE.B.5**: Interpret the parameters in a linear or exponential function in terms of a context.

| **Understandings:** | **Essential Questions:** |
|---|---|
| *Students will understand that…* | • What is a function? |
| • Functions can be represented with different notation. | • How can you determine whether a function is linear or nonlinear? |
| • Linear equations can be graphed by finding the slope of the line. | • How can you use a function notation to represent a function? |
| • Functions require elements in the domain are mapped to exactly one element in the range. | • How can you describe the graph of the equation $Ax + By = C$? |
| • Many real-life problems can be represented by linear functions. | • How can you describe the graph of the equations $y = mx + b$? |
| • Students can use transformations of graphs to represent other related linear and absolute value functions. | • How does the graph of the linear function $f(x) = x$ compare to the graphs of $g(x) = f(x) + c$ and $h(x) = f(cx)$? |
| | • How do the values of a, h, and k affect the graph of the absolute value function $g(x) = a \mid x - h \mid + k$? |

## Assessment Evidence

| **Performance Tasks:** | **Other Evidence:** |
|---|---|
| • Classwork Assignments (Practice worksheets, online assignments, activities, explorations/investigations, etc.) | • Use of digital platforms (Quizizz, Formative, quizlet live, kahoot, Schoology, Big Ideas Platform, etc.) |
| • Homework Assignments (Worksheets, online assignments, etc.) | • Conferences |
| • Class Participation and Preparation | • Student Performance during group activities |
| • Class Discussion | • Activities i.e. stations, group work, independent practice, card sorts, task cards, etc. |
| • Quizzes | • Project Based Assessment (optional) |
| • Test | **\*Additional or alternative performance tasks may be used** |
| •Benchmark Assessment | |

**Benchmarks:** Successful completion of quizzes and tests.

## Learning Plan

**Learning Activities:** **Guided Notes, worksheets, EdPuzzles, Do Nows, Formative, etc.**

**3.1: Functions (optional: covered in 8th grade math)**
- Determining Whether Relations are Functions
- Using the Vertical Line Test
- Finding the Domain and Range From a Graph
- Identifying Independent and Dependent Variables
- Modeling Real Life

**3.2: Characteristics of Functions (optional)**
- Estimating Intercepts
- Describing Characteristics

- Modeling Real Life

**3.3: Linear Functions (optional: covered in 8th grade math)**
- Identifying Linear Functions using Graphs
- Identifying Linear Functions using Tables
- Identifying Linear Functions using Equations

**3.4: Function Notation (2 days)**
- Evaluating a Function
- Interpreting Function Notation
- Solving for the Independent Variable
- Graphing a Linear Function in Function Notation
- Modeling Real Life

**3.5: Graphing Linear Equations in Standard Form (2 days)**
- Graphing Horizonal and Vertical Lines
- Using Intercepts to Graph a Linear Equation
- Modeling Real Life

**Option to complete 1.7 here. (1 day)**

**3.6: Graphing Linear Equations in Slope-Intercept Form (2 days)**
- Finding Slopes of Lines
- Finding Slope From Tables
- Identifying Slopes and y-intercepts
- Using Slope-Intercept Form to Graph an Equation
- Graphing from a verbal description (optional)
- Modeling Real Life (optional)

**3.7: Transformations of Linear Functions -Optional**
- Describing Horizontal and Vertical Translations
- Describing Reflections in the $x$-Axis and $y$-Axis
- Describing Horizontal and Vertical Stretches
- Describing Horizontal and Vertical Shrinks
- Combining Transformations
- Modeling Real Life

**3.8 Graphing Absolute Value Functions- Complete with Chapter 8**
- Graphing $g(x) = |x| + k$ and $g(x) = |x - h|$
- Graphing $g(x) = a|x|$
- Graphing $f(x) = |x - h| + k$ and $g(x) = f(ax)$
- Graphing $g(x) = a|x - h| + k$

**Test Review ( 1 day)**
**Test (1 Day)**

*Additional 2 days used for review and quiz days *

**Resources: Textbook, online resources, etc.**

| Unit Modifications for Special Population Students | |
|---|---|
| **Advanced Learners** | • Ask reflective and extension questions to build on classroom knowledge to develop a deeper understanding<br>• Use enrichment and extension activities<br>• Have them complete additional critical thinking exercise to develop a deeper understanding |
| **Struggling Learners** | • Read Problems aloud frequently<br>• Rephrase questions for student clarification<br>• Preferential Seating – close proximity to teacher<br>• Redirect student attention to the step-by-step explanation of each concept.<br>• Use of Dynamic Monitoring Tool to practice basic skills<br>• Have student view re-teaching videos |
| **English Language Learners** | • Have student view re-teaching videos<br>• Rephrase questions for student clarification<br>• Easy access to language dictionary, instructor, or any other means to help interpret any language/communication difficulties<br>• Allow use of translator device<br>• Provide vocabulary flash cards<br>• For Spanish speaking students view re-teaching videos in Spanish |
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| Interdisciplinary Connections |
|---|
| **Indicators:**<br>**New Jersey Student Learning Standards for English Language Arts**<br>**RST.9-10.3**. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. |

**RST.9-10.4**. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.

**RST.9-10.7**. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

**New Jersey Student Learning Standards for Social Studies**
**Developing Claims and Using Evidence-** Developing claims requires careful consideration of evidence, logical organization of information, self-awareness about biases, application of analysis skills, and a willingness to revise conclusions based on the strength of evidence. Using evidence responsibly means developing claims based on factual evidence, valid reasoning, and a respect for human rights.
**Recognizing and Defining Computational Problems**
The ability to recognize appropriate and worthwhile opportunities to apply computation is a skill that develops over time and is central to computing. Solving a problem with a computational approach requires defining the problem, breaking it down into parts, and evaluating each part to determine whether a computational solution is appropriate.

**New Jersey Student Learning Standards for Technology Education**
**9.3.ST-ET.5**: Apply the knowledge learned in STEM to solve problems.
**9.4.12.O.11**: Apply active listening skills to obtain and clarify information.

## Integration of 21ˢᵗ Century Skills

**Indicators:**
The P21 organization conducted research that identified deeper learning competencies and skills they called the Four Cs of 21st century learning:

Collaboration
Communication
Critical thinking
Creativity

| Unit 4: Chapter 4: Writing Linear Functions |
|---|
| **Unit Description:** This unit builds on unit 3, graphing linear equations. Those skills are extended to writing linear equations in two forms, slope-intercept and standard form. Connections are made between slopes of two lines and whether their relationship is that of parallel or perpendicular lines. The middle part of the unit makes real life connections by using data in scatter plots to model situations with linear equations either by using a graphing calculator or a spreadsheet. The unit ends by introducing the concept of an arithmetic sequence by connecting the y-intercept of linear function to the first term of a sequence. These concepts will be extended in algebra 2. |
| **Unit Duration: 14 Days** |

## Desired Results

**Standard(s):**

**A-CED:A-** Create equations that describe numbers or relationships.
**A-REI: D-** Represent and solve equations and inequalities graphically.
**F-IF:A-** Understand the concept of a function and use function notation.
**F-BF: A-** Build a function that models a relationship between two quantities.

**F-LE: A-** Construct and compare linear, quadratic, and exponential models and solve problems.
**F-LE: B-** Interpret expressions for functions in terms of the situation they model.
**S-ID: B-** Summarize, represent, and interpret data on two categorical and quantitative variables
**S-ID: C-** Interpret linear models

**Practices:**

**MP1:** Make sense of problems and persevere in solving them.
**MP2:** Reason abstractly and quantitatively.
**MP3:** Construct viable arguments and critique the reasoning of others.
**MP5:** Use appropriate tools strategically.
**MP6:** Attend to precision.

**Indicators: HSA-CED.A.2:** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

**HSA-REI.D.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).

**HSF-IF.A.3:** Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, the Fibonacci sequence is defined recursively by $f(0) = f(1) = 1, f(n + 1) = f(n) + f(n − 1)$ for $n \geq 1$.*

**HSF-BF.A.1a:** Determine an explicit expression, a recursive process, or steps for calculation from a context.

**HSF-BF.A.2:** Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.*

**HSF-LE.A.1b:** Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.

**HSF-LE.A.2:** Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).

**HSF-LE.B.5:** Interpret the parameters in a linear or exponential function in terms of a context.

**HSS-ID.B.6:** Represent data on two quantitative variables on a scatter plot and describe how the variables are related.

**HSS-ID.C.7:** Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

**HSS-ID.C.8:** Compute (using technology) and interpret the correlation coefficient of a linear fit.

| **Understandings:** | **Essential Questions:** |
|---|---|
| *Students will understand that…* | • Given the graph of a linear function, how can you write an equation of the line? |
| • If given a linear model, a linear equation can be written to model the data. | • How can you write an equation of a line when you are given the slope and a point on a line? |
| • Given a linear model, the equation can be rewritten in another form to identify the slope and y-intercept. | • How can you recognize lines that are parallel or perpendicular? |
| • Parallel lines have the same slope while perpendicular lines have negative reciprocal slopes. | • How can you use scatter plot and line of fit to make conclusions about data? |
| • Lines of best fit can be used to model and make predictions of linear models. | • How can you analytically find a line of best fit for a scatter plot? |
| • Arithmetic sequences describe linear patterns. | • How can you use arithmetic sequence to describe a pattern? |
| | • How can you describe a function that is represented by more than one equation? |

## Assessment Evidence

| **Performance Tasks:** | **Other Evidence:** |
|---|---|
| • Classwork Assignments (Practice worksheets, online assignments, activities, explorations/investigations, etc.) | • Use of digital platforms (Quizizz, Formative, quizlet live, kahoot, Schoology, Big Ideas Platform, etc.) |
| • Homework Assignments (Worksheets, online assignments, etc.) | • Conferences |
| • Class Participation and Preparation | • Student Performance during group activities |
| • Class Discussion | • Activities i.e. stations, group work, independent practice, card sorts, task cards, etc. |
| • Quizzes | • Project Based Assessment (optional) |
| • Test | |
| •Benchmark Assessment | **\*Additional or alternative performance tasks may be used** |

**Benchmarks:** Successful completion of quizzes and tests.

## Learning Plan

**Learning Activities:** Guided Notes, worksheets, EdPuzzles, Do Nows, Formative, etc.

**4.1: Writing Equations in Slope-Intercept Form (1 day)**
- Using Slopes and $y$-intercept to Write Equations
- Using Graphs to Write Equations
- Using Points to Write Equations
- Writing a Linear Function
- Modeling Real Life (optional)

**4.2: Writing Equations in Point-Slope Form (2 days)**
- Using a Slope and a Point to Write an Equation
- Using Two Points to Write an Equation
- Writing a Linear Function

- Modeling Real Life

**4.3: Writing Equations of Parallel and Perpendicular Lines (3 days)**
- Identifying Parallel Lines
- Writing an Equation of a Parallel Line
- Identifying Parallel and Perpendicular Lines
- Writing an Equation of a Perpendicular Line
- Modeling Real Life

**4.4: Scatter Plots and Lines of Fit (optional)**
- Interpreting a Scatter Plot
- Identifying Correlations
- Finding a Line of Fit

**4.5: Analyzing Lines of Fit (optional)**
- Using Residuals
- Finding a Line of Best Fit Using Technology
- Interpolating and Extrapolating Data
- Identifying Correlation and Causation

**4.6: Arithmetic Sequences (2 days)**
- Extending an Arithmetic Sequence
- Graphing and Arithmetic Sequence
- Identifying an Arithmetic Sequence from a Graph
- Finding the $n^{th}$ Term of an Arithmetic Sequence
- Modeling Real Life

**4.7: Piecewise Functions (optional)**
- Evaluating a Piecewise Function
- Graphing a Piecewise Function
- Writing a Piecewise Function
- Modeling Real Life

**Test Review ( 1 day)**
**Test (1 Day)**

*Additional 4 days used for review and quiz days *


**Resources:  Textbook, online resources, etc.**

| Unit Modifications for Special Population Students | |
| --- | --- |
| **Advanced Learners** | • Ask reflective and extension questions to build on classroom knowledge to develop a deeper understanding<br>• Use enrichment and extension activities<br>• Have them complete additional critical thinking exercise to develop a deeper understanding |
| **Struggling Learners** | • Read Problems aloud frequently<br>• Rephrase questions for student clarification<br>• Preferential Seating – close proximity to teacher<br>• Redirect student attention to the step-by-step explanation of each concept. |

| | |
|---|---|
| | • Use of Dynamic Monitoring Tool to practice basic skills<br>• Have student view re-teaching videos |
| **English Language Learners** | • Have student view re-teaching videos<br>• Rephrase questions for student clarification<br>• Easy access to language dictionary, instructor, or any other means to help interpret any language/communication difficulties<br>• Allow use of translator device<br>• Provide vocabulary flash cards<br>• For Spanish speaking students view re-teaching videos in Spanish |
| **Special Needs Learners** | Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org |
| **Learners with a 504** | Refer to page four in the Parent and Educator Resource Guide to Section 504 to assist in the development of appropriate plans. |

| Interdisciplinary Connections |
|---|
| **Indicators:**<br>**New Jersey Student Learning Standards for English Language Arts**<br>**RST.9-10.3**. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.<br>**RST.9-10.4**. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.<br><br>**9th and 10th Grade Writing Standards**<br>**WHST.9-10.6**. Use technology, including the Internet, to produce, share, and update writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.<br><br>**New Jersey Student Learning Standards for Computer Science and Design Thinking**<br>**8.1.8.DA.1**: Organize and transform data collected using computational tools to make it usable for a specific purpose. |

**8.1.12.DA.1**: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.
**8.1.12.DA.5**: Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.

**New Jersey Student Learning Standards for Technology Education**
**9.3.ST.1**: Use technology to acquire, manipulate, analyze and report data.
**9.3.ST-ET.5**: Apply the knowledge learned in STEM to solve problems.
**9.4.12.O.32**: Effectively use information technology to gather, store and communicate data in appropriate formats.
**Life Literacies & Key Skills**
**9.4.12.IML.3:** Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8)

## Integration of 21st Century Skills

**Indicators:**
The P21 organization conducted research that identified deeper learning competencies and skills they called the Four Cs of 21st century learning:

Collaboration
Communication
Critical thinking

**Unit 5: Chapter 5: Solving Systems of Linear Equations**

**Unit Description:** This unit concludes the study of linear functions by solving systems of linear equations. Students will build on the "find a solution" by graphing to include the substitution method and the elimination method. Special systems of equations will be examined where there is no solution or an infinite number of solutions. Students will learn to use graphing skills to solve systems with variables on both sides of the equation which will be helpful with future math classes. This unit concludes with a study of linear inequalities and systems of linear inequalities in two variables.

**Unit Duration: 15 Days**

## Desired Results

**Standard(s):**
   **A-CED: A-** Create equations that describe numbers or relationships
   **A-REI: C-** Solve systems of equations.
   **A-REI: D-** Represent and solve equations and inequalities graphically

**Practices:**
**MP1:** Make sense of problems and persevere in solving them.
**MP3:** Construct viable arguments and critique the reasoning of others.
**MP5:** Use appropriate tools strategically.
**MP6:** Attend to precision.
**MP7:** Look for and make use of structure.
**MP8:** Look for and express regularity in repeated reasoning.

**Indicators: HSA-CED.A.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.

**HSA-REI.C.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.

**HSA-REI.C.6:** Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

**HSA-REI.D.11:** Explain why the $x$-coordinates of the points where the graphs of the equations $y = f(x)$ $and$ $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.★

**HSA-REI.D.12:** Graph the solutions to a linear inequality in two variables as a half plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

| Understandings: | Essential Questions: |
|---|---|
| *Students will understand that…* <br> • A solution to a linear system is an ordered pair that satisfies both equations. <br> • Solving one equation for either variable in a system is essential to using the substitution method. | • How can you solve a system of linear equations? <br> • How can you use substitution to solve a system of linear equations? <br> • How can you use elimination to solve a system of linear equations? <br> • Can a system of linear equations have no solution or infinitely many solutions? |

- Properties of equality must be applied to every term of the equations to maintain the equality of the system.
- Systems of equations that have no solutions are parallel lines, and ones with infinitely many solutions coincide.
- Methods for solving systems of equations can be applied to solve nonlinear equations with variables on both sides.
- The solution to a system of linear inequalities is the set of ordered pairs that satisfy the system.

- How can you use a system of linear equations to solve an equation with variables on both sides?
- How can you graph a linear inequality in two variables?
- How can you graph a system of linear inequalities?

## Assessment Evidence

**Performance Tasks:**

• Classwork Assignments (Practice worksheets, online assignments, activities, explorations/investigations, etc.)
• Homework Assignments (Worksheets, online assignments, etc.)
• Class Participation and Preparation
• Class Discussion
• Quizzes
• Test
•Benchmark Assessment

**Other Evidence:**

• Use of digital platforms (Quizizz, Formative, quizlet live, kahoot, Schoology, Big Ideas Platform, etc.)

• Conferences

• Student Performance during group activities

• Activities i.e. stations, group work, independent practice, card sorts, task cards, etc.

• Project Based Assessment (optional)

**\*Additional or alternative performance tasks may be used**

**Benchmarks:** Successful completion of quizzes and tests.

## Learning Plan

**Learning Activities:  Guided Notes, worksheets, EdPuzzles, Do Nows, Formative, etc.**

**5.1: Solving Systems of Linear Equations by Graphing (2 days)**
- Checking Solutions
- Solving a System of Linear Equations by Graphing
- Modeling Real Life

**5.2: Solving Systems of Linear Equations by Substitution (2 days)**
- Solving a System of Linear Equations by Substitution
- Modeling Real Life

**5.3: Solving Systems of Linear Equations by Elimination (2 days)**
- Solving a System of Linear Equations by Elimination
- Modeling Real Life

**5.4: Solving Special Systems of Linear Equations (1 days)**
- Solving a System: No solution
- Solving a System: Infinitely Many Solutions
- Modeling Real Life

**5.5: Solving Equations by Graphing (optional)**
- Solving a Linear Equation by Graphing
- Solving an Absolute Value Equation by Graphing

- Modeling Real Life

**5.6: Solving Linear Inequalities in Two Variables (2 days)**
- Checking Solutions
- Graphing a Linear Inequality in Two Variables
- Modeling Real Life

**5.7: Systems of Linear Inequalities (2 days)**
- Checking Solutions
- Graphing a System of Linear Inequalities
- Graphing a System of Linear Inequalities: No Solution
- Writing Systems of Linear Inequalities
- Modeling Real Life (optional)

**Test Review ( 1 day)**
**Test (1 Day)**

*Additional 2 days used for review and quiz days *

**Resources:  Textbook, online resources, etc.**

| Unit Modifications for Special Population Students | |
|---|---|
| **Advanced Learners** | • Ask reflective and extension questions to build on classroom knowledge to develop a deeper understanding<br>• Use enrichment and extension activities<br>• Have them complete additional critical thinking exercise to develop a deeper understanding |
| **Struggling Learners** | • Read Problems aloud frequently<br>• Rephrase questions for student clarification<br>• Preferential Seating – close proximity to teacher<br>• Redirect student attention to the step-by-step explanation of each concept.<br>• Use of Dynamic Monitoring Tool to practice basic skills<br>• Have student view re-teaching videos |
| **English Language Learners** | • Have student view re-teaching videos<br>• Rephrase questions for student clarification<br>• Easy access to language dictionary, instructor, or any other means to help interpret any language/communication difficulties<br>• Allow use of translator device<br>• Provide vocabulary flash cards<br>• For Spanish speaking students view re-teaching videos in Spanish |
| **Special Needs Learners** | Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student |

| | can respond to instruction • Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org |
|---|---|
| **Learners with a 504** | Refer to page four in the Parent and Educator Resource Guide to Section 504 to assist in the development of appropriate plans. |

## Interdisciplinary Connections

**Indicators:**
**New Jersey Student Learning Standards for English Language Arts**
**RST.9-10.3**. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
**RST.9-10.4**. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.
**RST.9-10.5**. Analyze the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).

**New Jersey Student Learning Standards for Social Studies**
**Presenting Arguments and Explanations-** Using a variety of formats designed for a purpose and an authentic audience forms the basis for clear communication. Strong arguments contain claims with organized evidence and valid reasoning that respects the diversity of the world and the dignity of each person. Writing findings and engaging in civil discussion with an audience provides a key step in the process of thinking critically about conclusions and continued inquiry.

**New Jersey Student Learning Standards for Computer Science and Design Thinking**
**Collaborating Around Computing and Design**
Collaborative computing is the process of performing a computational task by working on pairs in teams. Because it involves asking for the contributions and feedback of others, effective collaboration can lead to better outcomes than working independently. Collaboration requires individuals to navigate and incorporate diverse perspectives, conflicting ideas, disparate skills, and distinct personalities. Students should use collaborative tools to effectively work together and to create complex artifacts.

**New Jersey Student Learning Standards for Technology Education**
**9.4.12.O.12**: Develop and interpret tables, charts, and figures to support written and oral communications.
**9.4.12.O.17**: Employ critical thinking skills (e.g., analyze, synthesize, and evaluate) independently and in teams to solve problems and make decisions.

**New Jersey Student Learning Standards for Science**
**Engaging in Argument from Evidence**: Argumentation is the process by which explanations and solutions are reached. In science and engineering, reasoning and argument based on evidence are essential to identifying the best explanation for a natural phenomenon or the best solution to a design problem. Scientists

and engineers use argumentation to listen to, compare, and evaluate competing ideas and methods based on merits.

## Integration of 21st Century Skills

**Indicators:**

The P21 organization conducted research that identified deeper learning competencies and skills they called the Four Cs of 21st century learning:

Collaboration
Communication
Critical thinking
Creativity

| **Unit 6: Chapter 6: Exponential Functions and Sequences** |
| --- |
| **Unit Description:** This unit begins with a review of the properties of integer exponents. This is followed with a review of exponential functions. This review is then used as the building blocks to discuss growth and decay functions and how to write them. The properties of exponents are used to introduce rational exponents and radical expressions. Exponential functions are then solved using properties of any exponents and graphing techniques. This chapter concludes with an introduction to geometric sequences and their connections to exponential functions. |
| **Unit Duration: 22 Days** |

## Desired Results

**Standard(s):**
  **N-RN: A-** Extend the properties of exponents to rational exponents
  **A-CED: A-**Create equations that describe numbers or relationships
  **A-SSE: B-** Write expressions in equivalent forms to solve problems.
  **A-REI: A-** Understand solving equations as a process of reasoning and explain the reasoning
  **F-IF: A-** Understand the concept of a function and use function notation
  **F-IF: C-** Analyze functions using different representations
  **F-BF: A-** Build a function that models a relationship between two quantities

**Practices:**
**MP1:**  Make sense of problems and persevere in solving them.
**MP2:**  Reason abstractly and quantitatively.
**MP3:**  Construct viable arguments and critique the reasoning of others.
**MP5:** Use appropriate tools strategically.
**MP6:**  Attend to precision.
**MP7:**  Look for and make use of structure.
**MP8:**  Look for and express regularity in repeated reasoning.

**Indicators: HSN-RN.A.1:** Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. For example, we define $5^{1/3}$ to be the cube root of 5 because we want $\left(5^{\frac{1}{3}}\right)^3 = 5^{\left(\frac{1}{3}\right)3}$ to hold, so $\left(5^{\frac{1}{3}}\right)^3$ must equal 5.

**HSN-RN.A.2:** Rewrite expressions involving radicals and rational exponents using the properties of exponents.

**HSA-CED.A.1:** Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.

**HSA-CED.A.2:** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

**HSA-SSE.B.3c**: Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. c.) Use the properties of exponents to transform expressions for exponential functions.

**HSA-REI.A.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.

**HSF-IF.A.3:** Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by $f(0) = f(1) = 1$,

$f(n + 1) = f(n) + f(n − 1)$ for $n ≥ 1$.

**HSF-IF.C.7e:** Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.

**HSF-IF.C.8b:** Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)12^t$,

$y = \frac{(1.2)^t}{10}$, and classify them as representing exponential growth or decay.

**HSF-BF.A.1a:** Determine an explicit expression, a recursive process, or steps for calculation from a context.

**HSF-BF.A.2:** Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.*

| Understandings: | Essential Questions: |
|---|---|
| *Students will understand that…* | • How can you write general rules involving properties of exponents? |
| • The rules of exponents can be used to simplify numerical expressions with rational exponents. | • How can you write and evaluate an $n^{th}$ root of a number? |
| • Students can use a table of values and the general shape to graph an exponential function. | • What are some characteristics of the graph of an exponential function? |
| • A growth factor greater than 1 reflects growth and a decay factor less than 1 reflects decay. | • What are some of the characteristics of exponential growth and exponential decay functions? |
| • They can find the intersection point on the graph or use the property of equal exponents of like bases to solve exponential equations. | • How can you solve an exponential equation graphically? |
| • Geometric sequences describe exponential functions. | • How can you use a geometric sequence to describe a pattern? |
| | • How can you define a sequence recursively? |

## Assessment Evidence

| Performance Tasks: | Other Evidence: |
|---|---|
| • Classwork Assignments (Practice worksheets, online assignments, activities, explorations/investigations, etc.) | • Use of digital platforms (Quizizz, Formative, quizlet live, kahoot, Schoology, Big Ideas Platform, etc.) |
| • Homework Assignments (Worksheets, online assignments, etc.) | • Conferences |
| • Class Participation and Preparation | • Student Performance during group activities |
| • Class Discussion | • Activities i.e. stations, group work, independent practice, card sorts, task cards, etc. |
| • Quizzes | • Project Based Assessment (optional) |
| • Test | **\*Additional or alternative performance tasks may be used** |
| •Benchmark Assessment | |

**Benchmarks:** Successful completion of quizzes and tests.

**Learning Activities:** Guided Notes, worksheets, EdPuzzles, Do Nows, Formative, etc.

**6.1 Properties of Exponents (3 days)**
- Using Zero and Negative Exponents
- Simplifying an Expression
- Using Properties of Exponents (Product of Powers Property, Quotient of Powers Property, Power of a Power Property)
- Using Properties of Exponents (Power of a Product Property, Power of Quotient Property)

**6.2: Radicals and Radical Exponents (2 days)**
- Finding $n^{th}$ roots
- Evaluating $n^{th}$ Root Expressions
- Evaluating Expressions With Rational Exponents
- Modeling Real Life (optional)

**6.3: Exponential Functions (3 days)**
- Identifying Functions
- Evaluating Exponential Functions
- Graphing $y = ab^x$
- Graphing $y = ab^{x-h} + k$
- Modeling Real Life

**6.4: Exponential Growth and Decay (3 days)**
- Using an Exponential Growth Function
- Identifying Exponential Growth and Decay
- Interpreting Exponential Functions
- Rewriting Exponential Functions
- Modeling Real Life

**6.5: Solving Exponential Equations (2 days)**
- Solving Exponential Equations with the Same Base
- Solving Exponential Equations with Unlike Bases
- Solving Exponential Equations When $0 < b < 1$
- Solving Exponential Equations by Graphing

**6.6: Geometric Sequences (2 days)**
- Identifying Geometric Sequences
- Extending Geometric Sequences
- Graphing a Geometric Sequence
- Finding the $n^{th}$ term of a Geometric Sequence
- Modeling Real Life (optional)

**6.7: Recursively Defined Sequences (optional)**
- Writing Terms of Recursively Defined Sequences
- Writing Recursive Rules
- Translation from Recursive Rules to Explicit Rules
- Translating from Explicit Rules to Recursive Rules
- Writing a Recursive Rule for a Special Sequence

**Test Review ( 2 days)**
**Test (1 Day)**

*Additional 4 days used for review and quiz days *

Resources: Textbook, online resources, etc.

| Unit Modifications for Special Population Students | |
|---|---|
| **Advanced Learners** | • Ask reflective and extension questions to build on classroom knowledge to develop a deeper understanding<br>• Use enrichment and extension activities<br>• Have them complete additional critical thinking exercise to develop a deeper understanding |
| **Struggling Learners** | • Read Problems aloud frequently<br>• Rephrase questions for student clarification<br>• Preferential Seating – close proximity to teacher<br>• Redirect student attention to the step-by-step explanation of each concept.<br>• Use of Dynamic Monitoring Tool to practice basic skills<br>• Have student view re-teaching videos |
| **English Language Learners** | • Have student view re-teaching videos<br>• Rephrase questions for student clarification<br>• Easy access to language dictionary, instructor, or any other means to help interpret any language/communication difficulties<br>• Allow use of translator device<br>• Provide vocabulary flash cards<br>• For Spanish speaking students view re-teaching videos in Spanish |
| **Special Needs Learners** | Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org |
| **Learners with a 504** | Refer to page four in the Parent and Educator Resource Guide to Section 504 to assist in the development of appropriate plans. |

## Interdisciplinary Connections

**Indicators:**
**New Jersey Student Learning Standards for English Language Arts**
**RST.9-10.3**. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
**RST.9-10.4**. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics

**9th and 10th Grade Writing Standards**
**D**. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.

**New Jersey Student Learning Standards for Social Studies**
**6.1.12.EconNE.6.a:** Analyze the impact of money, investment, credit, savings, debt, and financial institutions on the development of the nation and the lives of individuals.

**New Jersey Student Learning Standards for Computer Science and Design Thinking**
**8.1.8.DA.5**: Test, analyze, and refine computational models.
**8.1.12.DA.1**: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.
**8.2.12.EC.3**: Synthesize data, analyze trends, and draw conclusions regarding the effect of a technology on the individual, culture, society, and environment and share this information with the appropriate audience.

**New Jersey Student Learning Standards for Technology Education**
**9.3.ST.1**: Use technology to acquire, manipulate, analyze and report data.
**9.4.12.O.12**: Develop and interpret tables, charts, and figures to support written and oral communications.

## Integration of 21st Century Skills

**Indicators:**
The P21 organization conducted research that identified deeper learning competencies and skills they called the Four Cs of 21st century learning:

Collaboration
Communication
Critical thinking

| Unit 7: Chapter 7: Polynomial Equations and Factoring |
|---|
| **Unit Description:** This chapter formally introduces students to polynomial equations and factoring. This is necessary for understanding and solving quadratic equations and functions which are introduced in later units. The unit begins with terminology and forms of polynomials. Basic operations of adding, subtracting, and multiplying are explored. This is followed by factoring techniques, especially for quadratic equations. The unit ends with solving polynomial equations using their factored form. |
| **Unit Duration: 20 Days** |

## Desired Results

**Standard(s):**

**A-APR: A-** Perform arithmetic operations on polynomials.

**A-APR: B-** Understand the relationship between zeros and factors of polynomials.

**A-REI-B:** Solve equations and inequalities in one variable

**A-SSE-A:** Interpret the structure of expressions

**A-SSE: B-** Write expressions in equivalent forms to solve problems.

**Practices:**
**MP1:** Make sense of problems and persevere in solving them.
**MP3:** Construct viable arguments and critique the reasoning of others.
**MP6:** Attend to precision.
**MP7:** Look for and make use of structure.
**MP8:** Look for and express regularity in repeated reasoning.

**Indicators:**

**HSA-APR.A.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.

**HSA-APR.B.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.

**HSA-REI.B.4b:** Solve quadratic equations in one variable. b.) Solve quadratic equations by inspection (e.g., for $x^2 = 49$), 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 $a \pm bi$ for real numbers $a$ and $b$.

**HSA-SSE.A.2:** Use the structure of an expression to identify ways to rewrite it. *For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$.*
**HSA-SSE.B.3a:** 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.

| **Understandings:** | **Essential Questions:** |
|---|---|
| *Students will understand that…* | • How can you add and subtract polynomials? |
| • Adding and subtracting polynomials is the same as combining like terms. | • How can you multiply two polynomials? |
| • Multiplying polynomials is similar to finding area and volume of figures. | • What are the patterns in the special products $(a + b)(a - b), (a + b)^2$ and $(a - b)^2$ |
| | • How can you solve a polynomial equation? |

- Recognizing a special product simplifies the multiplication process.
- Factoring and using the Zero Product Property are the keys to solving a polynomial equation.
- Using sums and products are the key to factoring quadratic expressions.
- Factoring a polynomial completely requires different techniques and perhaps more than one factoring.

- How can you use algebra tiles to factor the trinomial $x^2 + bx + c$ into the product of two binomials?
- How can you recognize and factor special products?
- How can you factor a polynomial completely?

## Assessment Evidence

### Performance Tasks:

• Classwork Assignments (Practice worksheets, online assignments, activities, explorations/investigations, etc.)
• Homework Assignments (Worksheets, online assignments, etc.)
• Class Participation and Preparation
• Class Discussion
• Quizzes
• Test
•Benchmark Assessment

### Other Evidence:

• Use of digital platforms (Quizizz, Formative, quizlet live, kahoot, Schoology, Big Ideas Platform, etc.)

• Conferences

• Student Performance during group activities

• Activities i.e. stations, group work, independent practice, card sorts, task cards, etc.

• Project Based Assessment (optional)

**\*Additional or alternative performance tasks may be used**

**Benchmarks:** Successful completion of quizzes and tests.

## Learning Plan

**Learning Activities: Guided Notes, worksheets, EdPuzzles, Do Nows, Formative, etc.**

**7.1: Adding and Subtracting Polynomials (2 days)**
- Finding Degrees of Monomials
- Writing a Polynomial in Standard Form
- Classifying Polynomials
- Adding Polynomials
- Subtracting Polynomials
- Modeling Real Life

**7.2: Multiplying and Dividing Polynomials (1 day)**
- Multiplying Polynomials and Monomials
- Dividing Polynomials (optional: completed in Algebra 2)
- Multiplying Binomials Using the Distributive Property
- Multiplying Binomials using a Table (optional)
- Multiplying Binomials using the FOIL Method
- Modeling Real Life

**7.3: Special Products of Polynomials (1 day)**
- Using the Square of a Binomial Pattern
- Using the Sum and Difference Pattern
- Using Special Product Patterns in Mental Math (optional)
- Modeling Real Life

**7.4: Solving Polynomial Equations in Factored Form (3 days)**

- Solving Polynomial Equations
- Factoring a Polynomial Using the GCF
- Solving Equations by Factoring

**7.5: Factoring $x^2 + bx + c$ (2 days)**
- Factoring $x^2 + bx + c$ When $b$ and $c$ are Positive
- Factoring $x^2 + bx + c$ When $b$ is Negative and $c$ is Positive
- Factoring $x^2 + bx + c$ When $c$ is Negative
- Modeling Real Life

**7.6: Factoring $ax^2 + bx + c$ (2 days)**
- Factoring out the GCF
- Factoring $ax^2 + bx + c$ When $a$ and $c$ are Positive
- Factoring $ax^2 + bx + c$ When $a$ is Positive and $c$ is Negative
- Factoring $ax^2 + bx + c$ When $a$ is Negative
- Modeling Real Life

**7.7: Factoring Special Products (1 day)**
- Factoring the Difference of Two Squares
- Evaluating a Numerical Expression (optional)
- Factoring Perfect Square Trinomials
- Solving a Polynomial Equation
- Modeling Real Life

**7.8: Factoring Polynomials Completely (2 days)**
- Factoring Polynomials by Grouping
- Factoring Polynomials Completely
- Solving an Equation by Factoring Completely
- Modeling Real Life

**Test Review (1 day)**
**Test (1 day)**

*Additional 4 days used for review and quiz days *

**Resources: Textbook, online resources, etc.**

| Unit Modifications for Special Population Students | |
|---|---|
| **Advanced Learners** | <ul><li>Ask reflective and extension questions to build on classroom knowledge to develop a deeper understanding</li><li>Use enrichment and extension activities</li><li>Have them complete additional critical thinking exercise to develop a deeper understanding</li></ul> |
| **Struggling Learners** | <ul><li>Read Problems aloud frequently</li><li>Rephrase questions for student clarification</li><li>Preferential Seating – close proximity to teacher</li><li>Redirect student attention to the step-by-step explanation of each concept.</li><li>Use of Dynamic Monitoring Tool to practice basic skills</li><li>Have student view re-teaching videos</li></ul> |

| | |
|---|---|
| **English Language Learners** | • Have student view re-teaching videos<br>• Rephrase questions for student clarification<br>• Easy access to language dictionary, instructor, or any other means to help interpret any language/communication difficulties<br>• Allow use of translator device<br>• Provide vocabulary flash cards<br>• For Spanish speaking students view re-teaching videos in Spanish |
| **Special Needs Learners** | Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org |
| **Learners with a 504** | Refer to page four in the Parent and Educator Resource Guide to Section 504 to assist in the development of appropriate plans. |

## Interdisciplinary Connections

**Indicators:**
**New Jersey Student Learning Standards for English Language Arts**
**RST.9-10.3**. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

**New Jersey Student Learning Standards for Computer Science and Design Thinking**
**Recognizing and Defining Computational Problems**
The ability to recognize appropriate and worthwhile opportunities to apply computation is a skill that develops over time and is central to computing. Solving a problem with a computational approach requires defining the problem, breaking it down into parts, and evaluating each part to determine whether a computational solution is appropriate.

**New Jersey Student Learning Standards for Technology Education**
**9.4.12.O.17**: Employ critical thinking skills (e.g., analyze, synthesize, and evaluate) independently and in teams to solve problems and make decisions.

## Integration of 21st Century Skills

**Indicators:**

The P21 organization conducted research that identified deeper learning competencies and skills they called the Four Cs of 21st century learning:

Collaboration
Communication
Critical thinking

| Unit 8: Chapter 8: Graphing Quadratic Functions |
|---|

**Unit Description:** This unit uses the concepts of unit 7 to gain an understanding of quadratic functions. Graphs of quadratic functions are examined and graphed using transformations similar to the ones used earlier examining linear functions. The graphs are also used to connect solving quadratic equations with the x-intercepts of the graphs. Quadratic functions are presented in three forms, standard, vertex, and intercept form. The characteristics of each will be discussed. The unit ends with comparing quadratic functions and their graphs with those of linear and exponential functions.

**Unit Duration: 14 Days**

## Desired Results

**Standard(s):**
**A-CED: A-** Create equations that describe numbers or relationships
**A-SSE: B-** Write expressions in equivalent forms to solve problems
**A-APR: B-** Understand the relationship between zeros and factors of polynomials
**F-IF: B-** Interpret functions that arise in applications in terms of the context
**F-IF: C-** Analyze functions using different representations
**F-BF:B-** Build new functions from existing functions
**F-LE: A-** Construct and compare linear and exponential models and solve problems

**Practices:**
**MP1:** Make sense of problems and persevere in solving them.
**MP2:** Reason abstractly and quantitatively.
**MP4:** Model with Mathematics.
**MP5:** Use appropriate tools strategically.
**MP6:** Attend to precision.
**MP7:** Look for and make use of structure.

**Indicators: HSA-CED.A.2:** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

**HSA-SSE.B.3a:** Factor a quadratic expression to reveal the zeros of the function it defines.

**HSA-APR.B.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.

**HSF-IF.B.4:** For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.

**HSF-IF.C.7a:** 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 show intercepts, maxima, and minima.

**HSF-IF.C.8a:** 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 a context.

**HSF-IF.C.9:** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.*

**HSF-BF.B.3:** Identify the effect on the graph of replacing $f(x)$ by $f(x) + k, k\,f(x), f(kx),$ and $f(x + k)$ for specific values of $k$ (both positive and negative); find the value of $k$ given the graphs. Experiment with cases

and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

**HSF-LE.A.3:** Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.

| Understandings: | Essential Questions: |
|---|---|
| *Students will understand that…* <ul><li>The value of $a$ affects the stretch and direction of the quadratic function.</li><li>The value of $c$ is a vertical translation of the quadratic function.</li><li>The vertex is located on the axis of symmetry.</li><li>The value of $h$ is a horizontal translation of the quadratic function.</li><li>The intercept form of a quadratic function is useful in solving real-life problems.</li><li>Linear, exponential, and quadratic functions grow with their own characteristic rate.</li></ul> | <ul><li>What are some of the characteristics of the graph of a quadratic function of the form $f(x) = ax^2$?</li><li>How does the value of $c$ affect the graph of $f(x) = ax^2 + bx + c$?</li><li>How can you find the vertex of the graph $f(x) = ax^2 + bx + c$?</li><li>How can you describe the graph $f(x) = ax^2 + bx + c$?</li><li>What are some of the characteristics of the graph $f(x) = a(x - p)(x - q)$?</li><li>How can you compare the growth rates of linear, exponential, and quadratic functions?</li></ul> |

## Assessment Evidence

| Performance Tasks: | Other Evidence: |
|---|---|
| • Classwork Assignments (Practice worksheets, online assignments, activities, explorations/investigations, etc.)<br>• Homework Assignments (Worksheets, online assignments, etc.)<br>• Class Participation and Preparation<br>• Class Discussion<br>• Quizzes<br>• Test<br>•Benchmark Assessment | • Use of digital platforms (Quizizz, Formative, quizlet live, kahoot, Schoology, Big Ideas Platform, etc.)<br>• Conferences<br>• Student Performance during group activities<br>• Activities i.e. stations, group work, independent practice, card sorts, task cards, etc.<br>• Project Based Assessment (optional)<br>**\*Additional or alternative performance tasks may be used** |

**Benchmarks:** Successful completion of quizzes and tests.

## Learning Plan

**Learning Activities: Guided Notes, worksheets, EdPuzzles, Do Nows, Formative, etc.**

**Option to complete 3.8 here. (2 days)**
**8.1: Graphing $f(x) = ax^2$ (1 day)**
- Identifying Characteristics of a Quadratic Function
- Graphing $y = ax^2$ When $a > 0$
- Graphing $y = ax^2$ When $a < 0$
- Modeling Real Life

**8.2: Graphing $f(x) = ax^2 + c$ (1 day)**
- Graphing $y = x^2 + c$
- Graphing $y = ax^2 + c$

- Translating the Graph of $y = ax^2 + c$
- Modeling Real Life

**8.3: Graphing $f(x) = ax^2 + bx + c$ (2 days)**
- Finding the Axis of Symmetry and the Vertex
- Graphing $f(x) = ax^2 + bx + c$
- Finding a Minimum and Maximum Value
- Modeling Real Life

**Option to complete 9.2 here. (1 day)**
**9.2: Solving Quadratic Equations by Graphing (Completed in Chapter 8)**
- Solving a Quadratic Equation: Two Real Solutions
- Solving a Quadratic Equation: One Real Solution
- Solving a Quadratic Equation: No Real Solutions
- Finding Zeros of a Function
- Modeling Real Life

**8.4: Graphing $f(x) = a(x - h)^2 + k$ (1 day)**
- Identifying Even and Odd Functions (Optional)
- Graphing $y = a(x - h)^2$
- Graphing $y = a(x - h)^2 + k$
- Modeling Real Life

**8.5: Using Intercept Form (2 days)**
- Graphing $f(x) = a(x - p)(x - q)$
- Graphing a Quadratic Function
- Finding Zeros of a Function
- Graphing a Quadratic Function Using Zeros
- Writing Quadratic Functions (Optional)
- Graphing a Cubic Function Using Zeros (optional)
- Writing a Cubic Function (optional)

**8.6: Comparing Linear, Exponential, and Quadratic Functions (optional)**
- Using Graphs to Identify Functions
- Using Differences or Ratios to Identify Functions
- Writing a Function to Model Data
- Writing a Recursive Rule
- Using and Interpreting Average Rates of Change
- Modeling Real Life

**Test Review (1 day)**
**Test (1 day)**

*Additional 2 days used for review and quiz days *

**Resources: Textbook, online resources, etc.**

| Unit Modifications for Special Population Students | |
| --- | --- |
| **Advanced Learners** | • Ask reflective and extension questions to build on classroom knowledge to develop a deeper understanding<br>• Use enrichment and extension activities |

| | |
|---|---|
| | • Have them complete additional critical thinking exercise to develop a deeper understanding |
| **Struggling Learners** | • Read Problems aloud frequently<br>• Rephrase questions for student clarification<br>• Preferential Seating – close proximity to teacher<br>• Redirect student attention to the step-by-step explanation of each concept.<br>• Use of Dynamic Monitoring Tool to practice basic skills<br>• Have student view re-teaching videos |
| **English Language Learners** | • Have student view re-teaching videos<br>• Rephrase questions for student clarification<br>• Easy access to language dictionary, instructor, or any other means to help interpret any language/communication difficulties<br>• Allow use of translator device<br>• Provide vocabulary flash cards<br>• For Spanish speaking students view re-teaching videos in Spanish |
| **Special Needs Learners** | Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org |
| **Learners with a 504** | Refer to page four in the Parent and Educator Resource Guide to Section 504 to assist in the development of appropriate plans. |

| Interdisciplinary Connections |
|---|

**Indicators:**
**New Jersey Student Learning Standards for English Language Arts**
**RST.9-10.3**. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

**New Jersey Student Learning Standards for Computer Science and Design Thinking**
**8.1.12.DA.1**: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.

**New Jersey Student Learning Standards for Technology Education**
**9.4.12.O.12**: Develop and interpret tables, charts, and figures to support written and oral communications.
**9.4.12.O.17**: Employ critical thinking skills (e.g., analyze, synthesize, and evaluate) independently and in teams to solve problems and make decisions.

## Integration of 21st Century Skills

**Indicators:**
The P21 organization conducted research that identified deeper learning competencies and skills they called the Four Cs of 21st century learning:

Collaboration
Communication
Critical thinking

| Unit 9: Chapter 9: Solving Quadratic Equations |
|---|

**Unit Description:** This unit takes the concepts that were learned in the two previous units and uses them to focus specifically on solving quadratic equations. Different techniques such as completing the square, the quadratic formula, and graphing are examined to take into account the form of the quadratic equation. An introduction to simplifying square roots is presented which will be used to solve a certain form of a quadratic equation. The unit ends with connections to unit 5, systems of equations. In this unit one of the equations in the system will be a quadratic equation.

**Unit Duration: 18 Days**

## Desired Results

**Standard(s):**
**N-RN: A-** Extend the properties of exponents to rational exponents.
**A-CED: A-** Create equations that describe numbers or relationships.
**A-SSE: B-** Write expressions in equivalent forms to solve problems.
**A-REI: B-** Solve equations and inequalities in one variable.
**A-REI: D-** Represent and solve equations and inequalities graphically.
**F-IF: C-** Analyze functions using different representations.

**Practices:**
**MP1:** Make sense of problems and persevere in solving them.
**MP2:** Reason abstractly and quantitatively.
**MP3:** Construct viable arguments and critique the reasoning of others.
**MP5:** Use appropriate tools strategically.
**MP6:** Attend to precision.
**MP7:** Look for and make use of structure.

**Indicators:**

**HSN-RN.A.2:** Rewrite expressions involving radicals and rational exponents using the properties of exponents.

**HSA-CED.A.1:** Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.

**HSA-SSE.B.3b:** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. b.) Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.

**HSA-REI.B.4a:** Solve quadratic equations in one variable. a.) Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.

**HSA-REI.B.4b:** Solve quadratic equations in one variable. b.) Solve quadratic equations by inspection (e.g., for $x^2 = 49$), 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 $a \pm bi$ for real numbers $a$ and $b$.

**HSA-REI.C.7:** Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. For example, find the points of intersection between the line $y = -3x$ and the circle $x^2 + y^2 = 3$.

**HSA-REI.D.11:** Explain why the *x*-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.★

**HSF-IF.C.7a:** Graph linear and quadratic functions and show intercepts, maxima, and minima.

**HSF-IF.C.8a:** 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 a context.

| Understandings: | Essential Questions: |
|---|---|
| *Students will understand that…* <br><br> • By using properties of multiplication and division, one can simplify radicals to make them more useful. <br> • By examining the graph of a quadratic function, one can determine the number of real solutions. <br> • Quadratic equations of the form $ax^2 + bx + c = 0$ can be solved using the same techniques as linear equations. <br> • By mastering completing the square one learns the process of solving complex equations and the derivation of the quadratic formula. <br> • The quadratic formula can be used to solve any quadratic equations and determine the number of real solutions. <br> Any system of equations can be solved by finding the intersection of the equations. | • How can you multiply and divide square roots? <br> • How can you use a graph to solve a quadratic equation in one variable? <br> • How can you determine the number of solutions of a quadratic equation of the form $ax^2 + c = 0$? <br> • How can you use "completing the square" to solve a quadratic equation? <br> • How can you derive a formula that can be used to write the solutions of any quadratic equation in standard form? <br> • How can you solve a system of two equations when one is linear and the other is quadratic? |

## Assessment Evidence

| Performance Tasks: | Other Evidence: |
|---|---|
| • Classwork Assignments (Practice worksheets, online assignments, activities, explorations/investigations, etc.) <br> • Homework Assignments (Worksheets, online assignments, etc.) <br> • Class Participation and Preparation <br> • Class Discussion <br> • Quizzes <br> • Test <br> •Benchmark Assessment | • Use of digital platforms (Quizizz, Formative, quizlet live, kahoot, Schoology, Big Ideas Platform, etc.) <br><br> • Conferences <br><br> • Student Performance during group activities <br><br> • Activities i.e. stations, group work, independent practice, card sorts, task cards, etc. <br><br> • Project Based Assessment (optional) <br><br> **\*Additional or alternative performance tasks may be used** |

**Benchmarks:** Successful completion of quizzes and tests.

## Learning Plan

**Learning Activities: Guided Notes, worksheets, EdPuzzles, Do Nows, Formative, etc.**

**9.1: Properties of Radicals (5 days)**
- Using the Product Property of Square Roots
- Using the Quotient Property of Square Roots
- Using Properties of Cube Roots
- Rationalizing the Denominator
- Rationalizing the Denominator Using Conjugates
- Modeling Real Life
- Adding and Subtracting Radicals
- Multiplying Radicals

**9.2: Solving Quadratic Equations by Graphing (Completed in Chapter 8)**
- Solving a Quadratic Equation: Two Real Solutions
- Solving a Quadratic Equation: One Real Solution
- Solving a Quadratic Equation: No Real Solutions
- Finding Zeros of a Function
- Modeling Real Life

**9.3: Solving Quadratic Equations Using Square Roots (2 days)**
- Solving Quadratic Equations Using Square Roots
- Approximating Solutions of a Quadratic Equation
- Modeling Real Life
- Rewriting and Evaluating a Formula

**9.4: Solving Quadratic Equations by Completing the Square (2 days)**
- Completing the Square
- Solving a Quadratic Equation: $x^2 + bx = d$
- Solving Quadratic Equation: $ax^2 + bx + c = 0$
- Finding Minimum and Maximum Values
- Interpreting Forms of Quadratic Functions
- Modeling Real Life

**9.5: Solving Quadratic Equations Using the Quadratic Formula (3 days)**
- Using the Quadratic Formula
- Modeling Real Life
- Determining the Number of Real Solutions
- Finding the Number of $x$-Intercepts of a Parabola
- Choosing a Method

**9.6: Solving Non-Linear Systems of Equations (optional)**
- Solving a Nonlinear System by Graphing
- Solving a Nonlinear System by Substitution
- Solving a Nonlinear System by Elimination
- Approximating Solutions of a Nonlinear System
- Approximating Solutions of an Equation

**Test Review (1 day)**
**Test (1 day)**

*Additional 4 days used for review and quiz days *

**Resources: Textbook, online resources, etc.**

| Unit Modifications for Special Population Students | |
|---|---|
| **Advanced Learners** | • Ask reflective and extension questions to build on classroom knowledge to develop a deeper understanding<br>• Use enrichment and extension activities<br>• Have them complete additional critical thinking exercise to develop a deeper understanding |
| **Struggling Learners** | • Read Problems aloud frequently<br>• Rephrase questions for student clarification<br>• Preferential Seating – close proximity to teacher<br>• Redirect student attention to the step-by-step explanation of each concept.<br>• Use of Dynamic Monitoring Tool to practice basic skills<br>• Have student view re-teaching videos |
| **English Language Learners** | • Have student view re-teaching videos<br>• Rephrase questions for student clarification<br>• Easy access to language dictionary, instructor, or any other means to help interpret any language/communication difficulties<br>• Allow use of translator device<br>• Provide vocabulary flash cards<br>• For Spanish speaking students view re-teaching videos in Spanish |
| **Special Needs Learners** | Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org |
| **Learners with a 504** | Refer to page four in the Parent and Educator Resource Guide to Section 504 to assist in the development of appropriate plans. |

| Interdisciplinary Connections |
|---|
| **Indicators:**<br>**New Jersey Student Learning Standards for English Language Arts**<br>**RST.9-10.7**. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. |

**RST.11-12.7**. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

**New Jersey Student Learning Standards for Computer Science and Design Thinking**
**Collaborating Around Computing and Design**
Collaborative computing is the process of performing a computational task by working on pairs in teams. Because it involves asking for the contributions and feedback of others, effective collaboration can lead to better outcomes than working independently. Collaboration requires individuals to navigate and incorporate diverse perspectives, conflicting ideas, disparate skills, and distinct personalities. Students should use collaborative tools to effectively work together and to create complex artifacts.
**Recognizing and Defining Computational Problems**
The ability to recognize appropriate and worthwhile opportunities to apply computation is a skill that develops over time and is central to computing. Solving a problem with a computational approach requires defining the problem, breaking it down into parts, and evaluating each part to determine whether a computational solution is appropriate.

**New Jersey Student Learning Standards for Technology Education**
**9.3.ST-SM.2**: Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.

| Integration of 21st Century Skills |
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**Indicators:**
The P21 organization conducted research that identified deeper learning competencies and skills they called the Four Cs of 21st century learning:

Collaboration
Communication
Critical thinking

**Unit 10:** Chapter 11: Data Analysis and Displays (optional)

**Unit Description:** This unit is designed to introduce students to looking at data algebraically and graphically. It will extend their algebraic understanding into the analysis of data trends using slope, lines of best fit, correlation, causation, and linear models.

**Unit Duration: 14 Days**

## Desired Results

**Standard(s):**
**S-ID: A-** Summarize, represent, and interpret data on a single count or measurement variable
**S-ID: B-** Summarize, represent, and interpret data on two categorical and quantitative variables
**N-Q:A-** Reason quantitatively and use units to solve problems

**Practices:**
**MP1:** Make sense of problems and persevere in solving them.
**MP2:** Reason abstractly and quantitatively.
**MP3:** Construct viable arguments and critique the reasoning of others.
**MP4:** Model with Mathematics.
**MP5:** Use appropriate tools strategically.
**MP6:** Attend to precision.
**MP7:** Look for and make use of structure.

**Indicators:**
**HSS-ID.A.3:** Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).
**HSS-ID.A.2:** Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
**HSS.ID.A.1**
Represent data with plots on the real number line (dot plots, histograms, and box plots).
**HSS.ID.B.5:** Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.
**HSN.Q.A.1:** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

| **Understandings:** | **Essential Questions:** |
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| *Students will understand that…* | 1. How can you describe the variation of a set of data? |
| • All higher-level mathematics and physical sciences are based upon the relationship between quantities and reasoning with these quantities. | 2. How can you use a box and whisker plot to describe data? |
| • Data can be interpreted and organized using various algebraic concepts | 3. How can you use a histogram to characterize the basic shape of a distribution? |

## Assessment Evidence

| **Performance Tasks:** | **Other Evidence:** |
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| • Classwork Assignments (Practice worksheets, online assignments, activities, explorations/investigations, etc.) | • Use of digital platforms (Quizizz, Formative, quizlet live, kahoot, Schoology, Big Ideas Platform, etc.) |
| | • Conferences |

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| • Homework Assignments (Worksheets, online assignments, etc.)<br>• Class Participation and Preparation<br>• Class Discussion<br>• Quizzes<br>• Test<br>•Benchmark Assessment | • Student Performance during group activities<br>• Activities i.e. stations, group work, independent practice, card sorts, task cards, etc.<br>• Project Based Assessment (optional)<br>**\*Additional or alternative performance tasks may be used** |

**Benchmarks:** Successful completion of quizzes and tests.

## Learning Plan

**Learning Activities: Guided Notes, worksheets, EdPuzzles, Do Nows, Formative, etc.**

**11.1: Measures of Center and Variation (2 day)**
- Finding and Comparing Measures of Center
- Removing an Outlier
- Find a Range
- Finding a Standard Deviation
- Modeling Real Life

**11.2: Box and Whisker Plots (2 days)**
- Making a Box-and-Whisker Plot
- Interpreting a Box-and-Whisker Plot
- Comparing Box-and-Whisker Plots
- Modeling Real Life

**11.3: Shapes of Distributions (2 days)**
- Describing the Shape of a Distribution
- Choosing Appropriate Measures
- Comparing Data Distributions

**11.4: Two-Way Tables (2 days)**
- Finding and Interpreting Marginal Frequencies
- Making a Two-Way Table
- Finding Relative Frequencies
- Finding Conditional Relative Frequencies
- Recognizing Associations in Data
- Recognizing Associations in Data

**11.5: Choosing a Data Display (2 days)**
- Classifying Data
- Choosing and Creating Data Displays
- Analyzing Misleading Graphs

**Test Review (1 day)**
**Test (1 day)**

*Additional 2 days used for review and quiz days *

**Resources: Textbook, online resources, etc.**

## Unit Modifications for Special Population Students

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| **Advanced Learners** | • Ask reflective and extension questions to build on classroom knowledge to develop a deeper understanding<br>• Use enrichment and extension activities<br>• Have them complete additional critical thinking exercise to develop a deeper understanding |
| **Struggling Learners** | • Read Problems aloud frequently<br>• Rephrase questions for student clarification<br>• Preferential Seating – close proximity to teacher<br>• Redirect student attention to the step-by-step explanation of each concept.<br>• Use of Dynamic Monitoring Tool to practice basic skills<br>• Have student view re-teaching videos |
| **English Language Learners** | • Have student view re-teaching videos<br>• Rephrase questions for student clarification<br>• Easy access to language dictionary, instructor, or any other means to help interpret any language/communication difficulties<br>• Allow use of translator device<br>• Provide vocabulary flash cards<br>• For Spanish speaking students view re-teaching videos in Spanish |
| **Special Needs Learners** | Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org |
| **Learners with a 504** | Refer to page four in the Parent and Educator Resource Guide to Section 504 to assist in the development of appropriate plans. |

**Indicators:**

**New Jersey Student Learning Standards for English Language Arts**
**RST.9-10.4**. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.
**RST.9-10.7**. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
**WHST.9-10.6**. Use technology, including the Internet, to produce, share, and update writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

**New Jersey Student Learning Standards for Social Studies**
**Gathering and Evaluating Sources-** Finding, evaluating and organizing information and evidence from multiple sources and perspectives are the core of inquiry. Effective practice requires evaluating the credibility of primary and secondary sources, assessing the reliability of information, analyzing the context of information, and corroborating evidence across sources. Discerning opinion from fact and interpreting the significance of information requires thinking critically about ourselves and the world.
**6.1.12.EconNE.6.a:** Analyze the impact of money, investment, credit, savings, debt, and financial institutions on the development of the nation and the lives of individuals.

**New Jersey Student Learning Standards for Computer Science and Design Thinking**
**8.1.8.DA.1**: Organize and transform data collected using computational tools to make it usable for a specific purpose.
**8.1.8.DA.4**: Transform data to remove errors and improve the accuracy of the data for analysis.
**8.1.8.DA.5**: Test, analyze, and refine computational models.
**8.1.12.DA.5**: Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.

**New Jersey Student Learning Standards for Technology Education**
**9.3.ST.1**: Use technology to acquire, manipulate, analyze and report data.
**9.3.ST-SM.4**: Apply critical thinking skills to review information, explain statistical analysis, and to translate, interpret and summarize research and statistical data.
**9.4.12.O.12**: Develop and interpret tables, charts, and figures to support written and oral communications.

**Life Literacies & Key Skills**
**9.4.12.IML.3:** Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8)

**New Jersey Student Learning Standards for Science**
**Analyzing and Interpreting Data** Scientific investigations produce data that must be analyzed in order to derive meaning. Because data patterns and trends are not always obvious, scientists use a range of tools—including tabulation, graphical interpretation, visualization, and statistical analysis—to identify the significant features and patterns in the data. Scientists identify sources of error in the investigations and calculate the degree of certainty in the results. Modern technology makes the collection of large data sets much easier, providing secondary sources for analysis

| Integration of 21st Century Skills |
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| **Indicators:**<br>The P21 organization conducted research that identified deeper learning competencies and skills they called the Four Cs of 21st century learning:<br><br>Collaboration<br>Communication<br>Critical thinking<br>Creativity |