MATHEMATICS

Algebra I: Unit 4
Modeling with Statistics
Course Philosophy/Description

The fundamental purpose of Algebra 1 is to formalize and extend the mathematics that students learned in the elementary and middle grades. The Standards for Mathematical Practice apply throughout each course, and, together with the New Jersey Student Learning 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. The Conceptual knowledge behind the mathematics is emphasized. Algebra I provides a formal development of the algebraic skills and concepts necessary for students to succeed in advanced courses as well as the PARCC. The course also provides opportunities for the students to enhance the skills needed to become college and career ready.

The content shall include, but not be limited to, perform set operations, use fundamental concepts of logic including Venn diagrams, describe the concept of a function, use function notation, solve real-world problems involving relations and functions, determine the domain and range of relations and functions, simplify algebraic expressions, solve linear and literal equations, solve and graph simple and compound inequalities, solve linear equations and inequalities in real-world situations, rewrite equations of a line into slope-intercept form and standard form, graph a line given any variation of information, determine the slope, x- and y-intercepts of a line given its graph, its equation or two points on the line, write an equation of a line given any variation of information, determine a line of best fit and recognize the slope as the rate of change, factor polynomial expressions, perform operations with polynomials, simplify and solve algebraic ratios and proportions, simplify and perform operations with radical and rational expressions, simplify complex fractions, solve rational equations including situations involving mixture, distance, work and interest, solve and graph absolute value equations and inequalities, graph systems of linear equations and inequalities in two and three variables and quadratic functions, and use varied solution strategies for quadratic equations and for systems of linear equations and inequalities in two and three variables.
This ESL framework was designed to be used by bilingual, dual language, ESL and general education teachers. Bilingual and dual language programs use the home language and a second language for instruction. ESL teachers and general education or bilingual teachers may use this document to collaborate on unit and lesson planning to decide who will address certain components of the SLO and language objective. ESL teachers may use the appropriate leveled language objective to build lessons for ELLs which reflects what is covered in the general education program. In this way, whether it is a pull-out or push-in model, all teachers are working on the same Student Learning Objective connected to the New Jersey Student Learning Standards. The design of language objectives are based on the alignment of the World-Class Instructional Design Assessment (WIDA) Consortium’s English Language Development (ELD) standards with the New Jersey Student Learning Standards (NJSLS). WIDA’s ELD standards advance academic language development across content areas ultimately leading to academic achievement for English learners. As English learners are progressing through the six developmental linguistic stages, this framework will assist all teachers who work with English learners to appropriately identify the language needed to meet the requirements of the content standard. At the same time, the language objectives recognize the cognitive demand required to complete educational tasks. Even though listening and reading (receptive) skills differ from speaking and writing (expressive) skills across proficiency levels the cognitive function should not be diminished. For example, an Entering Level One student only has the linguistic ability to respond in single words in English with significant support from their home language. However, they could complete a Venn diagram with single words which demonstrates that they understand how the elements compare and contrast with each other or they could respond with the support of their native language with assistance from a teacher, para-professional, peer or a technology program.

http://www.state.nj.us/education/modelcurriculum/ela/ELLOverview.pdf
<table>
<thead>
<tr>
<th>#</th>
<th>Student Learning Objective</th>
<th>NJSLS</th>
<th>Big Ideas Math Correlation</th>
<th>Instruction: 8 weeks Assessment: 1 week</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Represent data with plots (dot plots, histograms, and box plots) on the real number line.</td>
<td>S.ID.A.1</td>
<td>11.2, 11.3, 11.5</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Compare center and spread of two or more data sets, interpreting differences in shape, center, and spread in the context of the data, taking into account the effects of outliers.</td>
<td>S.ID.A.2, S.ID.A.3</td>
<td>11.1, 11.2, 11.3</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Summarize and interpret categorical data for two categories in two-way frequency tables; explain possible associations and trends in the data.</td>
<td>S.ID.B.5</td>
<td>11.4</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Fit functions to data using technology, plot residuals and informally assess the fit of linear and non-linear functions by analyzing residuals.</td>
<td>S.ID.B.6a,6b</td>
<td>4.4, 4.5</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Interpret key features of functions from graphs and tables. Given a verbal description of the relationship, sketch the graph of a function, showing key features and relating the domain of the function to its graph.</td>
<td>F.IF.B.4, F.IF.B.5</td>
<td>3.2, 3.5</td>
<td></td>
</tr>
</tbody>
</table>
Research about Teaching and Learning Mathematics

Structure teaching of mathematical concepts and skills around problems to be solved (Checkly, 1997; Wood & Sellars, 1996; Wood & Sellars, 1997)
Encourage students to work cooperatively with others (Johnson & Johnson, 1975; Davidson, 1990)
Use group problem-solving to stimulate students to apply their mathematical thinking skills (Artzt & Armour-Thomas, 1992)
Students interact in ways that support and challenge one another’s strategic thinking (Artzt, Armour-Thomas, & Curcio, 2008)
Activities structured in ways allowing students to explore, explain, extend, and evaluate their progress (National Research Council, 1999)

There are three critical components to effective mathematics instruction (Shellard & Moyer, 2002):

- Teaching for conceptual understanding with the Balanced Math approach to instruction.
- Developing children’s procedural literacy
- Promoting strategic competence through meaningful problem-solving investigations

Teachers should be:

- Demonstrating acceptance and recognition of students’ divergent ideas.
- Challenging students to think deeply about the problems they are solving, extending thinking beyond the solutions and algorithms required to solve the problem
- Influencing learning by asking challenging and interesting questions to accelerate students’ innate inquisitiveness and foster them to examine concepts further.
- Projecting a positive attitude about mathematics and about students’ ability to “do” mathematics

Students should be:

- Actively engaging in “doing” mathematics
- Solving challenging problems
- Investigating meaningful real-world problems
- Making interdisciplinary connections
- Developing an understanding of mathematical knowledge required to “do” mathematics and connect the language of mathematical ideas with numerical representations
- Sharing mathematical ideas, discussing mathematics with one another, refining and critiquing each other’s ideas and understandings
- Communicating in pairs, small group, or whole group presentations
- Using multiple representations to communicate mathematical ideas
- Using connections between pictures, oral language, written symbols, manipulative models, and real-world situations
- Using technological resources and other 21st century skills to support and enhance mathematical understanding
Mathematics is not a stagnate field of textbook problems; rather, it is a dynamic way of constructing meaning about the world around us, generating knowledge and understanding about the real world every day. Students should be metaphorically rolling up their sleeves and “doing mathematics” themselves, not watching others do mathematics for them or in front of them. (Protheroe, 2007)

Balanced Mathematics Instructional Model

Balanced math consists of three different learning opportunities; guided math, shared math, and independent math. Ensuring a balance of all three approaches will build conceptual understanding, problem solving, computational fluency, and procedural fluency. Building conceptual understanding is the focal point of developing mathematical proficiency. Students should frequently work on rigorous tasks, talk about the math, explain their thinking, justify their answer or process, build models with graphs or charts or manipulatives, and use technology.

When balanced math is used in the classroom it provides students opportunities to:

- solve problems
- make connections between math concepts and real-life situations
- communicate mathematical ideas (orally, visually and in writing)
- choose appropriate materials to solve problems
- reflect and monitor their own understanding of the math concepts
- practice strategies to build procedural and conceptual confidence

Teacher builds conceptual understanding by modeling through demonstration, explicit instruction, and think-alouds, as well as guiding students as they practice math strategies and apply problem solving strategies. (whole group or small group instruction)

Teacher and students practice mathematics processes together through interactive activities, problem solving, and discussion. (whole group or small group instruction)

Students practice math strategies independently to build procedural and computational fluency. Teacher assesses learning and re-teaches as necessary. (whole group instruction, small group instruction, or centers)
<table>
<thead>
<tr>
<th>Effective Pedagogical Routines/Instructional Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Collaborative Problem Solving</strong></td>
</tr>
<tr>
<td>Connect Previous Knowledge to New Learning</td>
</tr>
<tr>
<td>Making Thinking Visible</td>
</tr>
<tr>
<td><strong>Develop and Demonstrate Mathematical Practices</strong></td>
</tr>
<tr>
<td>Inquiry-Oriented and Exploratory Approach</td>
</tr>
<tr>
<td>Multiple Solution Paths and Strategies</td>
</tr>
<tr>
<td>Use of Multiple Representations</td>
</tr>
<tr>
<td>Explain the Rationale of your Math Work</td>
</tr>
<tr>
<td>Quick Writes</td>
</tr>
<tr>
<td>Pair/Trio Sharing</td>
</tr>
<tr>
<td>Turn and Talk</td>
</tr>
<tr>
<td>Charting</td>
</tr>
<tr>
<td>Gallery Walks</td>
</tr>
<tr>
<td>Small Group and Whole Class Discussions</td>
</tr>
<tr>
<td>Student Modeling</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Analyze Student Work</strong></td>
</tr>
<tr>
<td>Identify Student’s Mathematical Understanding</td>
</tr>
<tr>
<td>Identify Student’s Mathematical Misunderstandings</td>
</tr>
<tr>
<td>Interviews</td>
</tr>
<tr>
<td>Role Playing</td>
</tr>
<tr>
<td>Anticipate Likely and Possible Student Responses</td>
</tr>
<tr>
<td>Collect Different Student Approaches</td>
</tr>
<tr>
<td>Multiple Response Strategies</td>
</tr>
<tr>
<td>Asking Assessing and Advancing Questions</td>
</tr>
<tr>
<td>Revoicing</td>
</tr>
<tr>
<td>Marking</td>
</tr>
<tr>
<td>Recapping</td>
</tr>
<tr>
<td>Challenging</td>
</tr>
<tr>
<td>Pressing for Accuracy and Reasoning</td>
</tr>
<tr>
<td>Maintain the Cognitive Demand</td>
</tr>
</tbody>
</table>
Educational Technology

Standards

8.1.12.A.4, 8.1.12.E.1, 8.2.12.E.1

➢ Technology Operations and Concepts
  - Construct a spreadsheet workbook with multiple worksheets, rename tabs to reflect the data on the worksheet, and use mathematical or logical functions, charts and data from all worksheets to convey the results.

  Example: Students can explore how to use technology to represent and interpret data with different plots such as dot plots, histograms and box plots. [http://www.mathsisfun.com/data/graphs-index.html](http://www.mathsisfun.com/data/graphs-index.html)

➢ Research and Information Fluency
  - Produce a position statement about a real world problem by developing a systematic plan of investigation with peers and experts synthesizing information from multiple sources.

  Example: Students can work together using digital tools on tasks that require them to compare characteristics of data. They can then report their findings to the group using Google Classroom. [http://www.mathsisfun.com/data](http://www.mathsisfun.com/data)

➢ Computational Thinking: Programming
  - Demonstrate an understanding of the problem solving capacity of computers in our world.

  Example: Students can use the graphing calculator to fit functions to a data set, plot residuals and assess the fit by analyzing residuals. They can then share how the technology facilitated and deepened their understanding with the class.

Link: [https://www.state.nj.us/education/cccs/2014/tech/](https://www.state.nj.us/education/cccs/2014/tech/)
Career Ready Practices

Career Ready Practices describe the career-ready skills that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study.

- **CRP2. Apply appropriate academic and technical skills.**
  Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.

  **Example:** Students will apply prior knowledge when solving real-world problems. Students will make sound judgments about the use of specific tools, such as Graphing Calculators, to explore and deepen understanding the concepts related to statistics including how to model, solve, write, graph, interpret and explain these relationships accurately.

- **CRP4. Communicate clearly and effectively and with reason.**
  Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others’ time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.

  **Example:** Students will engage in mathematical discourse on a daily basis. They will be expected to communicate the reasoning behind their solution paths, make connections to the context and the quantities involved, and use proper vocabulary. Students will be able to accurately describe the relationships depicted in statistical models visually, verbally and mathematically. They will be able to explain the meaning behind the solution path/representation chosen and defend their rationale. Students will also ask probing questions of others to clarify and deepen understanding.
Career Ready Practices

- **CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.**
  Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.

  **Example:** Throughout their daily lessons, students will understand the meaning of a problem by analyzing the relationships among the quantities, constraints and goals of the task. This analytic process will encourage students to find entry points that will facilitate problem solving. Students will become effective at self-monitoring, evaluating and critiquing their process. This in turn will facilitate their ability to progress as they are working and change strategy when necessary. Students will be able to use critical thinking to solve, model, interpret, create, and compare statistical models.

- **CRP12. Work productively in teams while using cultural global competence.**
  Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.

  **Example:** Students will work in collaborative and whole group settings to develop various solutions to math tasks. They will work together to understand the terms of the problem, ask each other clarifying and challenging questions, and develop agreed upon solutions using a variety of strategies and models. Students will listen to, read and discuss arguments with respect and courtesy at all times. A willingness to assist one another will be cultivated and honored. Students will demonstrate and explain to a peer or small group how to solve, model, interpret, create, compare and explain statistical models.
WIDA Proficiency Levels

At the given level of English language proficiency, English language learners will process, understand, produce or use:

<table>
<thead>
<tr>
<th>Level</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>6- Reaching</td>
<td>- Specialized or technical language reflective of the content areas at grade level</td>
</tr>
<tr>
<td></td>
<td>- A variety of sentence lengths of varying linguistic complexity in extended oral or written discourse as required by the specified grade level</td>
</tr>
<tr>
<td></td>
<td>- Oral or written communication in English comparable to proficient English peers</td>
</tr>
<tr>
<td>5- Bridging</td>
<td>- Specialized or technical language of the content areas</td>
</tr>
<tr>
<td></td>
<td>- A variety of sentence lengths of varying linguistic complexity in extended oral or written discourse, including stories, essays or reports</td>
</tr>
<tr>
<td></td>
<td>- Oral or written language approaching comparability to that of proficient English peers when presented with grade level material.</td>
</tr>
<tr>
<td>4- Expanding</td>
<td>- Specific and some technical language of the content areas</td>
</tr>
<tr>
<td></td>
<td>- A variety of sentence lengths of varying linguistic complexity in oral discourse or multiple, related sentences or paragraphs</td>
</tr>
<tr>
<td></td>
<td>- Oral or written language with minimal phonological, syntactic or semantic errors that may impede the communication, but retain much of its meaning, when presented with oral or written connected discourse, with sensory, graphic or interactive support</td>
</tr>
<tr>
<td>3- Developing</td>
<td>- General and some specific language of the content areas</td>
</tr>
<tr>
<td></td>
<td>- Expanded sentences in oral interaction or written paragraphs</td>
</tr>
<tr>
<td></td>
<td>- Oral or written language with phonological, syntactic or semantic errors that may impede the communication, but retain much of its meaning, when presented with oral or written, narrative or expository descriptions with sensory, graphic or interactive support</td>
</tr>
<tr>
<td>2- Beginning</td>
<td>- General language related to the content area</td>
</tr>
<tr>
<td></td>
<td>- Phrases or short sentences</td>
</tr>
<tr>
<td></td>
<td>- Oral or written language with phonological, syntactic, or semantic errors that often impede of the communication when presented with one to multiple-step commands, directions, or a series of statements with sensory, graphic or interactive support</td>
</tr>
<tr>
<td>1- Entering</td>
<td>- Pictorial or graphic representation of the language of the content areas</td>
</tr>
<tr>
<td></td>
<td>- Words, phrases or chunks of language when presented with one-step commands directions, WH-, choice or yes/no questions, or statements with sensory, graphic or interactive support</td>
</tr>
</tbody>
</table>
# Language Development Supports For English Language Learners

## To Increase Comprehension and Communication Skills

<table>
<thead>
<tr>
<th>Environment</th>
<th></th>
</tr>
</thead>
</table>
| - Welcoming and stress-free  
- Respectful of linguistic and cultural diversity  
- Honors students' background knowledge  
- Sets clear and high expectations  
- Includes routines and norms  
- Is thinking-focused vs. answer-seeking  
- Offers multiple modalities to engage in content learning and to demonstrate understanding  
- Includes explicit instruction of specific language targets  
- Provides participation techniques to include all learners  | - Integrates learning centers and games in a meaningful way  
- Provides opportunities to practice and refine receptive and productive skills in English as a new language  
- Integrates meaning and purposeful tasks/activities that:  
  - Are accessible by all students through multiple entry points  
  - Are relevant to students' lives and cultural experiences  
  - Build on prior mathematical learning  
  - Demonstrate high cognitive demand  
  - Offer multiple strategies for solutions  
  - Allow for a language learning experience in addition to content |

<table>
<thead>
<tr>
<th>Sensory Supports*</th>
<th>Graphic Supports*</th>
<th>Interactive Supports*</th>
<th>Verbal and Textual Supports</th>
</tr>
</thead>
</table>
| - Real-life objects (realia) or concrete objects  
- Physical models  
- Manipulatives  
- Pictures & photographs  
- Visual representations or models such as diagrams or drawings  
- Videos & films  
- Newspapers or magazines  
- Gestures  
- Physical movements  
- Music & songs | - Graphs  
- Charts  
- Timelines  
- Number lines  
- Graphic organizers  
- Graphing paper | - In a whole group  
- In a small group  
- With a partner such as **Turn-and-Talk**  
- In pairs as a group (first, two pairs work independently, then they form a group of four)  
- In triads  
- Cooperative learning structures such as **Think-Pair-Share**  
- Interactive websites or software  
- With a mentor or coach | - Labeling  
- Students' native language  
- Modeling  
- Repetitions  
- Paraphrasing  
- Summarizing  
- Guiding questions  
- Clarifying questions  
- Probing questions  
- Leveled questions such as **What? When? Where? How? Why?**  
- Questioning prompts & cues  
- Word Banks  
- Sentence starters  
- Sentence frames  
- Discussion frames  
- Talk moves, including **Wait Time** |

---


---

Galina (Halba) Imourko, ESOL Coach, PGPS, 2015, Rvsl. 2016
## Building Equity in Your Teaching Practice

How do the essential questions highlight the connection between the big ideas of the unit and equity in your teaching practice?

<table>
<thead>
<tr>
<th>CONTENT INTEGRATION</th>
<th>KNOWLEDGE CONSTRUCTION</th>
<th>PREJUDICE REDUCTION</th>
<th>EQUITABLE PEDAGogy</th>
<th>EMPOWERING SCHOOL CULTURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers use examples and content from a variety of cultures &amp; groups.</td>
<td>Teachers help students understand how knowledge is created and influenced by cultural assumptions, perspectives &amp; biases.</td>
<td>Teachers implement lessons and activities to assert positive images of ethnic groups &amp; improve intergroup relations.</td>
<td>Teachers modify techniques and methods to facilitate the academic achievement of students from diverse backgrounds.</td>
<td>Using the other four dimensions to create a safe and healthy educational environment for all.</td>
</tr>
</tbody>
</table>

This unit / lesson is connected to other topics explored with students.

There are multiple viewpoints reflected in the content of this unit / lesson.

The materials and resources are reflective of the diverse identities and experiences of students.

The content affirms students, as well as exposes them to experiences other than their own.

This unit / lesson provides context to the history of privilege and oppression.

This unit / lesson addresses power relationships.

This unit / lesson help students to develop research and critical thinking skills.

This curriculum creates windows and mirrors* for students.

This unit / lesson help students question and unpack biases & stereotypes.

This unit / lesson help students examine, research and question information and sources.

This unit / lesson challenges dominant perspectives.

The instruction has been modified to meet the needs of each student.

Students feel respected and their cultural identities are valued.

Additional supports have been provided for students to become successful and independent learners.

Opportunities are provided for student to reflect on their learning and provide feedback.

There are opportunities for students to connect with the community.

My classroom is welcoming and supportive for all students?

I am aware of and sensitive to the needs of my students and their families.

There are effective parent communication systems established. Parents can talk to me about issues as they arise in my classroom.

---

### Culturally Relevant Pedagogy Examples

- **Everyone has a Voice**: Create a classroom environment where students know that their contributions are expected and valued.  
  **Example**: Norms for sharing are established that communicate a growth mindset for mathematics. All students are capable of expressing mathematical thinking and contributing to the classroom community. Students learn new ways of looking at problem solving by working with and listening to each other.

- **Present New Concepts Using Student Vocabulary**: Use student diction to capture attention and build understanding before using academic terms.  
  **Example**: Teach math vocabulary in various modalities for students to remember. Use multi-modal activities, analogies, visual cues, graphic representations, gestures, pictures, practice and cognates. Model to students that some vocabulary has multiple meanings. Have students create the Word Wall with their definitions and examples to foster ownership.

- **Establish Inclusion**: Highlight how the topic may relate or apply to students.  
  **Example**: Have students come up with examples of how statistics can be used at home, in their neighborhood and outside of their neighborhood. After having a volunteer list a few in each category, use the examples in class with the students. Establishing inclusion also involves regularly grouping students with different classmates to share unique perspectives.

- **Integrate Relevant Word Problems**: Contextualize equations using word problems that reference student interests and cultures.  
  **Example**: When learning about statistics, problems that relate to student interests such as music, sports and art enable the students to understand and relate to the concept in a more meaningful way.

- **Encourage Student Leadership**: Create an avenue for students to propose problem solving strategies and potential projects.  
  **Example**: Students can learn about statistics by creating problems together and deciding if the problems fit the necessary criteria. This experience will allow students to discuss and explore their current level of understanding by applying the concepts to relevant real-life experiences.
### Differentiated Instruction

**Accommodate Based on Students Individual Needs: Strategies**

<table>
<thead>
<tr>
<th>Time/General</th>
<th>Processing</th>
<th>Comprehension</th>
<th>Recall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extra time for assigned tasks</td>
<td>Extra Response time</td>
<td>Precise processes for balanced math instruction model</td>
<td>Teacher-made checklist</td>
</tr>
<tr>
<td>Adjust length of assignment</td>
<td>Have students verbalize steps</td>
<td>Short manageable tasks</td>
<td>Use visual graphic organizers</td>
</tr>
<tr>
<td>Timeline with due dates for reports and projects</td>
<td>Repeat, clarify or reword directions</td>
<td>Brief and concrete directions</td>
<td>Reference resources to promote independence</td>
</tr>
<tr>
<td>Communication system between home and school</td>
<td>Mini-breaks between tasks</td>
<td>Provide immediate feedback</td>
<td>Visual and verbal reminders</td>
</tr>
<tr>
<td>Provide lecture notes/outline</td>
<td>Provide a warning for transitions</td>
<td>Small group instruction</td>
<td>Graphic organizers</td>
</tr>
<tr>
<td></td>
<td>Partnering</td>
<td>Emphasize multi-sensory learning</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Assistive Technology</th>
<th>Tests/Quizzes/Grading</th>
<th>Behavior/Attention</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer/whiteboard</td>
<td>Extended time</td>
<td>Consistent daily structured routine</td>
<td>Individual daily planner</td>
</tr>
<tr>
<td>Tape recorder</td>
<td>Study guides</td>
<td>Simple and clear classroom rules</td>
<td>Display a written agenda</td>
</tr>
<tr>
<td>Video Tape</td>
<td>Shortened tests</td>
<td>Frequent feedback</td>
<td>Note-taking assistance</td>
</tr>
<tr>
<td></td>
<td>Read directions aloud</td>
<td></td>
<td>Color code materials</td>
</tr>
</tbody>
</table>

**Tests/Quizzes/Grading**
- Extended time
- Study guides
- Shortened tests
- Read directions aloud

**Behavior/Attention**
- Consistent daily structured routine
- Simple and clear classroom rules
- Frequent feedback

**Organization**
- Individual daily planner
- Display a written agenda
- Note-taking assistance
- Color code materials
# Differentiated Instruction

## Accommodate Based on Content Needs: Strategies

- Anchor charts to model strategies and process
- Reference sheets that list formulas, step-by-step procedures and model strategies
- Conceptual word wall that contain definitions, translations, pictures and/or examples
- Graphic organizer to help students solve quadratic equations using different methods (such as quadratic formula, completing the square, factoring, etc.)
- Translation dictionary
- Sentence stems to provide additional language support for ELL students
- Teacher modeling
- Highlight and label solution steps for multi-step problems in different colors
- Create an interactive notebook with students with a table of contents so they can refer to previously taught material readily
- Targeted assistance for students when summarizing and interpreting two-way frequency tables by using real world examples
- Graph paper
- Step by step directions on how to use a graphing calculator to fit functions to data and plot residuals
- Visual, verbal and algebraic models of quadratic functions
- A chart noting key features of functions from graphs and tables
- Videos to reinforce skills and thinking behind concepts
- Use real world data sets to facilitate students’ ability to compare center and spread of two sets of data
Interdisciplinary Connections

Model interdisciplinary thinking to expose students to other disciplines.

Social Studies Connection:
Coffee and Crime (6.3.8.A.2)
- This task uses data to help a city council make an informed decision of whether to limit the number of coffee shops in the town.

Physical Education Connection:
Olympic Men's 100-meter Dash (2.5.8.A.2, 2.5.12.A.2)
- This task uses data from prior Olympic games to utilize statistics to predict future performance in the 100-yard dash.

Science Connection:
Boyle’s Law (MS-PS1-4, HS-PS1-3)
- Students will explore rational numbers and functions in the context of Boyle’s Law.
## Enrichment

### What is the Purpose of Enrichment?

- The purpose of enrichment is to provide extended learning opportunities and challenges to students who have already mastered, or can quickly master, the basic curriculum. Enrichment gives the student more time to study concepts with greater depth, breadth, and complexity.
- Enrichment also provides opportunities for students to pursue learning in their own areas of interest and strengths.
- Enrichment keeps advanced students engaged and supports their accelerated academic needs.
- Enrichment provides the most appropriate answer to the question, “What do you do when the student already knows it?”

### Enrichment is...

- Planned and purposeful
- *Different*, or differentiated, work – not just more work
- Responsive to students’ needs and situations
- A promotion of high-level thinking skills and making connections within content
- The ability to apply different or multiple strategies to the content
- The ability to synthesize concepts and make real world and cross-curricular connections
- Elevated contextual complexity
- Sometimes independent activities, sometimes direct instruction
- Inquiry based or open ended assignments and projects
- Using supplementary materials in addition to the normal range of resources
- Choices for students
- Tiered/Multi-level activities with flexible groups (may change daily or weekly)

### Enrichment is not...

- Just for gifted students (some gifted students may need intervention in some areas just as some other students may need frequent enrichment)
- Worksheets that are more of the same (busywork)
- Random assignments, games, or puzzles not connected to the content areas or areas of student interest
- Extra homework
- A package that is the same for everyone
- Thinking skills taught in isolation
- Unstructured free time
Assessments

**Required District/State Assessments**
- Unit Assessment
- PARCC
- SGO Assessments

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

### S.ID.A.1: Represent data with plots on the real number line (dot plots, histograms, and box plots).

### S.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.

### S.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).

### S.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.

### S.ID.B.6: Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

- **S.ID.B.6a:** Fit a function to the data (including the use of technology); use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.

- **S.ID.B.6b:** Informally assess the fit of a function by plotting and analyzing residuals, including with the use of technology.

### F.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.

### F.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.
Mathematical Practices

1. Make sense of problems and persevere in solving them.

2. Reason abstractly and quantitatively.

3. Construct viable arguments and critique the reasoning of others.

4. Model with mathematics.

5. Use appropriate tools strategically.

6. Attend to precision.

7. Look for and make use of structure.

8. Look for and express regularity in repeated reasoning.
### Algebra 1
Unit: 4  
Topic: Modeling with Statistics

| **NJSLS:** | S.ID.A.1, S.ID.A.2, S.ID.A.3, S.ID.B.5, S.ID.B.6, S.ID.B.6a, S.ID.B.6b, F.IF.B.4*, F.IF.B.5* |

### Unit Focus:
- Summarize, represent, and interpret data on a single count or measurement variable
- Summarize, represent, and interpret data on two categorical and quantitative variables
- Interpret functions that arise in applications in terms of the context

### New Jersey Student Learning Standard(s):
S.ID.A.1: Represent data with plots on the real number line (dot plots, histograms, and box plots).

**Student Learning Objective 1:** Represent data with plots (dot plots, histograms, and box plots) on the real number line.

**Modified Student Learning Objectives/Standards:** N/A

<table>
<thead>
<tr>
<th>MPs</th>
<th>Evidence Statement Key/Clarifications</th>
<th>Skills, Strategies &amp; Concepts</th>
<th>Essential Understandings/Questions (Accountable Talk)</th>
<th>Tasks/Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP 1</td>
<td>N/A</td>
<td>Represent data with dot plots on the real number line.</td>
<td>How can students accurately determine when to use dot plots, histograms, and box plots?</td>
<td>Type II and III:</td>
</tr>
<tr>
<td>MP 2</td>
<td></td>
<td>Represent data with histograms on the real number line.</td>
<td></td>
<td>Haircut Costs</td>
</tr>
<tr>
<td>MP 4</td>
<td></td>
<td>Represent data with box plots on the real number line.</td>
<td></td>
<td>Speed Trap</td>
</tr>
<tr>
<td>MP 5</td>
<td></td>
<td></td>
<td></td>
<td>Soccer</td>
</tr>
<tr>
<td>MP 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SPED Strategies:**
Use contextualized data to introduce the topic of representing data using dot plots, histograms, and box plots.
Create a graphic organizer for students to use while engaging in independent work that highlights key points addressed during introductory lesson.

Provide students with data to graph that is related to high interest topics.

Use assessing and advancing questions to determine additional strategies and support that may be needed to enhance learning.

**ELL Support:**
Introduce how data can be represented using dot plots, histograms and box plots by using concrete examples, visual displays and explicitly taught vocabulary.

Create a graphic organizer with students that chronicles the learning that took place during the introduction and serves as a resource for students to use while working independently or with peers. Particular attention should be paid to the language need of students when creating the document.
New Jersey Student Learning Standard(s):
S.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.
S.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).

Student Learning Objective 2: Compare center and spread of two or more data sets, interpreting differences in shape, center, and spread in the context of the data, taking into account the effects of outliers.

Modified Student Learning Objectives/Standards: N/A

<table>
<thead>
<tr>
<th>MPs</th>
<th>Evidence Statement Key/Clarifications</th>
<th>Skills, Strategies &amp; Concepts</th>
<th>Essential Understandings/Questions (Accountable Talk)</th>
<th>Tasks/Activities</th>
</tr>
</thead>
</table>
| MP 1 MP 2 MP 4 MP 5 MP 6 | N/A | - Appropriate use of a statistic depends on the shape of the data distribution.  
- Calculating standard deviation.  
- Represent two or more data sets with plots and use appropriate statistics to compare their center and spread.  
- Interpret differences in shape, center, and spread in context.  
- Explain possible effects of extreme data points (outliers) when summarizing data and interpreting shape, center and spread.  
**SPED Strategies:** Model the thinking process and algorithms involved in comparing 2 or more data sets, deliberately teach the vocabulary in context | - What determinations can students make based on the shape of the data distribution?  
- How can students calculate standard deviation for a set of data?  
- How can students represent and compare two or more sets of data using appropriate statistics?  
- How can students use the shape, center, and spread to interpret the differences of the data? | Type II and III:  
- Describing Data Sets with Outliers  
- Data not just for math class anymore  
- Shoes  
- Speeding Tickets  
- Measuring Variability in a Data Set  
- Identifying Outliers |
and document these items in a Google Doc/Anchor Chart/Graphic Organizer.

Ask questions that require students to look at the data and make meaning.

Discuss the effect of outliers on the data set and its graphical representation by using examples that are related to student experience i.e. test grades.

**ELL Support:**
Provide students with tasks that relate to real life experiences where the center and spread of two or more sets of data is required. This will anchor the concepts in a concrete way.

Support for vocabulary development should always be provided especially when new content is being covered. Access to dictionaries, linguistically simpler terminology and visual representations can facilitate understanding and reduce the impact of language proficiency on the conceptual development.

| Understanding the Standard Deviation |
**New Jersey Student Learning Standard(s):**

S.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.

**Student Learning Objective 3:** Summarize and interpret categorical data for two categories in two-way frequency tables; explain possible associations and trends in the data.

**Modified Student Learning Objectives/Standards:** N/A

<table>
<thead>
<tr>
<th>MPs</th>
<th>Evidence Statement Key/ Clarifications</th>
<th>Skills, Strategies &amp; Concepts</th>
<th>Essential Understandings/ Questions (Accountable Talk)</th>
<th>Tasks/Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP 1</td>
<td>S-ID.5</td>
<td>Categorical variables represent types of data which may be divided into groups.</td>
<td>How can categorical variables represent types of data?</td>
<td>Type II and III: peacefully</td>
</tr>
<tr>
<td>MP 5</td>
<td>• Tasks must have at least one of the categorical variables with more than two sub-categories.</td>
<td>Construct two-way frequency tables for categorical data.</td>
<td>Can students interpret joint, marginal, and conditional relative frequencies in context?</td>
<td>Musical Preferences</td>
</tr>
<tr>
<td>MP 7</td>
<td>• “Total” rows and columns will be provided but may be missing the data.</td>
<td>Interpret joint, marginal and conditional relative frequencies in context.</td>
<td>Can students explain associations between categorical data in two-way tables?</td>
<td>Interpreting Correlation</td>
</tr>
<tr>
<td></td>
<td>• Associations should be investigated based on the relative frequencies, not counts.</td>
<td>Explain possible associations between categorical data in two-way tables.</td>
<td>Can students identify and describe trends in data?</td>
<td>Salary</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Identify and describe trends in the data.</td>
<td>How are two-way frequency tables used to interpret joint, marginal and conditional relative frequencies?</td>
<td>Summarizing Bivariate Categorical Data with Relative Frequencies</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>SPED Strategies:</strong> Use contextualized data to introduce the topic of summarizing and interpreting data from two-way frequency tables to foster connections with prior learning.</td>
<td></td>
<td>Summarizing Bivariate Categorical Data</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Model the thinking process involved in summarizing and interpreting data from two-way frequency tables, deliberately teach the vocabulary in context and</td>
<td></td>
<td>Support for a Longer School Day</td>
</tr>
</tbody>
</table>

document these items in a Google Doc/Anchor Chart/Graphic Organizer.

While working in small groups, provide students with data sets to interpret that include high interest topics and encourage productive conversation.

Use assessing and advancing questions to determine additional strategies and support that may be needed to enhance learning.

**ELL Support:**

Provide students with two way frequency tables that are related to real life scenarios with which they can relate.

Model the thinking process, explain vocabulary in simpler terms and ask questions that encourage mathematical discourse.

Create a document such as an anchor chart that enumerates the process involved in creating and analyzing two-way frequency tables and defines important terms. Include common misconceptions that may help students when working independently or in small groups.

<table>
<thead>
<tr>
<th>Who do you pass the ball to?</th>
</tr>
</thead>
<tbody>
<tr>
<td>How do you use a two-way frequency table or scatter plot to identify associations or trends in a data set?</td>
</tr>
<tr>
<td>frequencies of categorical data?</td>
</tr>
</tbody>
</table>
**New Jersey Student Learning Standard(s):**

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

  
  S.ID.B.6a: Fit a function to the data (including the use of technology); use functions fitted to data to solve problems in the context of the data.
  
  Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.

  S.ID.B.6b: Informally assess the fit of a function by plotting and analyzing residuals, including with the use of technology.

**Student Learning Objective 4:** Fit functions to data using technology, plot residuals and informally assess the fit of linear and non-linear functions by analyzing residuals.

**Modified Student Learning Objectives/Standards:** N/A

<table>
<thead>
<tr>
<th>MPs</th>
<th>Evidence Statement Key/ Clarifications</th>
<th>Skills, Strategies &amp; Concepts</th>
<th>Essential Understandings/ Questions (Accountable Talk)</th>
<th>Tasks/Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP 1</td>
<td>N/A</td>
<td>Fit a function to data using technology.</td>
<td>How can using technology to fit a function to data help students learn more about functions?</td>
<td>Type I:</td>
</tr>
<tr>
<td>MP 2</td>
<td></td>
<td>Solve problems using functions fitted to data (prediction equations).</td>
<td></td>
<td>Type II and III:</td>
</tr>
<tr>
<td>MP 4</td>
<td></td>
<td>Interpret the intercepts of models in context.</td>
<td></td>
<td>Olympic 10 Meter Dash</td>
</tr>
<tr>
<td>MP 5</td>
<td></td>
<td>Plot residuals of linear and non-linear functions.</td>
<td></td>
<td>Restaurant Bill and Party Size</td>
</tr>
<tr>
<td>MP 6</td>
<td></td>
<td>Analyze residuals in order to informally evaluate the fit of linear and non-linear functions.</td>
<td></td>
<td>Analyzing Residuals</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>SPED Strategies:</strong> Model the thinking process and action steps involved in fitting functions to data, plotting residuals and assessing fit. Create a resource</td>
<td></td>
<td>Comparing Kicks</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Laptop Battery Charge</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Modeling a Context from Data</td>
</tr>
</tbody>
</table>

**SPED Strategies:**

Model the thinking process and action steps involved in fitting functions to data, plotting residuals and assessing fit. Create a resource.
by documenting these items in a Google Doc/Anchor Chart/Graphic Organizer.

Use contextualized data to illustrate the essential concepts to increase connections to prior learning and likelihood of increased proficiency.

**ELL Support:**
Using Desmos or graphing calculators, model how to fit functions to a data set by explaining the thinking and processes involved at each step.

Create notes with students that highlight the learning that has taken place and becomes a reference for later use. It should include steps, thinking, key terms/concepts and common misconceptions.

Teachers can increase understanding and proficiency by asking assessing and advancing questions as students work with their peers on conceptually based problems requiring the fitting of functions to data and plotting residuals.

<table>
<thead>
<tr>
<th>Seating and Prices</th>
</tr>
</thead>
<tbody>
<tr>
<td>PBA: Population</td>
</tr>
<tr>
<td>Snakes</td>
</tr>
</tbody>
</table>

What are linear and non-linear functions? Why would you want to identify trends or associations in a data set? Why would you want to informally assess and identify a type of function to fit a data set?
### New Jersey Student Learning Standard(s):  
**F.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.

**F.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.

### Student Learning Objective 5:  
Interpret key features of functions from graphs and tables. Given a verbal description of the relationship, sketch the graph of a function, showing key features and relating the domain of the function to its graph.

### Modified Student Learning Objectives/Standards: N/A

<table>
<thead>
<tr>
<th>MPs</th>
<th>Evidence Statement Key/Clarifications</th>
<th>Skills, Strategies &amp; Concepts</th>
<th>Essential Understandings/Questions (Accountable Talk)</th>
<th>Tasks/Activities</th>
</tr>
</thead>
</table>
| MP 4 | F-IF.4-1  
F-IF.5-1  
F-IF.5-2  
**HS-Int. 3-1**  
**F-L.E.A, Construct and compare linear, quadratic, and exponential models and solve problems, is the primary content and at least one of the other listed content elements** | Interpret maximum/minimum and intercepts of functions from graphs and tables in the context of the problem.  
Sketch graphs of functions given a verbal description of the relationship between the quantities.  
Identify intercepts and intervals where function is increasing/decreasing.  
Determine the practical domain of a function  
**SPED Strategies:**  
Model the thinking process and action steps involved in the accurate interpretation of key features of functions based on graphs and tables. Create a | How can students interpret the maximum and/or minimum and the intercepts from graphs and tables from the context of a problem?  
What do students need to know to accurately sketch the graph of a function given a verbal description of the relationship between the quantities?  
What information/skills are needed to accurately | **Type II and III:**  
Warming and Cooling  
Analyzing Data Collected on Two Variables  
Boyle’s Law  
Golf  
Interpreting Correlation |
| will be involved in tasks as well. [https://dese.mo.gov/sites/default/files/asmt-dlm-essential-elements-math.pdf](https://dese.mo.gov/sites/default/files/asmt-dlm-essential-elements-math.pdf) | resource by documenting these items in a Google Doc/Anchor Chart/Graphic Organizer. Encourage small group work so that students can practice and internalize this thinking. Use assessing and advancing questions to determine additional strategies and support that may be needed to enhance learning. **ELL Support:** Model the thinking process involved in identifying key features of functions from graphs and tables. Careful attention should be paid to providing scaffold for language proficiency differences among students. Resources such as native language dictionaries, anchor charts, notes and visual models should be available to students and incorporated into the instruction. Using simple verbal descriptions, the teacher can model how to sketch a graph based on that information. A deliberate effort to gradually increase the linguistic complexity of the verbal description should be made and support should be provided continuously to ensure that students understand the mathematical concept. | identify the intercepts and intervals of a function where it is increasing or decreasing? How can you describe the shape of a graph? How can you relate the shape of a graph to the meaning of the relationship it represents? | Interpreting Residuals from a Line Minimizing the Metal in a Can Modeling London’s Population Squirrel Population The Aquarium The Canoe Trip Variation 2 The Story of a Flight |
## Integrated Evidence Statements

### F-IF.A.Int.1: Understand the concept of a function and use function notation.
- Tasks require students to use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a real-world context.
- About a quarter of tasks involve functions defined recursively on a domain in the integers.

### F-Int.1-1: Given a verbal description of a linear or quadratic functional dependence, write an expression for the function and demonstrate various knowledge and skills articulated in the Functions category in relation to this function.
- Given a verbal description of a functional dependence, the student would be required to write an expression for the function and then, e.g., identify a natural domain for the function given the situation; use a graphing tool to graph several input-output pairs; select applicable features of the function, such as linear, increasing, decreasing, quadratic, nonlinear; and find an input value leading to a given output value.
  - e.g., a functional dependence might be described as follows: "The area of a square is a function of the length of its diagonal." The student would be asked to create an expression such as \( f(x) = \frac{1}{2} x^2 \) for this function. The natural domain for the function would be the positive real numbers. The function is increasing and nonlinear. And so on.
  - e.g., a functional dependence might be described as follows: "The slope of the line passing through the points (1, 3) and (7, y) is a function of y." The student would be asked to create an expression such as \( s(y) = \frac{3-y}{1-7} \) for this function. The natural domain for this function would be the real numbers. The function is increasing and linear. And so on.

### S-ID.Int.1: Solve multi-step contextual word problems with degree of difficulty appropriate to the course, requiring application of course-level knowledge and skills articulated in S-ID, excluding normal distributions and limiting function fitting to linear functions and exponential functions with domains in the integers.
- Tasks should go beyond 6.SP.4
- For tasks that use bivariate data, limit the use of time series. Instead use data that may have variation in the y-values for given x-values, such as pre and post test scores, height and weight, etc.
- Predictions should not extrapolate far beyond the set of data provided.
- Line of best fit is always based on the equation of the least squares regression line either provided or calculated through the use of technology.
- To investigate associations, students may be asked to evaluate scatter plots that may be provided or created using technology. Evaluation includes shape, direction, strength, presence of outliers, and gaps.
- Analysis of residuals may include the identification of a pattern in a residual plot as an indication of a poor fit.
Integrated Evidence Statements

- Exponential models may assess rate of growth, intercepts, etc.

S-ID.Int.2: Solve multi-step contextual word problems with degree of difficulty appropriate to the course, requiring application of course-level knowledge and skills articulated in S-ID, excluding normal distributions and limiting function fitting to quadratic, linear and exponential (with domains in the integers) functions with an emphasis on quadratic functions.
  - Tasks should go beyond 6.SP.4
  - For tasks that use bivariate data, limit the use of time series. Instead use data that may have variation in the y-values for given x-values, such as pre and post test scores, height and weight, etc.
  - Predictions should not extrapolate far beyond the set of data provided.
  - To investigate associations, students may be asked to evaluate scatter plots that may be provided or created using technology. Evaluation includes shape, direction, strength, presence of outliers, and gaps.
  - Analysis of residuals may include the identification of a pattern in a residual plot as an indication of a poor fit. Quadratic models may assess minimums/maximaums, intercepts, etc.

HS-Int.3-1: Solve multi-step contextual word problems with degree of difficulty appropriate to the course, requiring application of course-level knowledge and skills articulated in F-LE, A-CED.1, A-SSE.3, F-IF.B, F-IF.7, limited to linear functions and exponential functions with domains in the integers.
  - F-LE.A, Construct and compare linear, quadratic, and exponential models and solve problems, is the primary content and at least one of the other listed content elements will be involved in tasks as well.

HN-Int.3-2: Solve multi-step contextual word problems with degree of difficulty appropriate to the course, requiring application of course-level knowledge and skills articulated in F-LE, A-CED.1, A-SSE.3, F-IF.B, F-IF.7, limited to linear, quadratic, and exponential functions.
  - F-LE.A, Construct and compare linear, quadratic, and exponential models and solve problems, is the primary content and at least one of the other listed content elements will be involved in tasks as well. For rational solutions, exact values are required. For irrational solutions, exact or decimal approximations may be required. Simplifying or rewriting radicals is not required; however, students will not be penalized if they simplify the radicals correctly.

HS.D.2-8: Solve multi-step contextual word problems with degree of difficulty appropriate to the course, requiring application of course-level knowledge and skills articulated in F-BF.1a, F-BF.3, A-CED.1, A-SSE.3, F-IF.B, F-IF.7, limited to linear functions and exponential functions with domains in the integers.
Integrated Evidence Statements

- F-BF.1a is the primary content; other listed content elements may be involved in tasks as well.

HS.D.2-9: Solve multi-step contextual word problems with degree of difficulty appropriate to the course, requiring application of course-level knowledge and skills articulated in F-BF.1a, F-BF.3, A-CED.1, A-SSE.3, F-IF.B, F-IF.7, limited to linear and quadratic functions.
  - F-BF.1a is the primary content; other listed content elements may be involved in tasks as well.

HS.D.3-1a: Micro-models: Autonomously apply a technique from pure mathematics to a real-world situation in which the technique yields valuable results even though it is obviously not applicable in a strict mathematical sense (e.g., profitably applying proportional relationships to a phenomenon that is obviously nonlinear or statistical in nature). Content Scope: Knowledge and skills articulated in the Algebra 1 Type I, Sub-Claim A Evidence Statements.

HS.D.3-3a: Reasoned estimates: Use reasonable estimates of known quantities in a chain of reasoning that yields an estimate of an unknown quantity. Content Scope: Knowledge and skills articulated in the Algebra 1 Type I, Sub-Claim A Evidence Statements.
<table>
<thead>
<tr>
<th>Box Plots</th>
<th>Intervals</th>
<th>Spread</th>
</tr>
</thead>
<tbody>
<tr>
<td>Categorical data</td>
<td>Joint Frequencies</td>
<td>Standard Deviation</td>
</tr>
<tr>
<td>Categorical Variables</td>
<td>Linear Function</td>
<td>Trends</td>
</tr>
<tr>
<td>Center</td>
<td>Models</td>
<td>Two-way frequency table</td>
</tr>
<tr>
<td>Compare</td>
<td>Marginal Frequencies</td>
<td></td>
</tr>
<tr>
<td>Conditional Relative Frequencies</td>
<td>Maximum</td>
<td></td>
</tr>
<tr>
<td>Data</td>
<td>Minimum</td>
<td></td>
</tr>
<tr>
<td>Data set</td>
<td>Non-linear Function</td>
<td></td>
</tr>
<tr>
<td>Domain</td>
<td>Real number line</td>
<td></td>
</tr>
<tr>
<td>Dot plots</td>
<td>Represent</td>
<td></td>
</tr>
<tr>
<td>Functions</td>
<td>Residuals</td>
<td></td>
</tr>
<tr>
<td>Histograms</td>
<td>Scales</td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>Scatter plot</td>
<td></td>
</tr>
<tr>
<td>Intercepts</td>
<td>Shape</td>
<td></td>
</tr>
<tr>
<td>Interpret</td>
<td>Slope</td>
<td></td>
</tr>
<tr>
<td>References &amp; Suggested Instructional Websites</td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kahn Academy <a href="https://www.khanacademy.org">https://www.khanacademy.org</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Achieve the Core <a href="http://achievethecore.org">http://achievethecore.org</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Illustrative Mathematics <a href="https://www.illustrativemathematics.org/">https://www.illustrativemathematics.org/</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inside Mathematics <a href="http://www.insidemathematics.org">www.insidemathematics.org</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learn Zillion <a href="https://learnzillion.com">https://learnzillion.com</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Big Ideas Math <a href="https://www.bigideasmath.com/">https://www.bigideasmath.com/</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Youcubed <a href="https://www.youcubed.org/week-of-inspirational-math/">https://www.youcubed.org/week-of-inspirational-math/</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Howard County Public School System <a href="https://hcpss.instructure.com/courses/99">https://hcpss.instructure.com/courses/99</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Desmos <a href="https://www.desmos.com/">https://www.desmos.com/</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPALMS <a href="http://www.cpalms.org/Public/ToolkitGradeLevelGroup/Toolkit?id=14">http://www.cpalms.org/Public/ToolkitGradeLevelGroup/Toolkit?id=14</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partnership for Assessment of Readiness for College and Careers <a href="https://parcc.pearson.com/">https://parcc.pearson.com/</a></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Field Trip Ideas

**SIX FLAGS GREAT ADVENTURE:** This educational event includes workbooks and special science and math related shows throughout the day. Your students will leave with a better understanding of real world applications of the material they have learned in the classroom. Each student will have the opportunity to experience different rides and attractions linking mathematical and scientific concepts to what they are experiencing.

www.sixflags.com

**MUSEUM of MATHEMATICS:** Mathematics illuminates the patterns that abound in our world. The National Museum of Mathematics strives to enhance public understanding and perception of mathematics. Its dynamic exhibits and programs stimulate inquiry, spark curiosity, and reveal the wonders of mathematics. The Museum’s activities lead a broad and diverse audience to understand the evolving, creative, human, and aesthetic nature of mathematics.

www.momath.org

**LIBERTY SCIENCE CENTER:** An interactive science museum and learning center located in Liberty State Park. The center, which first opened in 1993 as New Jersey's first major state science museum, has science exhibits, the largest IMAX Dome theater in the United States, numerous educational resources, and the original Hoberman sphere.

http://lsc.org/plan-your-visit/