Englewood Public School District
Algebra 1
Second Marking Period

Unit 2: Modeling with Linear Functions, Systems and Inequalities

Overview: During this unit, students will investigate functions and their application to the real world using linear equations, scatter plots, and systems of equations.

Time Frame: 43 to 47 Days

Enduring Understandings:
- *A function pairs one input value with exactly one output value. Functions are represented using words, tables, equations, sets of ordered pairs, and graphs.*
- *Functions can be used to model real-world situations.*
- *In the graph of a line, the ratio for the slope indicates the rate of change.*
- *There are several forms for the equation of a line; each form communicates different information.*
- *A scatter plot with an equation of a line models the trend of real world data; the equation can be used to estimate and make predictions.*
- *Systems of equations of equations and inequalities can be solved using the graphing method, substitution method, or elimination method.*
- *Real world mathematical problems that include two unknowns can be modeled using systems of equations.*

Essential Questions:
- *How can you represent and describe functions?*
- *Can functions describe real world situations?*
- *What does the slope of a line indicate about the line?*
- *What information does the equation of a line give you?*
- *How can you make predictions based upon a scatter plot?*
- *How can you solve a system of linear equations or inequalities?*
- *How can systems of equations model real world situations?*

Standards	Topics and Objectives	Activities	Resources	Assessments
MP1, MP2, MP3, MP4, MP6, MP7 N-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose	**Topics** Identifying functions and writing in function notation. Investigating linear equations and their graphs. Writing and solving systems of linear	Standards Solution Common Core Algebra Lessons: • Linear Programming • Graphing Equations and Inequalities in Two Variables	Pearson Realize Chapters 4, 5, and 6 Standards Solution Common Core Lessons Illustrative Mathematics	**Formative Assessments:** Textbook Pages 252, 287–288, 321, 357–358, 393, 411–412 Math journal

and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **N-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **N-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. **A-SSE.A.1a, b** Interpret expressions that represent a quantity in terms of its context. **A-SSE.A.2** See the structure of an expression to identify ways to rewrite it. **A-CED.A.2** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. **A-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. **A-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

equations and inequalities.

Twenty-First Century Themes and Skills include:
- The Four C's
- Global awareness
- Financial, economic, business and entrepreneurial literacy

Objectives

Students will
- represent functions using tables, equations, and graphs
- use function notation
- represent arithmetic sequences using function rules
- use graphs to relate two quantities
- will model real world situations that are continuous and discrete

- Solving Systems of Equations and Inequalities

Standards Solution Common Core Function Lessons:
- Arithmetic and Geometric Sequences
- Function Domains and Ranges
- Interpreting Functions

Standards Solution Common Core Geometry Lessons:
- Parallel and Perpendicular Lines on a Coordinate Plane

Standards Solution Common Core Probability and Statistics Lessons:
- Correlation vs Causation
- Spaghetti Strength

Interpreting the Graph
https://www.illustrativemathematics.org/content-standards/HSF/IF/A/tasks/636

Clea on an Escalator
https://www.illustrativemathematics.org/content-standards/HSA/CED/A/2/tasks/1003

https://www.illustrativemathematics.org/

National Library of Virtual Manipulatives
http://nlvm.usu.edu/

Alabama Learning Exchange
http://alex.state.al.us/search.php?fa_submit=ALLPLANS

Arizona Math Flipbook
http://www.azed.gov/azcommoncore/files/2012/11/high-school-ccss-flip-book-usd-259-2012.pdf

NYC Department of Education
http://schools.nyc.gov/default.htm

Mathematics Assessment Project
http://map.mathshell.org/

Texas Instruments
https://education.ti.com/en/us/home

Desmos
https://teacher.desmos.com/

Worksheets for every topic:
http://kutasoftware.com/free.html
(CRP2, CRP4, CRP8, 9.3.ST.2, 9.3.ST-ET.5)

Algebra assessments,

(NJSLSA.R1, NJSLSA.W2, NJSLSA.L1, SL.9-10.4, NJSLSA.L6, 9.2.12.C.1, 9.2.12.C.2)

Summative Assessments:
Multiple choice / short answer assessments (CRP2, CRP4, CRP8)

Chapter quizzes/tests
- Pearson Realize
- MathXL

Grade 9 Algebra I Common Core Assessment II, Standards Solution

Benchmark Assessment:
Midterm Assessment

Alternative Assessments:
Learning centers: each learning center focuses on a different type of problem (9.3.ST.2, 9.3.ST-ET.5)

Create posters illustrating the main objectives of the unit (CRP6)

with the same solutions.
A-REI.C.6 Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

A-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,

A-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.

F-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 $y = f(x)$.

Dimes and Quarters
https://www.illustrativemathematics.org/content-standards/HSA/CED/A/3/tasks/220

Writing Constraints
https://www.illustrativemathematics.org/content-standards/HSA/CED/A/3/tasks/610

How Much Folate?
https://www.illustrativemathematics.org/content-standards/HSA/CED/A/2/tasks/1351

Your Father
https://www.illustrativemathematics.org/content-standards/HSF/IF/A/1/tasks/589

The Canoe Trip
https://www.illustrativemathematics.org/content-standards/HSF/IF/B/4/tasks/386

Function Machine
http://nlvm.usu.edu/en/nav/frames_asid_191_g_4_t_2.html?from=category_g_4_t_2.html

Penny Drop That Thang!
http://alex.state.al.us/lesson_view.php?id=33100

interactive, videos, games, lessons, homework:
https://www.opened.com/search?area=mathematics&grade=9&offset=0&resource_type=interactive-assessment
(CRP2, CRP4, CRP8, 9.3.ST.2, 9.3.ST-ET.5, 8.1.12.A.3)

Algebra common core worksheets:
https://www.ixl.com/math/algebra-1
(CRP2, CRP4, CRP8, 9.3.ST.2, 9.3.ST-ET.5)

Khan Academy – videos, lessons, assessments
www.khanacademy.org
(CRP2, CRP4, CRP8, 9.3.ST.2, 9.3.ST-ET.5, 8.1.12.A.3)

Worksheets / assessment items for all topics based on standards:
http://jmap.org/JMAP_RESOURCES_BY_TOPIC.htm#AI
(CRP2, CRP4, CRP8, 9.3.ST.2, 9.3.ST-ET.5)

F-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. **F-IF.A.3** Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. **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. **F-IF.B.5** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. **F-IF.B.6** Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. **F-IF.C.7a, b** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. **F-BF.A.1a** Determine an	It's All in the Family http://alex.state.al.us/lesson_view.php?id=33143 Focusing on Graphs http://alex.state.al.us/lesson_view.php?id=32232 When Will Mr. X meet Ms. Y? http://alex.state.al.us/lesson_view.php?id=32169 Interpreting Functions http://alex.state.al.us/lesson_view.php?id=32179 Graphing is Great http://alex.state.al.us/lesson_view.php?id=26211 Wild Water Adventure http://alex.state.al.us/lesson_view.php?id=26172 The Cycle Shop http://schools.nyc.gov/Academics/CommonCoreLibrary/TasksUnitsStudentWork/default.htm Solving Linear Equations in Two Variables http://map.mathshell.org/lessons.php?unit=9235&collection=8 Graphing Calculator Investigations: Systems of Equations

explicit expression, a recursive process, or steps for calculation from a context.

F-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.

F-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.

F-BF.B.4a Solve an equation of the form $f(x) = c$ for a simple function f that has an inverse and write an expression for the inverse.

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

F-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).

https://education.ti.com/en/us/activity/detail?id=DBE100A329CB4628AD43D56D9F7DDCBD

Systems of Two Linear Equations
https://teacher.desmos.com/activitybuilder/custom/560ecad46f97120006252c2c

Everything you need to know about math journals:
https://thecornerstoneforteachers.com/math-journals/
(NJSLSA.R1, NJSLSA.W2, NJSLSA.L1, SL.9-10.4, NJSLSA.L6)

Additional texts:
www.newsela.com
www.readworks.org
www.commonlit.org

G-GPE.B.5 Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems.

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

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

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

S-ID.C.9 Distinguish between correlation and causation.

Key Vocabulary:
Continuous graph, dependent variable, domain, function, independent variable, linear function, nonlinear function, range, recursive formula, relation sequence, direct variation, linear equation, piecewise function, point-slope form, rate of change, slope, slope-intercept form, standard form, step function, trend line, *x*-intercept, *y*-intercept, consistent, dependent, elimination method, inconsistent, independent, linear inequality, solution of an inequality, solution of an inequality, solution to a system of linear equations, solution to a system of linear inequalities, substitution method

Accommodations and Modifications:

Students with special needs: Support staff will be available to aid students related to IEP specifications. 504 accommodations will also be attended to by all instructional leaders. Modifications, alternative assessments, and scaffolding strategies will be used to support this learning. The use of Universal Design for Learning (UDL) will be considered for all students as teaching strategies are considered. Additional staff should be included so all students can fully participate in the standards associated with this curriculum.

ELL/ESL students: Students will be supported according to the recommendations for "can do's" as outlined by WIDA - https://www.wida.us/standards/CAN_DOs/

Students at risk of school failure: Formative and summative data will be used to monitor student success at first signs of failure. Student work will be reviewed to determine support. This may include parent consultation, basic skills review and differentiation strategies. With considerations to UDL, time may be a factor in overcoming developmental considerations. More time will be made available with a certified instructor to aid students in reaching the standards.

Gifted and Talented Students: Students excelling in mastery of standards will be challenged with complex, high level challenges.

English Language Learners:	Special Education:	At-Risk:	Gifted and Talented:
- Teaching modeling - Peer modeling - Word walls - Give directions in small steps and in as few words as possible - Provide visual aids - Group similar problems together - Repeat directions when necessary - Provide a vocabulary list with definitions - Use of alge-tiles when needed - Use of number line when needed	- Utilize modifications & accommodations delineated in the students' IEP - Work with paraprofessional - Work with a partner - Shorten assignments to focus on mastery or key concepts - Maintain adequate space between desks - Keep workspaces clear of unrelated materials - Provide fewer problems to attain passing grades - Tape a number line to the students desk - Create a math journal that they can use during class, on assignments and (if teacher allows) on assessments - Provide extra time to complete a task when needed - Provide definitions of different graphs / charts with illustrations - Allow tests to be taken in a separate room	- Use visual demonstrations, illustrations and models - Give directions / instructions verbally and in simple written format - Peer support - Increased one – on – one time - Teachers may modify instructions by modeling what the student is expected to do - Instructions may be printed out in large print and hung up for the students to see during the time of the lesson - Review behavior expectations and make adjustments - Create a math journal that they can use during class, on assignments and (if teacher allows) on assessments - Allow students to complete an independent project as an alternative test - Use of alge-tiles when needed	- Inquiry based instruction - Independent study - Higher order thinking skills - Adjusting the pace of the lessons - Real world scenarios - Student driven instruction - Allow students to complete an independent project as an alternative test

	- Allow students to use a calculator when appropriate - Divide test into small sections of similar questions or problems - Use of alge-tiles when needed - Use of number line when needed	Use of number line when needed

Interdisciplinary Connections: ELA

NJSLSA.R1. Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
NJSLSA.W2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content
NJSLSA.L1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking
SL.9-10.4: Present information, findings and supporting evidence clearly, concisely and logically. The content, organization, development and style are appropriate to task, purpose and audience.
NJSLSA.L6: Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression.

21st Century Standards

9.2.12.C.1: Review career goals and determine steps necessary for attainment.
9.2.12.C.2: Modify Personalized Student Learning Plans to support declared career goals.
9.3.ST.2: Use technology to acquire, manipulate, analyze and report data.
9.3.ST-ET.5: Apply the knowledge learned in STEM to solve problems.

Career Ready Practices:

CRP2: Apply appropriate academic and technical skills
CRP4: Communicate clearly and effectively and with reason
CRP6: Demonstrate creativity and innovation
CRP8: Utilize critical thinking to make sense of problems and persevere in solving them
CRP11: Use technology to enhance productivity

Technology Standards:

8.1.12.A.3: Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue.

Major **Supporting** **Additional** (Identified by PARCC Model Content Frameworks)