02 Essentials of Algebra

Content Area: **Math**
Course(s):
Time Period: **Full Year**
Length: **6 weeks**
Status: **Published**

General Overview, Course Description or Course Philosophy

Senior Math Analysis CP is designed for seniors who will pursue liberal arts or humanities in college. The main course objective is to strengthen and extend the concepts of algebra, geometry, and problem solving, including modeling and reasoning. The course integrates ideas of functions and trigonometry with explorations in world-life applications. Additionally, students are provided SAT review and exposure to college placement exam experiences.

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

This unit aims to develop mastery of linear relationships: linear equations, linear inequalities, systems of linear equations, and linear functions. Students must be fluent in the creation and analysis of these relationships to be prepared for college and career level mathematics.

Objectives:

- Solve single variable linear equations
- Calculate slope between points on a plane
- Understand that linear relationships have a constant rate of change (slope)
- Graph lines from linear equations in various forms
- Graph linear inequalities
- Write linear equations given: two points, a slope and intercept, alternate form of the equation, etc.
- relate equations of parallel and perpendicular lines
- Evaluate linear functions
- Write linear functions to model situations
- Use linear relationships to model and solve application problems
- Solve systems of linear equations and inequalities and evaluate the solutions

Essential Questions:

- How can you determine if a relationship is linear?
- In what ways can a liner relationship be represented?
- How can linear relationships be used to model situations and make predictions?

Enduring Understandings:

- Linear relationships have a constant rate of change
- The solution to a linear equation is the set of all points that satisfy the equation
- A given linear equation may be represented in (infinitely) many equivalent forms
- A system of linear equations may have: no solutions, one distinct solution, or infinitely many solutions
- liner relationships are a powerful tool for modeling situations and making predictions

CONTENT AREA STANDARDS

MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.4	Model with mathematics.
MA.K-12.6	Attend to precision.
MA.A-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.
MA.A-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.
MA.A-APR.D.7	Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.
MA.A-CED.A.1	Create equations and inequalities in one variable and use them to solve problems.
MA.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.
MA.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.
MA.A-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.
MA.A-REI.A.2	Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
MA.A-REI.B.3	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
MA.A-REI.B.4	Solve quadratic equations in one variable.
MA.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 with the same solutions.
MA.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.
MA.A-REI.C.7	Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.
MA.A-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).
MA.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, 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.

MA.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.
MA.A-SSE.A.1	Interpret expressions that represent a quantity in terms of its context.
MA.A-SSE.B.3	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)

CS.K-12.1.a	Include the unique perspectives of others and reflect on one's own perspectives when designing and developing computational products.
CS.K-12.2.b	Create team norms, expectations, and equitable workloads to increase efficiency and effectiveness.
CS.K-12.2.c	Solicit and incorporate feedback from, and provide constructive feedback to, team members and other stakeholders.
CS.K-12.2.d	Evaluate and select technological tools that can be used to collaborate on a project.
CS.K-12.3.a	Identify complex, interdisciplinary, real-world problems that can be solved computationally.
CS.K-12.3.b	Decompose complex real-world problems into manageable sub-problems that could integrate existing solutions or procedures.
CS.K-12.3.c	Evaluate whether it is appropriate and feasible to solve a problem computationally.
LA.RH.9-10.4	Determine the meaning of words and phrases as they are used in a text, including vocabulary describing political, social, or economic aspects of history and the social sciences; analyze the cumulative impact of specific word choices on meaning and tone.
LA.RH.9-10.5	Analyze how a text uses structure to emphasize key points or advance an explanation or analysis.
LA.RH.9-10.7	Integrate quantitative or technical analysis (e.g., charts, research data) with qualitative analysis in print or digital text, to analyze information presented via different mediums.
LA.RST.9-10.2	Determine the central ideas, themes, or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.
LA.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.
LA.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.
LA.RST.9-10.5	Analyze the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
LA.RST.9-10.6	Determine the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.
WRK.K-12.P.4	Demonstrate creativity and innovation.
WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
WRK.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.

STUDENT LEARNING TARGETS

Declarative Knowledge

Students will understand that:

- single variable equations are solved by using inverse operations to isolate the variable
- single variable equations may have no solution, a finites set of specific solutions, or infinitely many solutions
- the set of solutions two a two variable equation can be plotted on the coordinate plane to form a line
- linear equations can be written in many forms
- the solutions to a liner inequality is half-plane region
- two or more linear equations in the same variables form a system of linear equations

Procedural Knowledge

Students will be able to:

- graph lines with and without a graphing calculator
- calculate and interpret the slope of a line
- find the equation of vertical and horizontal lines
- write linear equations in the standard, point-slope, and slope-intercept form of a line.
- to identify the slope and y-intercept of a line from its equation
- determine equations of parallel and perpendicular lines
- use a graphing calculator to find the line of best fit
- Create equations that describe numbers or relationships
- Interpret the structure of expressions
- Represent and solve equations graphically
- Summarize, represent, and interpret data on quantitative variables.
- Interpret linear models

EVIDENCE OF LEARNING

Formative Assessments

- Student feedback/questioning/observation
- Exit Ticket

- Error analysis
- Specific skill assessment/questions
- Survey/polling
- Reflection questions
- Scored/evaluated class work or homework
- Task completion

Summative Assessments

Lesson Quizzes
Unit Test
Performance Tasks

RESOURCES (Instructional, Supplemental, Intervention Materials)

Official SAT practice book chapter 19 Heart of Algebra

NJDOE model curriculum for Algebra

Khan Acadmey Algebra

Kuta Software worksheets

INTERDISCIPLINARY CONNECTIONS

Interdisciplinary connections are frequently addressed through modeling and application problems whereby students solve and analyze situations taken from business, physics, engineering, biology, statistics, geography, and numerous other fields. Examples can be found in topic specific textbook problems and digital resources.

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

See link to Accommodations & Modifications document in course folder.