DOBBS FERRY MIDDLE SCHOOL
Dobbs Ferry, New York 10522

COURSE OUTLINE

SUBJECT: Algebra I **GRADE**: 8

Unit 1: One-Variable Statistics – In this unit, students discuss the difference between statistical and non-statistical questions and classify that data as numerical or categorical. They represent and interpret data using data displays, and describe distributions using the appropriate terminology. They create data displays and calculate summary statistics using technology, then interpret the values in context. They learn that standard deviation is a measure of variability, and they interpret standard deviation in context. They recognize outliers, investigate their source, make decisions about excluding them from the data set, and understand how the presence of outliers impacts measures of center and measures of variability. They compare measures of center and the standard deviation and the interquartile range for different data sets. In the culminating activity, students pose and answer a statistical question by designing an experiment, collecting data, and analyzing data.

Unit 2: Linear Equations, Inequalities, and Systems – In this unit, students expand and deepen their prior understanding of expressions, equations, and inequalities. Students reason about equations, inequalities, and systems of equations and inequalities, as ways to represent constraints, and they reason about the process of solving equations and inequalities in terms of finding values that satisfy those constraints. The process of finding solutions may involve rewriting and manipulating equations. Students learn to explain and validate the steps to do so. Throughout the unit, students practice reasoning about situations and mathematical representations, interpreting expressions and numbers in context, and using mathematical tools to model quantities and relationships.

Unit 3: Two-Variable Statistics – In this unit, students expand and deepen their prior understanding of expressions, equations, and inequalities. Students reason about equations, inequalities, and systems of equations and inequalities, as ways to represent constraints, and they reason about the process of solving equations and inequalities in terms of finding values that satisfy those constraints. The process of finding solutions may involve rewriting and manipulating equations. Students learn to explain and validate the steps to do so. Throughout the unit, students practice reasoning about situations and mathematical representations, interpreting expressions and numbers in context, and using mathematical tools to model quantities and relationships.

Unit 4: Functions – In this unit, students expand their understanding of functions, building on what they learned in grade 8. Students develop their capacity to represent, interpret, and use functions to make sense of quantities in situations and to solve problems. They are introduced to new tools for communicating about functions: function

notation, domain and range, average rates of change, and mathematical terms for describing key features of graphs. They also develop their ability to gather information about a function from its graph, by connecting features of the graph to features of the situation and other representations, and to sketch a graph that tells the story about the function. Along the way, students begin to distinguish categories of functions: linear functions, piecewise-defined functions (the absolute value function, in particular), and inverse functions. Throughout the unit, students use, interpret, and connect the different representation of functions, both in and out of context.

Unit 5: Introduction to Exponential Functions – In this unit, students are introduced to exponential relationships. Students learn that exponential relationships are characterized by a constant quotient over equal intervals, and compare them to linear relationships which are characterized by a constant difference over equal intervals. They encounter contexts with quantities that change exponentially. These contexts are presented verbally and with tables and graphs. They construct equations and use them to model situations and solve problems. They learn that the output of an increasing exponential function is eventually greater than the output of an increasing linear function for the same input.

Students view these new types of relationships as functions and employ the notation and terminology of functions (for example, dependent and independent variables). They study graphs of exponential functions both in terms of contexts they represent and abstract functions that don't represent a particular context, observing the effect of different values of a and b on the graph of the function f represented by $f(x)=ab^x$. The context of credit (both in terms of loans and savings) is used through several lessons.

Unit 6: Introduction to Quadratic Functions – In this unit, students study quadratic functions systematically. They look at patterns which grow quadratically and contrast them with linear and exponential growth. Then they examine other quadratic relationships via tables, graphs, and equations, gaining appreciation for some of the special features of quadratic functions and the situations they represent. They analyze equivalent quadratic expressions and how these expressions help to reveal important behavior of the associated quadratic function and its graph. They gain an appreciation for the factored, standard, and vertex forms of a quadratic function and use these forms to solve problems.

Unit 7: Quadratic Equations – In this unit, students interpret, write, and solve quadratic equations. They learn that writing and solving quadratic equations is a way to precisely describe and answer questions about quadratic functions. It is especially useful for finding input values that produce certain outputs.

Students solve quadratic equations by reasoning, by rewriting expressions in factored form and using the zero product property, by completing the square, and by applying the quadratic formula. They also rewrite expressions in vertex form to solve problems about the maximum or minimum value of a function. Along the way, students see that quadratic equations may have 2, 1, or 0 solutions, and that the solutions may be rational or irrational.

MATERIALS NEEDED

- TI-84 Plus CE Graphing Calculator
- Pencil Case
- Pens (blue or black only)
- Pencils
- Chromebook (provided)
- Workbook (provided)

CRITERIA FOR GRADING

Grades will be based on the following:

- Classwork: 30%
- Independent Practice: 20%
- Assessments: 50%

Outline developed by: Math Department *Date: March 2025*