Algebra I Common Core

Mathematics                  Prince George’s County Public Schools            2014 - 2015

Course Code:                  
Prerequisites: Math 8 Common Core or Algebra/Data Analysis
Credits: 1.0 Math, Merit

Algebra I Common Core formalizes and extends the mathematics students learned in the middle grades. Five critical areas comprise Algebra I: Relationships Between Quantities and Reasoning with Equations, Linear and Exponential Relationships, Descriptive Statistics, Expressions and Equations, and Quadratic Functions and Modeling. The critical areas deepen and extend understanding of linear and exponential relationships by contrasting them with each other and by applying linear models to data that exhibit a linear trend, and students engage in methods for analyzing, solving, and using quadratic functions. The Mathematical Practice Standards apply throughout each course and, together with the content standards, prescribe that students experience mathematics as a coherent, useful, and logical subject that makes use of their ability to make sense of problem situations.

INTRODUCTION:
Typically in a Math class, to understand the majority of the information it is necessary to continuously practice your skills. This requires a tremendous amount of effort on the student’s part. Each student should expect to dedicate 2 - 3 hours of studying for every hour in class. Some hints for success in a Math class include: attending class daily, asking questions in class, and thoroughly completing all homework problems with detailed solutions as soon as possible after each class session.

INSTRUCTOR INFORMATION:
Name: 
E-Mail:  
Planning:  
Phone:

CLASS INFORMATION:
COURSE NUMBER:  
CLASS MEETS:  
ROOM:  
TEXT: Algebra 1, Glencoe

CALCULATORS:
The use of a graphing calculator is required. While participants may use any graphing calculator, the instruction in the course requires the TI-83 Plus. The TI-84 Plus is very similar and can be used as well. Knowledge and competence for use of other graphing calculators will be the sole responsibility of the student.

★ – Modeling Standards
### GRADING:

<table>
<thead>
<tr>
<th>Category</th>
<th>Brief Description</th>
<th>Grade Percentage</th>
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<tbody>
<tr>
<td>CLASS WORK</td>
<td>This includes all work completed in the classroom setting. Including: Group participation, Notebooks, Vocabulary, Written responses, Group discussions, Active participation in math projects, Completion of assignments</td>
<td>30%</td>
</tr>
<tr>
<td>HOMEWORK</td>
<td>This includes all work completed outside of the classroom and student's preparation for class (materials, supplies, etc.) Assignments can included, but not limited to: Problem of the Week, Performance Tasks</td>
<td>20%</td>
</tr>
<tr>
<td>ASSESSMENT</td>
<td>This category entails both traditional and alternative methods of assessing student learning: Group discussions, Performance Tasks, Problem Based Assessments, Exams, Quizzes, Research/Unit Projects, Portfolios, Oral Presentations, Surveys</td>
<td>50%</td>
</tr>
</tbody>
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*An instructional rubric should be created to outline the criteria for success for each alternative assessment.*

Your grade will be determined using the following scale:

- 90% - 100%     A
- 80% - 89%      B
- 70% - 79%      C
- 60% - 69%      D
- 59% and below  E
## Algebra 1
### Common Core Curriculum

<table>
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<tr>
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#### Unit 1 (Quarter 1)

**Linear and Exponential Expressions, Equations and Inequalities**

- **Reason quantitatively and use units to solve problems.**
  - N.Q.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. *
  - N.Q.2 Define appropriate quantities for the purpose of descriptive modeling. *
  - N.Q.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. *
- **Interpret the structure of expressions.**
  - A.SSE.1 Interpreting expressions that represent a quantity in terms of its context.*
    - a. Interpret parts of an expression, such as terms, factors, and coefficients. *
    - b. Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret $P(1+r)^t$ as the product of $P$ and a factor not depending on $P$. *
- **Solve systems of equations.**
  - A.REI.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.
  - A.REI.6 Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

#### Unit 2 (Quarters 1 and 2)

**Linear and Exponential Functions**

- **Represent and solve equations and inequalities graphically.**
  - A.REI.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).
  - A.REI.11 Explain why the x-coordinates of the points where the graphs of the equations $f(x) = g(x)$ and $y = f(x)$ 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.*
  - A.REI.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.
- **Understand the concepts of a function and use function notation.**
  - F.IF.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 $y = f(x)$.
  - F.IF.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.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by $f(0) = f(1) = 1$, $f(n+1) = f(n) + f(n-1)$ for $n \geq 1$.

#### Unit 3 (Quarter 2)

**Descriptive Statistics**

- **Summarize, represent, and interpret data on a SINGLE count or measurement.**
  - S.ID.1 Represent data with plots on the real number line (dot plots, histograms, and box plots).*
  - S.ID.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.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).*
- **Summarize, represent, and interpret data on TWO categorical and quantitative variables.**
  - S.ID.4 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.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.*
## Algebra 1 Common Core: Curriculum Map

### Standards for 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.

### Unit 1 (Quarter 1)
**Linear and Exponential Expressions, Equations and Inequalities**

- **Create equations that describe numbers or relationships.**
  - A.CED.1 Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.
  - A.CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
  - A.CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.
  - A.CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm’s law $V = IR$ to highlight resistance $R$.

### Unit 2 (Quarters 1 and 2)
**Linear and Exponential Functions**

- **Interpret functions that arise in applications in terms of a context.**
  - F.IF.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.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*.
  - F.IF.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*.

### Unit 3 (Quarter 2)
**Descriptive Statistics**

- **Analyze functions using different representations.**
  - F.IF.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*
  - F.IF.7a Graph linear and quadratic functions and show intercepts, maxima, and minima.

- **Build a function that models a relationship between two quantities.**
  - F.BF.1 Write a function that describes a relationship between two quantities.*
  - F.BF.1a Determine an explicit expression, a recursive process, or steps for calculation from a context.

- **Build new functions from existing functions.**
  - F.BF.3 Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k f(x)$, $f(kx)$, and $f(x + k)$ for specific values of $k$ (both positive and negative); find the value of $k$ given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.
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| Unit 1 (Quarter 1) Linear and Exponential Expressions, Equations and Inequalities |
| Construct and compare linear, quadratic, and exponential models and solve problems. |
| F.LE.1 Distinguish between situations that can be modeled with linear functions and with exponential functions. * |
| F.LE.1a Prove that linear functions grow by equal differences over equal intervals; and that exponential functions grow by equal factors over equal intervals. * |
| F.LE.1b Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. * |
| F.LE.1c Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. * |
| F.LE.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). * |
| F.LE.3 Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. * |

| Unit 2 (Quarters 1 and 2) Linear and Exponential Functions |
| Interpret expressions for functions in terms of situation they model. |
| F.LE.5 Interpret the parameters in a linear or exponential function in terms of a context. * |

| Unit 3 (Quarter 2) Descriptive Statistics |
| Summarize, represent, and interpret data on TWO categorical and quantitative variables. |
| S.ID.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. * |
| S.ID.6a Fit a function to the data; 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 and exponential models. * |
| S.ID.6b Informally assess the fit of a function by plotting and analyzing residuals. * |
| S.ID.6c Fit a linear function for a scatter plot that suggests a linear association. * |

| Interpret linear models |
| S.ID.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. * |
| S.ID.8 Compute (using technology) and interpret the correlation coefficient of a linear fit. * |
| S.ID.9 Distinguish between correlation and causation. * |

★ – Modeling Standards
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<th>Standards for Mathematical Practices</th>
<th>Unit 4 (Quarter 3)</th>
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<tr>
<td>★ 1. Make sense of problems and persevere in solving them.</td>
<td>Expressions and Equations</td>
<td>Interpret functions that arise applications in terms of a context.</td>
</tr>
<tr>
<td>★ 2. Reason abstractly and quantitatively.</td>
<td>★ 3. Construct viable arguments and critique the reasoning of others.</td>
<td>F.IF.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*</td>
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<td>★ 3. Construct viable arguments and critique the reasoning of others.</td>
<td>★ 4. Model with mathematics.</td>
<td>F.IF.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.*</td>
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<td>★ 4. Model with mathematics.</td>
<td>★ 5. Use appropriate tools strategically.</td>
<td>F.IF.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:*</td>
</tr>
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<td>★ 5. Use appropriate tools strategically.</td>
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<td>Analyze functions using different representations.</td>
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<td>F.IF.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*</td>
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<tr>
<td>★ 7. Look for and make use of structure.</td>
<td>★ 8. Look for and express regularity in repeated reasoning.</td>
<td>F.IF.7a Graph linear and quadratic functions and show intercepts, maxima, and minima.*</td>
</tr>
<tr>
<td>★ 8. Look for and express regularity in repeated reasoning.</td>
<td></td>
<td>F.IF.7b Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.*</td>
</tr>
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</table>

**Unit 4 (Quarter 3)**

**Expressions and Equations**

- **Extend the properties of exponents to rational exponents**
  - N.RN.2 Rewrite expressions involving radicals to rational exponents using the properties of exponents.
- **Use properties of rational and irrational numbers**
  - N.RN.3 Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.
- **Interpret the structure of expressions**
  - A.SSE.1 Interpret expressions that represent a quantity in terms of its context.*
  - A.SSE.1a Interpret parts of an expression, such as terms, factors, and coefficients.*
  - A.SSE.1b Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret P(1+r)^n as the product of P and a factor not depending on P.*
  - A.SSE.2 Use the structure of an expression to identify ways to rewrite it. For example, see x^4 - y^4 as (x^2)^2 - (y^2)^2, thus recognizing it as a difference of squares that can be factored as (x^2 + y^2)(x^2 - y^2).
- **Write expressions in equivalent forms to solve problems**
  - A.SSE.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.*
  - A.SSE.3a Factor a quadratic expression to reveal the zeros of the function it defines.
  - A.SSE.3b Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.
  - A.SSE.3c Use the properties of exponents to transform expressions for exponential functions. For example the expression 1.15^t can be rewritten as (1.15^{1/12})^{12t} ≈ 1.01212t to reveal the approximate equivalent monthly interested rate if the annual rate is 15%.
- **Perform arithmetic operations on polynomials**
  - A.APR.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.
  - A.APR.2 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.
  - A.APR.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.

**Unit 5 (Quarters 4)**

**Quadratic Functions and Modeling**

- **Interpret functions that arise applications in terms of a context**
  - F.IF.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.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.*
  - F.IF.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:* Analyze functions using different representations.
  - F.IF.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*
  - F.IF.7a Graph linear and quadratic functions and show intercepts, maxima, and minima.*
  - F.IF.7b Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.*
- **Build a function that models a relationship between two quantities**
  - F.BF.1 Write a function that describes a relationship between two quantities.*
  - F.BF.1a Determine an explicit expression, a recursive process, or steps for calculation from a functional relationship.
### Algebra 1 Common Core: Curriculum Map

#### Standards for 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.
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### Unit 4 (Quarter 3)

**Expressions and Equations**

- Multiply polynomials.
- **A.APR.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.

**Create equations that describe numbers or relationships.**

- **A.CED.1** Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.
- **A.CED.2** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- **A.CED.4** Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law $V = IR$ to highlight resistance $R$.

**Solve equations and inequalities in one variable.**

- **A.REI.4** Solve quadratic equations in one variable.
- **A.REI.4a** Use the method of completing the square to transform any quadratic equation in $x$ into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.
- **A.REI.4b** Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers $a$ and $b$.

### Unit 5 (Quarters 4)

**Quadratic Functions and Modeling**

- Context.

**Build new functions from existing functions.**

- **F.BF.3** Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k f(x)$, $f(kx)$, and $f(x + k)$ for specific values of $k$ (both positive and negative); find the value of $k$ given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

**Construct and compare linear, quadratic, and exponential models and solve problems.**

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

**Summarize, represent, and interpret data on TWO categorical and quantitative variables.**

- **S.ID.6** Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
- **S.ID.6a** Fit a function to the data; 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 and exponential models.

★ – Modeling Standards