Unit Title: Function, Linear, and Quadratic "Review"

Duration of Unit: 3 - 4 weeks (September)

Topic Sequence:
1. Functions – 3 – 4 days
2. Linear Functions and Systems – 1 week
3. Quadratic Functions – 2 – 3 weeks

Common Core State Standards Addressed:

CCSS.Math.Content.HSF.BF.A.1.b

Combine standard function types using arithmetic operations. *For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model*.

CCSS.Math.Content.HSF.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. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

CCSS.Math.Content.HSF.BF.B.4

Find inverse functions.

CCSS.Math.Content.HSF.BF.B.4.a

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. *For example, f(x) =2 x^3 or f(x) = (x+1)/(x-1) for x ≠ 1*.

CCSS.Math.Content.HSF.IF.C.7.b

Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

CCSS.Math.Content.HSF.IF.C.9

Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum*.

CCSS.Math.Content.HSA.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.

CCSS.Math.Content.HSA.REI.C.6

Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

CCSS.Math.Content.HSA.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.[*]

CCSS.Math.Content.HSA.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.

CCSS.Math.Content.HSN.CN.A.1

Know there is a complex number i such that $i^2 = -1$, and every complex number has the form $a + bi$ with a and b real.

CCSS.Math.Content.HSN.CN.A.2

Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.

CCSS.Math.Content.HSN.CN.C.7

Solve quadratic equations with real coefficients that have complex solutions.

CCSS.Math.Content.HSA.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.

CCSS.Math.Content.HSA.REI.B.4.a

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.

CCSS.Math.Content.HSA.REI.B.4.b

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.

CCSS.Math.Content.HSA.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).

CCSS.Math.Content.HSA.SSE.B.3.a

Factor a quadratic expression to reveal the zeros of the function it defines.

CCSS.Math.Content.HSA.SSE.B.3.b

Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.

CCSS.Math.Content.HSF.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.*[*]

CCSS.Math.Content.HSF.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.*[*]

CCSS.Math.Content.HSF.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.[*]

CCSS.Math.Content.HSF.IF.C.8.a

Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.

CCSS.Math.Content.HSF.IF.C.9

Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.*

Student Friendly Learning Targets:
- I can define a function and identify the domain and range
- I can perform operations with functions
- I can simplify expressions and solve equations
- I can find the inverse of a function
- I can identify transformations of a graph

- I can solve a linear system in two variables by graphing
- I can solve a linear system in two variables by substitution
- I can solve a linear system in two variables by elimination (combination)

- I can factor a quadratic expression
- I can graph quadratic functions and identify key characteristics
- I can solve quadratic equations using multiple and appropriate methods such as: taking the square root, factoring, completing the square, and using the quadratic formula
- I can identify and use complex numbers that derive from quadratic functions

Vocabulary:
Functions: function, domain, range, expression, equation, transformation, inverse
Linear: linear system, slope, intersection, substitution, elimination
Quadratic: quadratic, factoring, axis of symmetry, vertex, x- and y-intercept, square root, complex number

Materials and/or Technology Needed:
Guided notes (no textbook)
Practice worksheets
TI-84 Graphing Calculator

Instructional Notes:

- http://education.ohio.gov/getattachment/Topics/Academic-Content-Standards/Mathematics/High_School_Algebra_Model_Curriculum_October2013.pdf.aspx

PARCC MODEL CONTENT FRAMEWORKS
Themes from middle school algebra continue and deepen during high school. As early as grade 6, students began thinking about solving equations as a process of reasoning (6.EE.5). This perspective continues throughout Algebra I and Algebra II (A-REI).27 "Reasoned solving" plays a role in Algebra II because the equations students encounter can have extraneous solutions.

In Algebra II, they extend the real numbers to complex numbers, and one effect is that they now have a complete theory of quadratic equations: Every quadratic equation with complex coefficients has (counting multiplicities) two roots in the complex numbers.

Look for and make use of structure (MP.7). The structure theme in Algebra I centered on seeing and using the structure of algebraic expressions. This continues in Algebra II, where students delve deeper into transforming expressions in ways that reveal meaning. The example given in the standards — that $x^4 - y^4$ can be seen as the difference of squares — is typical of this practice. This habit of seeing subexpressions as single entities will serve students well in areas such as trigonometry, where, for example, the factorization of $x^4 - y^4$ described above can be used to show that the functions $\cos^4 x - \sin^4 x$ and $\cos^2 x - \sin^2 x$ are, in fact, equal (A-SSE.2).

Assessment Notes:
Summative:
- Individual quizzes over graphing, dividing (all operations), factoring, and solving
- Unit test

Formative:
- Watch volunteers explain problems to peers on the board and observe students at their seats individually working or following along
- Observe students working on practice problems at their desk or at the board
- Exit Slip
- Muddy/Clear Post-its
- KWL (Know, Want to know, Learned) Chart
- Self-reflection

Resources:
Algebra 2 Textbook
Game: "I have, who has .." factoring
Internet – extra worksheets, examples, demonstrations, activities
Learning Tasks:
- https://www.georgiastandards.org/Frameworks/GSO%20Frameworks/Acc-Math-I-Unit-7-SE-Algebraic-Investigations-Pt3.pdf
- https://www.georgiastandards.org/CommonCore/Common%20Core%20Frameworks/CCGPS_Math_9-12_AnalyticGeo_Unit5SE.pdf\
- https://www.georgiastandards.org/Common-Core/Common%20Core%20Frameworks/CCGPS_Math_8_8thGrade_Unit4SE.pdf
- http://map.mathshell.org/materials/download.php?fileid=700
- http://illuminations.nctm.org/Lesson.aspx?id=2783

General resources:
- http://achievethecore.org/
- https://www.illustrativemathematics.org/
- http://www.nctm.org/
- http://www.parcconline.org/

Unit Title: Polynomial Functions

Duration of Unit: 4 – 5 weeks (September/October)

Topic Sequence:
1. Polynomial function introduction – definition, basic characteristics, and graphs
2. Simplifying polynomial functions – mainly dividing (review other operations)
3. Factoring polynomials, using the remainder and factor theorems
4. Solving polynomial equations

Common Core State Standards Addressed:

CCSS.Math.Content.HSA.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).
CCSS.Math.Content.HSF.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.*[*]
CCSS.Math.Content.HSF.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.*[*]
CCSS.Math.Content.HSF.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.[*]
CCSS.Math.Content.HSF.IF.C.7.c Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
CCSS.Math.Content.HSF.IF.C.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.*

CCSS.Math.Content.HSA.APR.D.6 Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or, for the more complicated examples, a computer algebra system.

CCSS.Math.Content.HSA.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.
CCSS.Math.Content.HSA.APR.C.4 Prove polynomial identities and use them to describe numerical relationships. *For example, the polynomial identity $(x^2 + y^2)^2 = (x^2 - y^2)^2 + (2xy)^2$ can be used to generate Pythagorean triples.*
CCSS.Math.Content.HSA.APR.B.2 Know and apply the Remainder Theorem: For a polynomial $p(x)$ and a number a, the remainder on division by $x - a$ is $p(a)$, so $p(a) = 0$ if and only if $(x - a)$ is a factor of $p(x)$.

CCSS.Math.Content.HSA.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.
CCSS.Math.Content.HSN.CN.C.8 Extend polynomial identities to the complex numbers. *For example, rewrite $x^2 + 4$ as $(x + 2i)(x - 2i)$.*

Student Friendly Learning Targets:
- I can define a polynomial and identify unique characteristics
- I can graph polynomial functions; describe domain and/or range, identify zeros, describe end behavior and sketch these key features. Also, I can compare two functions and identify key features of types of graphs.
- I can factor polynomials to identify zeros.
- I can use and apply the certain theorems to lead into solving problems.
- I can solve polynomial equations by finding zeros. If given zeros, I can find the corresponding function.

Vocabulary:
Graphing: Polynomial function, x-intercept, domain/range, multiplicity, end behavior
Dividing: Divisor, Long division, Synthetic division
Factoring: "Factor completely", Remainder Theorem, Factor Theorem
Solving: Zeros

Materials and/or Technology Needed:
Guided notes (no textbook)
Practice worksheets
TI-84 Graphing Calculator

Instructional Notes:
Refresh the idea of adding, subtracting and multiplying polynomials (distributive property)
Review factoring quadratics; Greatest common factor, $x^2 + bx + c$, $ax^2 + bx + c$
Stress the important relationship between x-intercepts on a graph, zeros from solving, and factors

- http://education.ohio.gov/getattachment/Topics/Academic-Content-Standards/Mathematics/High_School_Algebra_Model_Curriculum_October2013.pdf.aspx

PARCC MODEL CONTENT FRAMEWORKS :In Algebra I, students added, subtracted, and multiplied polynomials. In Algebra II, students divide polynomials with remainder, leading to the factor and remainder theorems. This is the underpinning for much of advanced algebra, including the algebra of rational expressions.

Emphasis the following Standards for Mathematical Practice:
CCSS.Math.Practice.MP3 Construct viable arguments and critique the reasoning of others.
Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

CCSS.Math.Practice.MP4 Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Assessment Notes:

Summative:
- Individual quizzes over graphing, dividing (all operations), factoring, and solving
- Unit test

Formative:
- Watch volunteers explain problems to peers on the board and observe students at their seats individually working or following along
- Observe students working on practice problems at their desk or at the board
- Exit Slip
- Muddy/Clear Post-its
- KWL (Know, Want to know, Learned) Chart
- Self-reflection

Resources:

Algebra 2 Textbook

Game: I have, who has .. or Old Poly (Similar to Old Maid) to help refresh quadratic factoring

Puzzle: Factoring Match

Review/Pre-Assessment: Quadratic factoring match (equations, discriminants, graphs, vertex, roots, factors)

Internet – extra worksheets, examples, demonstrations, activities

Learning Tasks:
- **https://www.georgiastandards.org/Frameworks/GSO%20Frameworks/Math%20III%20Unit2%20SE.pdf**
- https://www.georgiastandards.org/Frameworks/GSO%20Frameworks/Acc-Math-II-Unit-2-SE-Inverse-Polynomial-Functions.pdf

General resources:
- http://achievethecore.org/
- https://www.illustrativemathematics.org/
- http://www.nctm.org/
- http://www.parcconline.org/

Unit Title: Rational Functions

Duration of Unit: 4 weeks (October/November)

Topic Sequence:
1. Rational function introduction – definition, basic characteristics, graphs
2. Rewriting rational functions
3. Multiplying and dividing rational expressions including complex fractions
4. Adding and subtracting rational expressions
5. Solving rational equations

Common Core State Standards Addressed:
Graphing:
CCSS.Math.Content.HSF.IF.C.7.d (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
Adding and Subtracting:
CCSS.Math.Content.HSA.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.
Multiplying and Dividing:
CCSS.Math.Content.HSA.APR.D.6 Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or, for the more complicated examples, a computer algebra system.
Solving:
CCSS.Math.Content.HSA.REI.A.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

Student Friendly Learning Targets:
- I can define a rational function and its characteristics
- I can graph rational functions
- I can rewrite rational expressions using addition, subtraction, multiplication and division
- I can simplify rational expressions including complex fractions
- I can solve radical equations in one variable and explain why some solutions cannot be solutions

Vocabulary:
Graphing: Rational functions, domain, range, zeros, asymptotes, end behavior, maximum/minimums
Adding, subtracting, multiplying, dividing: Rational numbers, rational expression, closure property
Solving: Rational equation, extraneous solution

Materials and/or Technology Needed:
Guided notes and examples
Practice worksheets
TI-84 graphing calculator

Instructional Notes:
Review the number system
Stress the importance of checking a solution

- http://education.ohio.gov/getattachment/Topics/Academic-Content-Standards/Mathematics/High_School_Algebra_Model_Curriculum_October2013.pdf.aspx

PARCC MODEL CONTENT FRAMEWORKS :
In Algebra I, students added, subtracted, and multiplied polynomials. In Algebra II, students divide polynomials with remainder, leading to the factor and remainder theorems. This is the underpinning for much of advanced algebra, including the algebra of rational expressions.

Fluency Recommendations
- This standard sets an expectation that students will divide polynomials with remainder by inspection in simple cases.
- The ability to see structure in expressions and to use this structure to rewrite expressions is a key skill in everything from advanced factoring (e.g., grouping) to summing series to the rewriting of rational expressions to examine the end behavior of the corresponding rational function.

Emphasis the following Standards for Mathematical Practice:
CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them.
Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

CCSS.Math.Practice.MP2 Reason abstractly and quantitatively.
Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to *decontextualize*—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to *contextualize*, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

Assessment Notes:
Summative:
- Individual quizzes over graphing, simplifying rational expressions, and solving
- Unit test

Formative:
- Watch volunteers explain problems to peers on the board and observe students at their seats individually working or following along
- Observe students working on practice problems at their desk or at the board
- Exit Slip
- Muddy/Clear Post-its
- KWL (Know, Want to know, Learned) Chart
- Self-reflection

Instructional and Assessment Resources:
Algebra 2 Textbook
Internet – extra worksheets, examples, demonstrations, activities Project: "Field Trip"
Learning Tasks:
- https://extranet.georgiastandards.org/Frameworks/GSO%20Frameworks/Acc-Math-III-Unit-3-SE-Rational-Functions.pdf
- https://www.georgiastandards.org/CommonCore/Common%20Core%20Frameworks/CCGPS_Math_9-12_AcelAnalyticGeoAdvancedAlg_Unit7SE.pdf
General resources:
- http://achievethecore.org/
- https://www.illustrativemathematics.org/
- http://www.nctm.org/
- http://www.parcconline.org/

Unit Title: Radical Functions

Duration of Unit: 4 weeks (November)

Topic Sequence:
1. Radical function introduction – definition, basic characteristics, and graphs
2. Simplifying radical expressions
3. Operations with radical expressions
4. Solving radical equations

Common Core State Standards Addressed:
Graphing:
CCSS.Math.Content.HSF.IF.C.7.b Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
Simplifying:
CCSS.Math.Content.HSN.RN.A.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents.
CCSS.Math.Content.HSA.SSE.A.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 $(x^2 - y^2)(x^2 + y^2)$.*
Operations with expressions:
CCSS.Math.Content.HSN.RN.A.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents.
Solving:
CCSS.Math.Content.HSA.REI.A.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

Student Friendly Learning Targets:
- I can identify radical functions
- I can create graphs of square and cube root functions while identifying their x-intercepts
- I can simplify radical expressions by applying exponential properties (write radical expressions as expressions with rational exponents, and write expressions with rational exponents as radical expressions)
- I can solve a radical equation and can determine/explain which number cannot be solutions

Vocabulary:
Graphing: Radical function, parent function, square root, cube root, domain/range
Simplifying: Laws of exponents, rational
Solving: Extraneous

Materials and/or Technology Needed:
Guided notes and examples
Practice worksheets
TI-84 graphing calculator
Guided graphing examples: http://dustintench.pbworks.com/f/Math%2B3%2B-%2BML%2B-%2B3.3.pdf

Instructional Notes:
Review exponential properties

- http://education.ohio.gov/getattachment/Topics/Academic-Content-Standards/Mathematics/High_School_Algebra_Model_Curriculum_October2013.pdf.aspx

Emphasis the following Standards for Mathematical Practice:
CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them.
Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

CCSS.Math.Practice.MP2 Reason abstractly and quantitatively.
Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to *decontextualize*—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents— and the ability to *contextualize*, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

Assessment Notes:
Summative:
- Individual quizzes over graphing, simplifying rational expressions, and solving
- Unit test
Formative:
- Watch volunteers explain problems to peers on the board and observe students at their seats individually working or following along
- Observe students working on practice problems at their desk or at the board
- Exit Slip
- Muddy/Clear Post-its
- KWL (Know, Want to know, Learned) Chart
- Self-reflection

Instructional and Assessment Resources:
Algebra 2 Textbook
Game: Bingo – Add/Subtract/Multiply/Divide radical expressions
       Around the world review
Activity: Matching – Simplifying radical expressions
Internet – extra worksheets, examples, demonstrations, activities
       Learning Tasks:

- https://www.georgiastandards.org/Common-Core/Common%20Core%20Frameworks/CCGPS_Math_9-12_AcelAnalyticGeoAdvancedAlg_Unit7SE.pdf
- http://www.purplemath.com/modules/graphrad.htm
- http://www.kutasoftware.com/FreeWorksheets/Alg2Worksheets/Graphing%20Radicals.pdf
- https://share.ehs.uen.org/node/26381

General resources:

- http://achievethecore.org/
- https://www.illustrativemathematics.org/
- http://www.nctm.org/
- http://www.parcconline.org/

Unit Title: Exponential and Logarithm Functions

Duration of Unit: 5-6 weeks (December/January)

Topic Sequence:
1. Exponential function introduction – definition, basic characteristics, and graphs
2. Exponential growth and decay models
3. Graphing logarithm functions
4. Writing equivalent forms of exponential and logarithm expressions to lead into simplifying and evaluating logarithm expressions
5. Solving exponential and logarithm equations

Common Core State Standards Addressed:
Graphing:
CCSS.Math.Content.HSF.LE.A.1 Distinguish between situations that can be modeled with linear functions and with exponential functions.
CCSS.Math.Content.HSF.LE.A.1.a Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
CCSS.Math.Content.HSF.IF.C.7.e Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.
Growth/Decay:
CCSS.Math.Content.HSF.IF.C.8.b Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)12^t$, $y = (1.2)^{t}/10$, and classify them as representing exponential growth or decay.
CCSS.Math.Content.HSF.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).
Simplifying:
CCSS.Math.Content.HSA.SSE.B.3.c Use the properties of exponents to transform expressions for exponential functions. *For example the expression 1.15^t can be rewritten as $(1.15^{1/12})^{12t} \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.*
CCSS.Math.Content.HSF.LE.A.4 For exponential models, express as a logarithm the solution to $ab^{ct} = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.
Solving:
CCSS.Math.Content.HSF.BF.B.5 (+) Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.
CCSS.Math.Content.HSA.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.
CCSS.Math.Content.HSA.SSE.B.4 Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. *For example, calculate mortgage payments.*[*]
CCSS.Math.Content.HSF.LE.B.5 Interpret the parameters in a linear or exponential function in terms of a context.

Student Friendly Learning Targets:
- I can graph exponential and logarithm functions showing intercepts and end behavior
- I can classify exponential functions as growth or decay
- I can state the inverse relationship between exponents and logarithms to write equivalent forms of exponential and logarithm functions while simplifying and evaluating
- I can estimate/solve logarithmic and exponential functions using algebra and apply my skills to real-life applications

Vocabulary:
Graphing: Exponent, base, exponential function, logarithmic function, inverse
Simplifying/Evaluating: Power to a power, inverse property, common log, natural log, change of base
Solving: Inverse functions

Materials and/or Technology Needed:
Guided notes and examples
Practice worksheets
TI-84
Resource

Instructional Notes:
Review exponential properties
An exponent function has the variable in the exponent, not necessarily an equation with an exponent
Logarithmic functions seem to take longer for students to grasp, so work with them for a longer period

- http://education.ohio.gov/getattachment/Topics/Academic-Content-Standards/Mathematics/High_School_Algebra_Model_Curriculum_October2013.pdf.aspx

Emphasis the following Standards for Mathematical Practice:
CCSS.Math.Practice.MP5 Use appropriate tools strategically.
Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

CCSS.Math.Practice.MP6 Attend to precision.
Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

PARCC MODEL CONTENT FRAMEWORKS:
As students acquire mathematical tools from their study of algebra and functions, they apply these tools in statistical contexts (e.g., S-ID.6). In a modeling context, they might informally fit an exponential function to a set of data, graphing the data and the model function on the same coordinate axes.

Attend to precision (MP.6). As in the previous two courses, the habit of using precise language is not only a tool for effective communication but also a means for coming to understanding. For example, when investigating loan payments, if students can articulate something like, "What you owe at the end of a month is what you owed at the start of the month, plus 1/12 of the yearly interest on that amount, minus the monthly payment," they are well along a path that will let them construct a recursively defined function for calculating loan payments (A-SSE.4).

Assessment Notes:
Summative:
- Individual quizzes over graphing, growth and decay, equivalent forms, solving
- Unit test

Formative:
- Watch volunteers explain problems to peers on the board and observe students at their seats individually working or following along
- Observe students working on practice problems at their desk or at the board
- Exit Slip
- Muddy/Clear Post-its
- KWL (Know, Want to know, Learned) Chart
- Self-reflection

Instructional and Assessment Resources:
Algebra 2 Textbook
PARCC: Temperature change
           Graphs of functions
Project: Xbox Xponential
           iPod dPreciation
           Meet "e" in St. Louis
Internet – extra worksheets, examples, demonstrations, activities
     General resources:
- http://achievethecore.org/
- https://www.illustrativemathematics.org/
- http://www.nctm.org/
- http://www.parcconline.org/

Unit Title: Sequences

Duration of Unit: 4 Weeks (January/February)

Topic Sequence:
1. Sequence introduction – definition, basic characteristics, and terms of a sequence
2. Arithmetic sequences
3. Geometric sequences
4. Pascal's triangle
5. Binomial theorem

Common Core State Standards Addressed:

Terms:

CCSS.Math.Content.HSF.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).

CCSS.Math.Content.HSF.BF.A.1 Write a function that describes a relationship between two quantities.[*]

Arithmetic:

CCSS.Math.Content.HSF.IF.A.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 $n \geq 1$.*

CCSS.Math.Content.HSF.BF.A.1.a Determine an explicit expression, a recursive process, or steps for calculation from a context.

CCSS.Math.Content.HSF.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.[*]

Geometric:

CCSS.Math.Content.HSF.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.[*]

CCSS.Math.Content.HSA.SSE.B.4 Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. *For example, calculate mortgage payments.*[*]

CCSS.Math.Content.HSF.BF.A.1.a Determine an explicit expression, a recursive process, or steps for calculation from a context.

CCSS.Math.Content.HSF.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).

Pascal's and Binomial:

CCSS.Math.Content.HSA.APR.C.5 (+) Know and apply the Binomial Theorem for the expansion of $(x + y)^n$ in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal's Triangle.

Student Friendly Learning Targets:
- I can tell you what a sequence represents and be able to find the terms of a sequence
- I can recognize arithmetic and geometric sequences and find the indicated term
- I can convert a list of numbers into a function and explain recursive/explicit formulas
- I can find entries in Pascal's Triangle and use this to apply the binomial theorem to write expansions

Vocabulary:
Terms, sequence, slope/rate of change, arithmetic and geometric sequence, recursive formula, explicit formula, Pascal's triangle, binomial expansion, binomial theorem

Materials and/or Technology Needed:
Guided notes and examples
Practice worksheets
TI-84 graphing calculator

Instructional Notes:
Students will have to know the definitions of coefficient and term
Students will need to recognize different types of functions (specifically linear models)

- http://education.ohio.gov/getattachment/Topics/Academic-Content-Standards/Mathematics/High_School_Algebra_Model_Curriculum_October2013.pdf.aspx

PARCC MODEL CONTENT FRAMEWORKS:
Look for and express regularity in repeated reasoning (MP.8). Algebra II is where students can do a more complete analysis of sequences (F-IF.3), especially arithmetic and geometric sequences, and their associated series. Developing recursive formulas for sequences is facilitated by the practice of abstracting regularity for how you get from one term to the next and then giving a precise description of this process in algebraic symbols (F-BF.2). Technology can be a useful tool here: Most Computer Algebra Systems allow one to model recursive function definitions in notation that is close to standard mathematical notation. And spreadsheets make natural the process of taking successive differences and running totals (MP.5).

Assessment Notes:
Summative:
- Individual quizzes over calculating a term of a sequence, arithmetic sequences, geometric sequences, binomial theorem
- Unit test

Formative:
- Watch volunteers explain problems to peers on the board and observe students at their seats individually working or following along
- Observe students working on practice problems at their desk or at the board
- Exit Slip
- Muddy/Clear Post-its
- KWL (Know, Want to know, Learned) Chart
- Self-reflection

Instructional and Assessment Resources:
Algebra 2 Textbook
Internet – extra worksheets, examples, demonstrations, activities

Resources:

- http://www.projectmaths.ie/documents/teachers/TL_arithmetic_sequences.pdf
  http://www.shodor.org/interactivate/lessons/IntroArithmetic/
- http://www.onlinemathlearning.com/arithmetic-sequences-algebra.html
- Learning Tasks:
  https://www.georgiastandards.org/Frameworks/GSO%20Frameworks/Math%20IV%20unit%202%20SE.pdf

General resources:

- http://achievethecore.org/
- https://www.illustrativemathematics.org/
- http://www.nctm.org/
- http://www.parcconline.org/

Unit Title: Trigonometric Functions

Duration of Unit: 4 – 5 Weeks (March)

Topic Sequence:
1. Trigonometric functions introduction – ratios and right triangles, degree and radian measures
2. Unit circle – co-terminal and reference angles, quadrental angles, evaluating exact values
3. Trigonometric graphs of sine, cosine, and tangent
4. Trigonometric identities

Common Core State Standards Addressed:
Functions and the unit circle
CCSS.Math.Content.HSF.TF.A.1
Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.
CCSS.Math.Content.HSF.TF.A.2
Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.

Graphs
CCSS.Math.Content.HSF.TF.B.5
Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.*

Identities
CCSS.Math.Content.HSF.TF.C.8
Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and use it to find $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ given $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ and the quadrant of the angle.

Student Friendly Learning Targets:
- I can identify a trigonometric function
- I can use a unit circle
- I can describe trigonometric graphs
- I can use trigonometric identities to verify true statements

Vocabulary:
Central angle, intercepted arc, unit circle, degree, radian, co-terminal, trigonometric function, quadrant, reference angle
sine, cosine, tangent, periodicity, period, even/odd function, amplitude, frequency, phase shift, domain, range
equivalent, Pythagorean Identity, quotient identity

Materials and/or Technology Needed:
Guided notes and examples
Practice worksheets
TI-84 graphing calculator

Instructional Notes:
Review over transformations

- http://education.ohio.gov/getattachment/Topics/Academic-Content-Standards/Mathematics/High_School_Algebra_Model_Curriculum_October2013.pdf.aspx

PARCC MODEL CONTENT FRAMEWORKS:
- In Geometry, students began trigonometry through a study of right triangles. In Algebra II, they extend the three basic functions to the entire unit circle.
- Look for and make use of structure (MP.7). The structure theme in Algebra I centered on seeing and using the structure of algebraic expressions. This continues in Algebra II, where students delve deeper into transforming expressions in ways that reveal meaning. The example given in the standards — that $x4 – y4$ can be seen as the difference of squares — is typical of this practice. This habit of seeing sub expressions as single entities will serve students well in areas such as trigonometry, where, for example, the factorization of $x4 – y4$ described above can be used to show that the functions $\cos4x – \sin4x$ and $\cos2x – \sin2x$ are, in fact, equal (A-SSE.2).

Emphasis the following Standards for Mathematical Practice:
CCSS.Math.Practice.MP7 Look for and make use of structure.
Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression x^2 + 9x + 14, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 - 3$(x - y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

CCSS.Math.Practice.MP8 Look for and express regularity in repeated reasoning.
Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y - 2)/(x - 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x - 1)(x + 1)$, $(x - 1)(x^2 + x + 1)$, and $(x - 1)(x^3 + x2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Assessment Notes:
Summative:
- Individual quizzes over basic trigonometric terms, unit circle, graphs, and identities
- Unit test

Formative:
- Watch volunteers explain problems to peers on the board and observe students at their seats individually working or following along
- Observe students working on practice problems at their desk or at the board
- Exit Slip
- Muddy/Clear Post-its
- KWL (Know, Want to know, Learned) Chart
- Self-reflection

Instructional and Assessment Resources:
Algebra 2 Textbook
Project:
Learning Tasks:
Internet – extra worksheets, examples, demonstrations, activities
    Learning Tasks:
- http://www.sosmath.com/trig/Trig2/trig2/trig2.html
- https://www.georgiastandards.org/Frameworks/GSO%20Frameworks/Acc-Math-III-Unit-6-SE-Trig-Identities-Equations-Apps.pdf
- http://projectmaths.ie/documents/teachers/TL10_trigonometric_functions.pdf
- https://www.georgiastandards.org/Frameworks/GSO%20Frameworks/Acc-Math-III-Unit-7-SE-Extended-Trig.pdf
    General resources:
- http://achievethecore.org/
- https://www.illustrativemathematics.org/
- http://www.nctm.org/
- http://www.parcconline.org/

Unit Title:

Duration of Unit: 4 weeks (April)

Topic Sequence:
1. Probability introduction – Theoretical probability and the Counting Principle
2. Permutations and Combinations
3. Mutually exclusive, inclusive, and independent events
4. Dependent and conditional probability

Common Core State Standards Addressed:

CCSS.Math.Content.HSS.CP.A.1
Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").

CCSS.Math.Content.HSS.CP.B.9
(+) Use permutations and combinations to compute probabilities of compound events and solve problems.

CCSS.Math.Content.HSS.CP.A.2
Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.
CCSS.Math.Content.HSS.CP.B.7
Apply the Addition Rule, P(A or B) = P(A) + P(B) - P(A and B), and interpret the answer in terms of the model.
CCSS.Math.Content.HSS.CP.B.8
(+) Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model.

CCSS.Math.Content.HSS.CP.A.3
Understand the conditional probability of A given B as $P(A$ and $B)/P(B)$, and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.
CCSS.Math.Content.HSS.CP.A.5
Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. *For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.*
CCSS.Math.Content.HSS.CP.B.6
Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model.

Student Friendly Learning Targets:
- I can find the probability of an event and apply the Fundamental Counting Principle
- I can distinguish between permutations and combinations
- I can find the probability of independent events
- I can find the probability of dependent events

Vocabulary:
Probability, event, sample space, subset, union, intersection, random
Independent events, product
Dependent event, conditional probability

Materials and/or Technology Needed:
Guided notes and examples
Practice worksheets
TI-84 graphing calculator

Instructional Notes:

- http://education.ohio.gov/getattachment/Topics/Academic-Content-Standards/Mathematics/High_School_Algebra_Model_Curriculum_October2013.pdf.aspx

CCSS.Math.Practice.MP2 Reason abstractly and quantitatively.
Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to *decontextualize*—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents— and the ability to *contextualize*, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

Assessment Notes:
Summative:
- Individual quizzes over
- Unit test

Formative:
- Watch volunteers explain problems to peers on the board and observe students at their seats individually working or following along
- Observe students working on practice problems at their desk or at the board
- Exit Slip
- Muddy/Clear Post-its
- KWL (Know, Want to know, Learned) Chart
- Self-reflection

Instructional and Assessment Resources:
Algebra 2 Textbook
Internet – extra worksheets, examples, demonstrations, activities
Learning Tasks:
- http://www.rbdil.org/counting.html
- https://www.georgiastandards.org/Common-Core/Common%20Core%20Frameworks/CCGPS_Math_7_7thGrade_Unit6SE.pdf
- http://www.insidemathematics.org/index.php/high-school-statistics-and-probability

General resources:
- http://achievethecore.org/
- https://www.illustrativemathematics.org/
- http://www.nctm.org/
- http://www.parcconline.org/

Unit Title: Statistics

Duration of Unit: 3 weeks (May)

Topic Sequence:
1. Statistics introduction and random processes: Central tendency
2. Representing and making inferences: Stem-and-Leaf, histograms, circle graphs, box-and-whisker
3. Distributions and interpreting: Dispersion, Binomial, Normal

Common Core State Standards Addressed:
CCSS.Math.Content.HSS.IC.A.1
Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
CCSS.Math.Content.HSS.IC.A.2
Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. *For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model*?
CCSS.Math.Content.HSS.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.
CCSS.Math.Content.HSS.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).

CCSS.Math.Content.HSS.IC.B.3
Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
CCSS.Math.Content.HSS.IC.B.4
Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.
CCSS.Math.Content.HSS.IC.B.5
Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.
CCSS.Math.Content.HSS.IC.B.6
Evaluate reports based on data.

CCSS.Math.Content.HSS.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).
CCSS.Math.Content.HSS.ID.A.4
Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.

Student Friendly Learning Targets:
- I can understand statistics as a process for making inferences based on random samples.
- I can define mean, median, mode, range
- I can identify outliers for a data set

- I can decide if data collected is consistent with the selected model or if another model is needed.
- I can pose questions that suggest a model, collect data, and answer my question.
- I can infer different means
- I can use margin of error in different situations
- I can write or present a summary of data-based research

- I can interpret the differences in the shape, center, and spread of data
- I can predict the effect of an outlier
- I can read and interpret given data
- I can calculate frequencies

Vocabulary:
Central tendency: mean, median, mode, outlier, lower/upper quartile, minimum/maximum value, interval
Representing: histogram, box plot, pie chart, frequency, cause
Distributions: interval, frequency, distribution, outlier, samples, margin of error

Materials and/or Technology Needed:
Guided notes and examples
Practice worksheets
TI-84 graphing calculator

Instructional Notes:
- http://education.ohio.gov/getattachment/Topics/Academic-Content-Standards/Mathematics/High_School_Statistics-and-Probability_Model-Curriculum_October2013.pdf.aspx

PARCC MODEL CONTENT FRAMEWORKS:
As students acquire mathematical tools from their study of algebra and functions, they apply these tools in statistical contexts (e.g., S-ID.6). In a modeling context, they might informally fit an exponential function to a set of data, graphing the data and the model function on the same coordinate axes.

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.

Assessment Notes:
Summative:
- Individual quizzes over
- Unit test

Formative:
- Watch volunteers explain problems to peers on the board and observe students at their seats individually working or following along
- Observe students working on practice problems at their desk or at the board
- Exit Slip
- Muddy/Clear Post-its
- KWL (Know, Want to know, Learned) Chart
- Self-reflection

Resources:
Algebra 2 Textbook
Internet – extra worksheets, examples, demonstrations, activities
    Learning Tasks:
- https://www.georgiastandards.org/CommonCore/Common%20Core%20Frameworks/CCGPS_Math_9-12_CoorAlgebra_Unit4SE.pdf

    General resources:
- http://achievethecore.org/
- https://www.illustrativemathematics.org/
- http://www.nctm.org/
- http://www.parcconline.org/