HOUSTON COUNTY SCHOOLS
MATHEMATICS DEPARTMENT

Algebra 2
2020-2021

Houston County's system-wide initiatives center around building fully functional, intensely focused professional learning communities in our schools.

This initiative includes a <u>focus on learning</u> which <u>clarifies</u> and <u>monitors essential learning</u>.

Not all content in a given grade or course is emphasized equally in the standards, nor should it be. Some clusters require greater emphasis than others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. More time in these areas may also be necessary for students to meet the demands of the Georgia Milestones assessments.

*<u>To say that some standards have greater emphasis is **not** to say that anything in the standards can safely be neglected in instruction!</u>* Neglecting material will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade. This new guide not only gives calendar pacing at the unit level, but also pacing at the standard level and one of three levels of content Essential, listed below.

PACING GUIDE & TEACHER PLANNER

Math teachers from every middle school in Houston County were invited to meet to identify "Essential Standards." Teachers considered the content expectations for future units within their grade, for future grades, on state assessments, and in other content areas to determine which standards were "Essential," Supporting," or "Additional." Their designations are color-coded within the list of standards as below and the included calendar shows approximate within-unit time allocations by standard or cluster.

μEssential Σ Supporting *Additional

On SharePoint, we amended course materials (including lesson plans, study guides, assessments, and POD's) to reflect the content of greatest emphasis for this math course because of their prioritization of standards.

This document shows where students and teachers should spend the large Essential of their time in order to meet the expectations of the standards. It includes a standard-by-standard calendar for teachers to use to plan and allocate teaching/learning time appropriately.

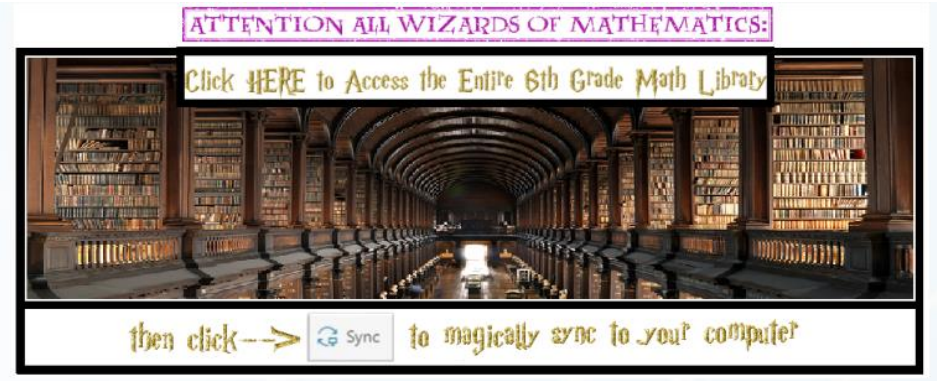
What resources are available for me?

What's on your SharePoint Course page?	• Unit Plans • "I Can" Statements with Examples • Unit Assessments • Daily PODs • Lessons and Tasks • Assessment Banks *(instructions for ExamView banks after the calendars)* • Milestones Resources including Mock Assessments • HRW Teacher/Student Instructions • And much more
Student Weeblys	http://hcbemath.weebly.com/

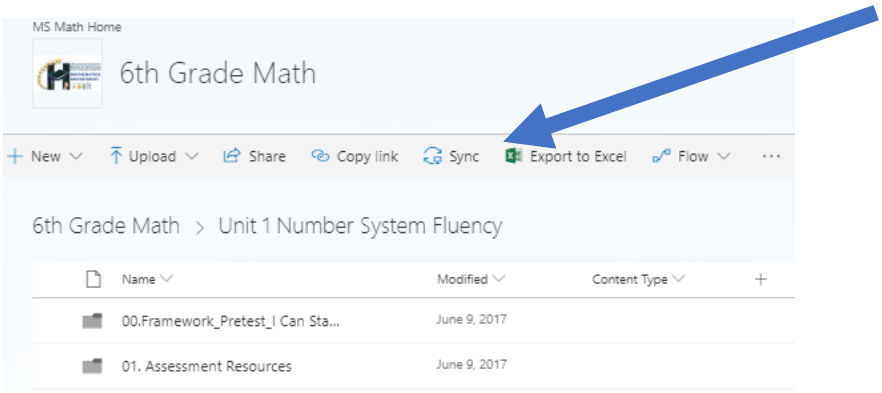
How do I sync the mathematics material to my file library on my desktop?

From Office 365, navigate to > SharePoint > Departments > Teaching & Learning > Math > Grade Band > Course Home.

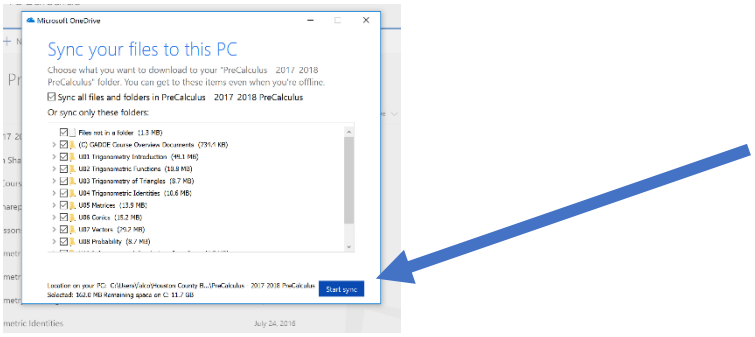
1. Navigate to your course home on SharePoint and click the icon below.



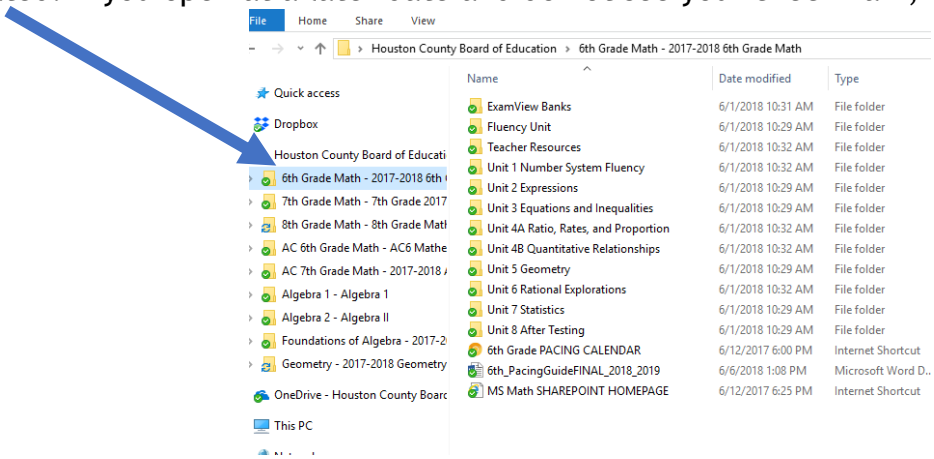
2. You are now in your course's document library. Click the Sync Button.



3. A window will open and all the folders in this library should be checked. Keep them checked and choose Start sync. ***Note, you may encounter two screens before this in which you choose ALLOW and then must SIGN IN with your HCBE email.



4. After a few seconds, you will get notified that the files are syncing to your Houston County BOE One Drive and the files will be located in your file library. These files work like Dropbox and are updated in real time as changes are made by Dr. Rape or Jennifer Farrow. BE SURE YOU SEE GREEN CHECK MARK. This means it is synced and your files are updated. If you open at a later date and do not see your checkmark, repeat this process.



NOTE*** These files are locked for editing and saving to these folders. You may open, edit, and save to your personal files in another file location.

NOTE**** ExamView Tests will NOT open directly from the Houston County Board of Education File Folders. To open, right-click copy and right-click save to a folder on your desktop or My Documents. Then, open the file from this location. A PDF of each test is available for you to preview

Algebra 2 Unit 1 – Quadratics Revisited

1st Semester

August 4 - December 18

September 7 (Labor Day Holiday); October 13-16 (Fall Holiday); November 11 (Veteran's Day); November 23-27 (Thanksgiving Holiday)

Algebra 2 Georgia Standards of Excellence 2020-2021 Pacing Guide

μEssential Σ Supporting *Additional

Students will revisit solving quadratic equations in this unit. Students explore relationships between number systems: whole numbers, integers, rational numbers, real numbers, and complex numbers. Students will perform operations with complex numbers and solve quadratic equations with complex solutions. **IMPORTANT: USE THE TASKS, TOO!**

TEACHING MAP FOR UNIT 1:

μ (Green) – Essential Standards

∑ (Blue) – Supporting Standards

* (Orange/Red) – Additional Standards

Quadratic Review

- Graphs/Attributes/Solutions
- Factoring and Solving by Factoring
- Solve by Square Roots
- Solve by Completing the Square
- Solve by Quadratic Formula (discriminant)
- Writing Functions Given a Graph
- Find Average Rate of Change over a Specified Interval
- Transforming a given function to create a new function.

Complex Numbers

- Solving Quadratics with Non-Real Solutions
- Connecting Graphs to Complex Solutions
- The meaning of i^u
- Operating with Complex Numbers: Addition, Subtraction, Multiplication
- Using the Complex Conjugate to Divide Complex Numbers

STANDARDS:

N.CN.1μ Understand there is a complex number i such that $i^2 = -1$, and every complex number has the form a + bi where a and b are real numbers.

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

N.CN.3Σ **Find** the conjugate of a complex number; use the conjugate to find the ~~absolute value (modulus) and~~ quotient of complex numbers.

A.REI.4μ Solve quadratic equations in one variable.

A.REI.4bμ Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, factoring, completing the square, and the quadratic formula, as appropriate to the initial form of the equation (limit to real number solutions).

N.CN.7μ Solve quadratic equations with real coefficients that have complex solutions by (but not limited to) square roots, completing the square, and the quadratic formula.

F.IF.6Σ **Calculate** and interpret the average rate of change of a function (presented symbolically or a as a table) over a specified interval. Estimate the rate of change from a graph.

F.BF.3μ 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 and explanation of the effects on the graph using technology. ~~*Include recognizing even and odd functions from their graphs and algebraic expressions for them.*~~

UNIT 1: QUADRATICS REVISITED

SUGGESTED PACING CALENDAR

Monday	Tuesday	Wednesday	Thursday	Friday
Aug **3**	Aug **4**	Aug **5**	Aug **6**	Aug **7**
Summer	UNIT 1			
	QUADRATIC REVIEW----------→			
	First Day of School			
Aug **10**	Aug **11**	Aug **12**	Aug **13**	Aug **14**
UNIT 1				
QUADRATIC REVIEW, cont'd----------→				
Aug **17**	Aug **18**	Aug **19**	Aug **20**	Aug **21**
UNIT 1				
QUADRATIC REVIEW, cont'd ----------I				
Graphs: Zeros, End Behavior, Y intercept, domain, range, intervals of increase and decrease, turning points, end behavior, average rate of change over an interval, even, odd, neither, transformations				
Aug **24**	Aug **25**	Aug **26**	Aug **27**	Aug **28**
UNIT 1				
COMPLEX NUMBERS----------→				
Aug **31**	Sept **1**	Aug **2**		
UNIT 1				
COMPLEX NUMBERS-------I	**Target Date – Unit 1 Review/Assessment**			

If needed, teaching simplifying square roots can be added in place of days during the quadratic review.

Algebra 2 Unit 2 – Operations with Polynomials

1st Semester

August 4 - December 18

September 7 (Labor Day Holiday); October 13-16 (Fall Holiday); November 11 (Veteran's Day); November 23-27 (Thanksgiving Holiday)

Algebra 2 Georgia Standards of Excellence 2020-2021 Pacing Guide

μEssential ΣSupporting *Additional

In this unit students, will:

- Describe polynomials using appropriate vocabularyμ
- Operate with polynomials (add, subtract, & multiply) μ
- Divide polynomials using long divisionμ
- use complex numbers in polynomial identities and equations*
- understand and apply the Remainder Theoremμ

In this unit, students continue their study of polynomials by identifying the parts of polynomial expressions, as well as operating with polynomials. Students will learn the procedure for long division of polynomials, as well as how to apply the Remainder Theorem.

Note: Hold synthetic division until Unit 3, where it is used in combination with the Rational Root Theorem to solve polynomial equations.

Teaching Map for Unit 2

μ (Green) – Essential Standards

∑ (Blue) – Supporting Standards

* (Orange/Red) – Additional Standards

Polynomial Basics

- Definition of a Polynomial Function
- Rewriting polynomials into standard form
- Classifying Polynomials by number of terms and degree

Polynomial Function Operations & Closure

- Solving Quadratics with Non-Real Solutions
- Connecting Graphs to Complex Solutions
- The meaning of i^u
- Add/Subtract Polynomial Functions
- Multiply Polynomial Functions
  - Use the Distributive Property
  - Pascal's Triangle
- Dividing Polynomials
  - Long Division
  - Synthetic Division
  - Remainder Theorem

F.BF.1 Write a function that describes a relationship between two quantities. Σ

A.SSE.1 Interpret expressions that represent a quantity in terms of its context. Σ

A.SSE.1a Interpret parts of an expression, such as terms, factors, and coefficients, in context. Σ

A.SSE.1b Given situations which utilize formulas or expressions with multiple terms and/or factors, interpret the meaning (in context) of individual terms or factors. Σ

A.APR.1 Add, subtract, and multiply polynomials; understand that polynomials form a system analogous to the integers in that they are closed under these operations. Σ

A.APR.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) = o iff (x – a) is a factor of p(x). Σ

A.APR.5 Know and apply that the Binomial Theorem gives 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 using Pascal's Triangle. *

A.APR.6 Rewrite simple rational expressions in different forms using inspection, long division, or a computer algebra system; 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). Σ

F.BF.1b Combine standard function types using arithmetic operations in contextual situations (Adding, subtracting, and multiplying functions of different types). Σ

UNIT 2: POLYNOMIAL OPERATIONS

SUGGESTED PACING CALENDAR

Monday	Tuesday	Wednesday	Thursday	Friday
			Sept **3**	Sept **4**
			UNIT 2	
			POLYNOMIAL INTRO, CLASSIFY, STANDARD FORM------I	
Sept **7**	Sept **8**	Sept **9**	Sept **10**	Sept **11**
LABOR DAY	UNIT 2			
	ADD SUBTRACT MULT DIV POLYNOMIALS----------→			
	Add/Subtract	*Mult/Distributive*	*Mult/Pascal*	*Mult/Pascal*
Sept **14**	Sept **15**	Sept **16**	Sept **17**	Sept **18**
UNIT 2				
ADD SUBTRACT MULT DIV POLYNOMIALS----------→			**Target Date – Unit 2 Review/Assessment**	
Divide (LONG)	*Divide (Long)*	*Div/Remainder Thm*		

Algebra 2 Unit 3 – Polynomial Functions

1st Semester

August 4 - December 18

September 7 (Labor Day Holiday); October 13-16 (Fall Holiday); November 11 (Veteran's Day); November 23-27 (Thanksgiving Holiday)

Algebra 2 Georgia Standards of Excellence — 2020-2021 Pacing Guide

μEssential ΣSupporting *Additional

In this unit students will:

- use polynomial identities to solve problems
- use complex numbers in polynomial identities and equations
- understand and apply the rational Root Theorem
- Find the average rate of change over a specified interval
- Perform transformations of functions
- understand and apply The Fundamental Theorem of Algebra
- understand the relationship between zeros and factors of polynomials
- represent, analyze, and solve polynomial functions algebraically and graphically

In this unit, students continue their study of polynomials by identifying zeros and making connections between zeros of a polynomial and solutions of a polynomial equation. Students will see how the Fundamental Theorem of Algebra can be used to determine the number of solutions of a polynomial equation and will find all the roots of those equations. Students will graph polynomial functions and interpret the key characteristics of the function.

TEACHING MAP FOR UNIT 3:

μ (Green) – Essential Standards ∑ (Blue) – Supporting Standards * (Orange/Red) – Additional Standards

Unit 3A ≈ Solving Polynomials

- Using the Fundamental Theorem of Algebra to determine the number of solutions that a polynomial has without graphing it.
- ID zeros from pre-factored polynomials (cross over from graphs to factorizations) to link factors to solutions.
- Identify zeroes from polynomial functions.
  - Factor polynomials
    - polynomials in quadratic form
    - grouping
    - sum/difference of perfect cubes
    - sum/difference of perfect squares
  - use Quadratic Formula where applicable
  - link factors to solution – Zero Product Property
- Solve polynomials with highest exponent greater than 2, utilizing the Rational Root Theorem to narrow down possible choices for roots and division to determine if it is a root.
  - Note: Where synthetic division should be introduced.
- Given a higher order polynomial that is not easily factored, and a quadratic factor, use long division to find the remaining factors(s) and the zeros of the function.

Unit 3B ≈ Graphing Polynomial Functions

- BY HAND generate the graphs of polynomial functions given in both factored and standard form, identifying key features such as roots, y-intercept, domain, range, intervals of increase and decrease, number of turning points, and end behaviors
- USING TECHNOLOGY generate the graphs of polynomial functions, identifying key features such as roots, y-intercept, domain, range, intervals of increase and decrease, relative minimum and maximum point(s), absolute maximum and minimums, and end behaviors.
- Use the Fundamental Theorem of Algebra – tie to graphs with both real and imaginary solutions
- Find the Average Rate of Change Over a Specified Interval
- Transforming a given function to create a new function
- Describe functions as even, odd, or neither from by a graph and a function represented symbolically.
- Real world applications of polynomial functions

N.CN.9 Use the Fundamental Theorem of Algebra to find all roots of a polynomial equation. μ

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. μ

A.SSE.2 Use the structure of an expression to rewrite it in different equivalent forms. 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 $(x^2 - y^2)(x^2 + y^2)$. μ

A.APR.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.* *

N.CN.8 Extend polynomial identities to include factoring with complex numbers. *For example, rewrite $x^2 + 4$ as $(x + 2i)(x - 2i)$.* *

F.IF.4 Using tables, graphs, and verbal descriptions, interpret the key characteristics of a function which models the relationship between two quantities. Sketch a graph showing key features including: intercepts; interval where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; ~~and periodicity~~. *(Limit to polynomial functions.)* μ

F.IF.7c Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. μ

F.IF.6Σ Calculate and interpret the average rate of change of a function (presented symbolically or a as a table) over a specified interval. Estimate the rate of change from a graph.

F.BF.3μ 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 and explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

A.SSE.1 Interpret expressions that represent a quantity in terms of its context. Σ

ALGEBRA 2

UNIT 3: POLYNOMIAL FUNCTIONS

SUGGESTED PACING CALENDAR

Monday	Tuesday	Wednesday	Thursday	Friday
Sept **21**	Sept **22**	Sept **23**	Sept **24**	Sept **25**
UNIT 3A				
Algebra Theorems, Connecting Zeros to Solutions to Factors, Synthetic Division, Choosing Divisors with Rational Root Theorem----------I				
Fundamental Theorem of Algebra Zero Product Theorem	*Zeros from graphs, given zeros, list factors*	*Synthetic Division*	*Synthetic Division*	*Rational Root Theorem, Synthetic Division*
Sept **28**	Sept **29**	Sept **30**	Oct **1**	Oct **2**
UNIT 3A				
SOLVE POLYNOMIALS OF HIGHER ORDER, IDENTIFY ZEROS, RELATE THEM TO GRAPH GIVEN OR ON CALCULATORS----------→				
Oct **5**	Oct **6**	Oct **7**	Oct **8**	Oct **9**
UNIT 3A				
SOLVE POLYNOMIALS OF HIGHER ORDER, USE TI84------I		**Target Date – Unit 3A Review/Assessment**		*In-service*
Oct **12**	Oct **13**	Oct **14**	Oct **15**	Oct **16**
~~FALL BREAK~~	~~FALL BREAK~~	~~FALL BREAK~~	~~FALL BREAK~~	~~FALL BREAK~~
Oct **19**	Oct **20**	Oct **21**	Oct **22**	Oct **23**
UNIT 3B				
GRAPH POLYNOMIALS OF HIGHER ORDER, IDENTIFY ZEROS IDENTIFY KEY FEATURES ----------→				
Zeros, End Behavior, Y intercept, domain, range, intervals of increase and decrease, turning points, end behavior, average rate of change over an interval, even, odd, neither, transformations				
Oct **26**	Oct **27**	Oct **28**	Oct **29**	Oct **30**
UNIT 3B				
GRAPH POLYNOMIALS OF HIGHER ORDER, IDENTIFY ZEROS IDENTIFY KEY FEATURES ----------→				
Zeros, End Behavior, Y intercept, domain, range, intervals of increase and decrease, turning points, end behavior, average rate of change over an interval, even, odd, neither, transformations				
Nov **2**	Nov **3**	Nov **4**	Nov **5**	Nov **6**
UNIT 3B				
GRAPH POLYNOMIALS OF HIGHER ORDER, ID ZEROS, ID KEY FEATURES ------→			**Target Date – Unit 3B Review/Assessment**	
Zeros, End Behavior, Y intercept, domain, range, intervals of increase and decrease, turning points, end behavior, average rate of change over an interval, even, odd, neither, transformations				

Algebra 2 Unit 4A – ~~*Rational and*~~ Radical Functions

1st Semester

August 4 - December 18

September 7 (Labor Day Holiday); October 13-16 (Fall Holiday); November 11 (Veteran's Day); November 23-27 (Thanksgiving Holiday)

Algebra 2 Georgia Standards of Excellence 2020-2021 Pacing Guide

μEssential ΣSupporting *Additional

In this unit students will:

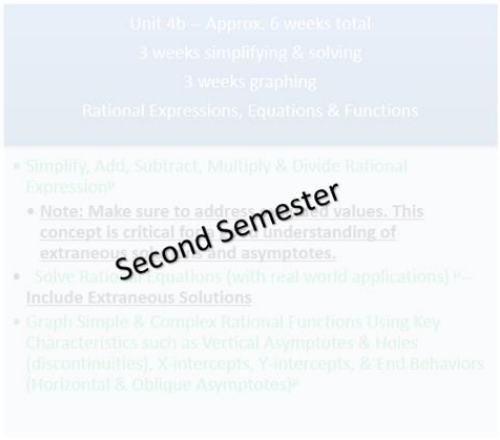
- Define rational exponents
- rewrite expressions involving radicals and rational exponents
- Explore Radical Functions (also discussions of "closure").
- Perform arithmetic operations with radical expressions and simplify arithmetic and radical expressions
- Investigate the properties of simple radical functions and then expand their knowledge of the graphical behavior and characteristics
- Solve equations and inequalities involving radical functions – understanding extraneous solutions are sometimes generated.
- Apply radical functions with an emphasis on interpretation of real world phenomena of the radical expressions

TEACHING MAP FOR UNIT 4:

μ (Green) – Essential Standards ∑ (Blue) – Supporting Standards * (Orange/Red) – Additional Standards

Unit 4A – Radical Expressions, Equations, & Functions

- Rational vs. Irrational numbers
- Rewrite Radical Expressions as Expressions Containing Rational Exponents
- Simplify Expressions Written with Radicals or Rational Expressions
- Simplify, Add, Subtract, Multiply & Divide Radical Expressions
- Solve Radical Equations (with real world applications) – include extraneous solutions
- Graph Radical Functions (square root & cube root) – Notice Behavior & Key Characteristics such as Domain, Range, & End Behavior



N.RN.1μ Explain how the meaning of rational exponents follows from extending the properties of integer exponents to rational numbers, allowing for a notation for radicals in terms of rational exponents. *For example, we define* $5^{(1/3)}$ *to be the cube root of 5 because we want* $[5^{(1/3)}]^3 = 5^{[(1/3)\times 3]}$ *to hold, so* $[5^{(1/3)}]^3$ *must equal 5.*

N.RN.2Σ Rewrite expressions involving radicals and rational exponents using the properties of exponents.

N.RN.3Σ Explain why the sum or product of rational numbers is rational; why the sum of a rational number and an irrational number is irrational; and why the product of a nonzero rational number and an irrational number is irrational.

A.APR.7μ Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a non-zero rational expression; add, subtract, multiply, and divide rational expressions.

A.REI.2μ Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

A.CED.1Σ Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear, quadratic, simple rational, and exponential functions (integer inputs only).

F.IF.4μ Using tables, graphs, and verbal descriptions, interpret the key characteristics of a function which models the relationship between two quantities. Sketch a graph showing key features including: intercepts; interval where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior. (Limit to rational functions.)

F.IF.5Σ 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. (Limit to radical and rational functions.)

F.IF.7μ Graph functions expressed algebraically and show key features of the graph both by hand and by using technology. (Limit to rational functions.)

F.IF.7bμ Graph square root, cube root~~, and piecewise-defined functions, including step functions and absolute value functions.~~

A.CED.2Σ Create linear, quadratic, and exponential equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. (Limit to rational and radical functions. The phrase "in two or more variables" refers to formulas like the compound interest formula, in which $A = P(1 + r/n)^{nt}$ has multiple variables.)

ALGEBRA 2 **UNIT 4A: ~~RATIONAL AND~~ RADICAL FUNCTIONS** *SUGGESTED PACING CALENDAR*

Monday	Tuesday	Wednesday	Thursday	Friday
Nov **9**	Nov **10**	Nov **11**	Nov **12**	Nov **13**
UNIT 4A RATIONAL VS IRRATIONAL, CONVERT TO RADICALS TO RATIONAL EXPONENTS, NOTE CLOSURE		Veteran's Day	UNIT 4A RATIONAL VS IRRATIONAL, CONVERT TO RADICALS TO RATIONAL EXPONENTS, NOTE CLOSURE	
Nov **16**	Nov **17**	Nov **18**	Nov **19**	Nov **20**
UNIT 4A SIMPLIFY RADICAL EXPRESSIONS (RATIONAL EXPONENTIAL OR RADICAL FORM)		SOLVE RADICAL EQUATIONS/APPLICATIONS----------→		
Nov **23**	Nov **24**	Nov **25**	Nov **26**	Nov **27**
Thanksgiving Break				
NOv **30**	Dec **1**	Dec **2**	Dec **3**	Dec **4**
UNIT 4A GRAPH RADICAL EXPRESSIONS/NOTE CHARACTERISTICS----------→ *Zeros, End Behavior, Y intercept, domain, range, intervals of increase and decrease, turning points, end behavior, average rate of change over an interval, even, odd, neither, transformations*				
Dec **7**	Dec **8**	Dec **9**	Dec **10**	Dec **11**
UNIT 4A GRAPH RADICALS----------I *Zeros, End Behavior, Y intercept, domain, range, intervals of increase and decrease, turning points, end behavior, average rate of change over an interval, even, odd, neither, transformations*			**Target Date – Unit 4A Review/Assessment**	
Dec **14**	Dec **15**	Dec **16**	Dec **17**	Dec **18**
Final Exam Review		**Final Exams**		Last Day of School (½ Day)

Algebra 2 Unit 4B – Rational ~~and Radical~~ Functions

2nd Semester

January 5 - May 26

January 18 (MLK Holiday); February 15 (President's Day Holiday); February 16 (Student Holiday) March 29-April 2 (Spring Break)

Algebra 2 Georgia Standards of Excellence 2020-2021 Pacing Guide

μEssential ΣSupporting *Additional

In this unit students will:

- Rewrite expressions involving rational exponents
- Explore Rational Functions (also discussions of "closure").
- Perform arithmetic operations with rational expressions and simplify arithmetic expressions
- Investigate the properties of simple rational functions and then expand their knowledge of the graphical behavior and characteristics of more complex rational functions
- Solve equations and inequalities involving rational functions – understanding extraneous solutions are sometimes generated.
- Apply rational functions with an emphasis on interpretation of real world phenomena of the rational expressions

TEACHING MAP FOR UNIT 4

μ (Green) – Essential Standards ∑ (Blue) – Supporting Standards * (Orange/Red) – Additional Standards

Unit 4b – Rational Expressions, Equations, & Functions

- Simplify, Add, Subtract, Multiply, & Divide Rational Expressions
  - Note: Make sure to address excluded values. This concept is critical for a good understanding of extraneous solutions and asymptotes.
- Solve Rational Equations (with real world applications)
  - Include Extraneous Solutions
- Graph Simple & Complex Rational Functions Using Key Characteristics such as Vertical Asymptotes & Holes (discontinuities), X-intercepts, Y-intercepts, & End Behaviors (Horizontal & Oblique Asymptotes)

N.RN.1μ Explain how the meaning of rational exponents follows from extending the properties of integer exponents to rational numbers, allowing for a notation for radicals in terms of rational exponents. *For example, we define* $5^{(1/3)}$ *to be the cube root of 5 because we want* $[5^{(1/3)}]^3 = 5^{[(1/3)\times 3]}$ *to hold, so* $[5^{(1/3)}]^3$ *must equal 5.*

N.RN.3Σ Explain why the sum or product of rational numbers is rational; why the sum of a rational number and an irrational number is irrational; and why the product of a nonzero rational number and an irrational number is irrational.

A.APR.7μ Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a non-zero rational expression; add, subtract, multiply, and divide rational expressions.

A.REI.2μ Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

A.CED.1Σ Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear, quadratic, simple rational, and exponential functions (integer inputs only).

F.IF.4μ Using tables, graphs, and verbal descriptions, interpret the key characteristics of a function which models the relationship between two quantities. Sketch a graph showing key features including: intercepts; interval where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior. (Limit to rational functions.)

F.IF.5Σ 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. (Limit to radical and rational functions.)

F.IF.7μ Graph functions expressed algebraically and show key features of the graph both by hand and by using technology. (Limit to rational functions.)

F.IF.7dμ Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.

A.CED.2Σ Create linear, quadratic, and exponential equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. (Limit to rational and radical functions. The phrase "in two or more variables" refers to formulas like the compound interest formula, in which $A = P(1 + r/n)^{nt}$ has multiple variables.)

ALGEBRA 2 **UNIT 4B: RATIONAL ~~AND RADICAL~~ FUNCTIONS** *SUGGESTED PACING CALENDAR*

Jan 4	Jan 5	Jan 6	Jan 7	Jan 8
Inservice	UNIT 4B			
	Rational Operations, Excluded Values----------I			
Jan 11	**Jan 12**	**Jan 13**	**Jan 14**	**Jan 15**
UNIT 4B				
Solve Rational Equations, Extraneous solutions----------→				
Jan 18	**Jan 19**	**Jan 20**	**Jan 21**	**Jan 22**
MLK Holiday	UNIT 4B			
	Solve Rational Equations, Extraneous solutions----------→			
Jan 25	**Jan 26**	**Jan 27**	**Jan 28**	**Jan 29**
UNIT 4B				
Graph Rational Functions, Asymptotes, Characteristics----------→				
Zeros, End Behavior, Y intercept, domain, range, intervals of increase and decrease, turning points, end behavior, average rate of change over an interval, even, odd, neither, transformations				
Feb 1	**Feb 2**	**Feb 3**	**Feb 4**	**Feb 5**
UNIT 4B				
Graph Rational Functions, Asymptotes, Characteristics----------→				
Zeros, End Behavior, Y intercept, domain, range, intervals of increase and decrease, turning points, end behavior, average rate of change over an interval, even, odd, neither, transformations				
Feb 8	**Feb 9**	**Feb 10**	**Feb 11**	**Feb 12**
UNIT 4B				
Graph Rationals ----------I			**Target Date – Unit 4B Review/Assessment**	
Zeros, End Behavior, Y intercept, domain, range, intervals of increase and decrease, turning points, end behavior, average rate of change over an interval, even, odd, neither, transformations				

Algebra 2 Unit 5 –Exponential and Logarithmic Functions

2nd Semester

January 5 - May 26

January 18 (MLK Holiday); February 15 (President's Day Holiday); February 16 (Student Holiday) March 29-April 2 (Spring Break)

Algebra 2 Georgia Standards of Excellence 2020-2021 Pacing Guide

In this unit, students will:

- Review exponential functions and their graphs
- Explore Exponential Growth
- Develop the Concept of a logarithm as an exponent, along with the inverse relationship with exponents
- Define Logarithms and Natural Logarithms
- Develop the Change-of-Base Formula
- Develop the Properties of Logarithms
- Solve Problems Relating to Exponential and Logarithmic Functions

TEACHING MAP FOR UNIT 5:

μ (Green) – Essential Standards ∑ (Blue) – Supporting Standards * (Orange/Red) – Additional Standards

Unit 5A – Properties and Equations of Exponentials of Logarithms

- Review Exponential Growth & Decay – meaning of exponents, bases, & coefficients (this was taught in Alg.1)
- Base 'e' (Note: this is the first introduction to 'e')
- Concept of logarithm; converting between logarithmic & exponential forms (include common and natural logarithms)
- Evaluating logarithms by hand
- Properties of logarithms – power property, quotient property, product property, & identity
- Solving exponential & logarithmic equations

Unit 5B – Graphing Exponentials & Logarithms

- Graphing Exponential Functions –Use key features such as intercepts and asymptotes (This is an extension of exponential work from Alg. 1)
- Graph Logarithmic Functions
  - Use key features such as intercepts and asymptotes
  - Using the idea of inverse functions (Note: this is the first intro to inverse functions. They will be studied in more detail in Unit 6.)

NOTE TO TEACHER: The development of a logarithm as the inverse of an exponential equation is typically very difficult-just as subtraction is harder than addition and multiplication is easier than division. A full and complete understanding of addition facts is needed to be able to understand subtraction. Furthermore, quick access to addition facts enhances understanding of subtraction. The same is true for multiplication and division-quick recall of multiplication facts is extremely helpful to learn division. While there is no "magic bullet" for teaching logarithms, the development of the concept will be much easier if students have at their command quick reference and recall to the exponential facts. Materials to help with exponent quick recall are provided.

F.IF.8∑ Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. (Limit to exponential and logarithmic functions.)

F.IF.8b∑ Use the properties of exponents to interpret expressions for exponential functions. *For example, identify percent rate of change in functions such as* $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)^{(12t)}$, $y = (1.2)^{(t/10)}$, *and classify them as representing exponential growth and decay. (Limit to exponential and logarithmic functions.)*

F.LE.4μ 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.

F.IF.8∑ Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. *(Limit to exponential and logarithmic functions.)*

F.BF.5μ Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.

A.SSE.3∑ Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. *(Limit to exponential and logarithmic functions.)*

A.SSE.3c∑ Use the properties of exponents to transform expressions for exponential functions. *For example, the expression* 1.15^t, *where t is in years, 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%.*

F.IF.7μ Graph functions expressed algebraically and show key features of the graph both by hand and by using technology. *(Limit to exponential and logarithmic functions.)*

F.IF.7eμ Graph exponential and logarithmic functions, showing intercepts and end behavior.

ALGEBRA 2 **UNIT 5: EXPONENTIAL AND LOGARITHMIC FUNCTIONS** *SUGGESTED PACING CALENDAR*

Monday	Tuesday	Wednesday	Thursday	Friday
Feb **15**	Feb **16**	Feb **17**	Feb **18**	Feb **19**
PRESIDENTS' DAY	INSERVICE	UNIT 5A Review Exponents, Work on Exponent Fact Fluency----------I		
Feb **22**	Feb **23**	Feb **24**	Feb **25**	Feb **26**
UNIT 5A Exponent/Log Relationship as Inverses, solve equations, real world applications (Newton's Law of Cooling, HalfLife, Interest----------→				
Mar **1**	Mar **2**	Mar **3**	Mar **4**	Mar **5**
UNIT 5A Solving Simple Exponential and Log Eqs applications, base "e," "ln"----------I			**Target Date – Unit 5A Review/Assessment**	
Mar **8**	Mar **9**	Mar **10**	Mar **11**	Mar **12**
UNIT 5B Graph Exponential and Logarithmic Functions, real world applications----------→ *Zeros, End Behavior, Y intercept, domain, range, intervals of increase and decrease, turning points, end behavior, average rate of change over an interval, even, odd, neither, transformations*				
Mar **15**	Mar **16**	Mar **17**	Mar **18**	Mar **19**
UNIT 5B Graph Exponential and Logarithmic Functions, attributes of exp & log graphs (relate to real world applications)----------→ *Zeros, End Behavior, Y intercept, domain, range, intervals of increase and decrease, turning points, end behavior, average rate of change over an interval, even, odd, neither, transformations*				
Mar **22**	Mar **23**	Mar **24**	Mar **25**	Mar **26**
UNIT 5B Graph Exp & Log attributes (relate to real world applications)---------→ *Zeros, End Behavior, Y intercept, domain, range, intervals of increase and decrease, turning points, end behavior, average rate of change over an interval, even, odd, neither, transformations*			**Target Date – Unit 5B Review/Assessment**	
Mar **29**	Mar **30**	Mar **31**	Apr **1**	Apr **2**
Spring Break				

Algebra 2 Unit 6 –Mathematical Modeling

2nd Semester

January 5 - May 26

January 18 (MLK Holiday); February 15 (President's Day Holiday); February 16 (Student Holiday) March 29-April 2 (Spring Break)

Algebra 2 Georgia Standards of Excellence 2020-2021 Pacing Guide

μEssential Σ Supporting *Additional

This unit is a bit of a "leftovers" and "compare/contrast" unit in that leftover concepts put into one place…that said, this is the first time that students can truly compare different types of functions together and get a full understanding of transformations and how they affect different functions. This is the first time students can begin to understand how interrelated all of the mathematical ideas and processes are interwoven. This is the unit in which students will begin to truly understand Algebra, and not just regurgitate ideas they have learned from a single unit. While graphing and calculating by hand are important, encourage students to also rely heavily upon their graphing calculators to verify solutions, inverses, transformations, and key characteristics from graphs. Use the PDF portfolio for lessons, as your workbook has little to offer outside of the units students have already done in your class. Have fun!

TEACHING MAP FOR UNIT 6:

μ (Green) – Essential Standards ∑ (Blue) – Supporting Standards * (Orange/Red) – Additional Standards

Composition & Inverse Functions

- Composing Functions
  - Use multiple function types
  - Use function notation, tables, & graphs
- Define inverses as functions for which f(g(x)) = g(f(x)) = x
- Find inverse functions (use multiple function types)
- Understand that some functions, once inverted, are no longer functions and the domain must be restricted to maintain function status.
- The graphs of inverse functions are reflections across the line y=x.

Absolute Value & Piecewise Functions

- Graph absolute value, piecewise & step functions
- Identify key characteristics of the graphs (domain, range, max/min, end behavior, & intervals of increase/decrease)

Systems & Linear Programming

- Solve a system composed of any of the function types previously studied
- Use technology to solve systems, understand that graphically the solutions are the points where the graphs intersect.
- Recognize that some solutions are extraneous.
- Graph inequalities
- Determine constraints upon graphs in real-world applications
- Linear programming/Corner Values Method

Functions: Characteristics & Transformations

Putting it all together

- Graphing all function types - linear, quadratic, exponential, logarithmic, polynomial, cube root, square root, rational, absolute value, & piecewise
- Identifying, Comparing, & Contrasting Key Characteristics -- Domain, Range, End Behavior, minimum/maximum, intervals of increase/decrease, asymptotes, holes, & intercepts
- Graph & Describe the Impact of Transforming Functions -- f(x) + k, f(x + k), kf(x), f(kx)
- Calculate the average rate of change over a specified interval and compare the average rates of change over multiple intervals.

Sequences & Series

- Arithmetic Sequences
- Geometric Sequences
- Calculate the sume of finite geometric sequences

STANDARDS FOUND ON FACING PAGE (ABOVE CALENDAR)

ALGEBRA 2 **UNIT 6: MATHEMATICAL MODELING** *SUGGESTED PACING CALENDAR*

NOTE: HCBE ALGEBRA 2 DIFFERS FROM GADOE'S NEWEST ITERATION OF THE ALEBRA 2 UNITS.

F.BF.1c[μ] Compose functions. For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time.

F.BF.4[μ] Find inverse functions.

F.BF.4a[μ] 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, $f(x) = 2(x3)$ or $f(x) = (x+1)/(x-1)$ for $x \neq 1$.

F.BF.4b[μ] Verify by composition that one function is the inverse of another.

F.BF.4c[μ] Read values of an inverse function from a graph or a table, given that the function has an inverse.

A.CED.4* Rearrange formulas to highlight a quantity of interest using the same reasoning as in solving equations. Examples: Rearrange Ohm's law V = IR to highlight resistance R; Rearrange area of a circle formula $A = \pi r^2$ to highlight the radius r.

F.IF.7[μ] Graph functions expressed algebraically and show key features of the graph both by hand and by using technology.

F.IF.7b[μ] Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

F.IF.6[Σ] Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.

F.BF.3[μ] 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.

F.IF.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 function and an algebraic expression for another, say which has the larger maximum.

A.CED.2* Create linear, quadratic, and exponential equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. (The phrase "in two or more variables" refers to formulas like the compound interest formula, in which $A = P(1 + r/n)^{nt}$ has multiple variables.)

A.CED.3* Represent constraints by equations or inequalities, and by systems of equation and/or inequalities, and interpret data points as possible (i.e. a solution) or not possible (i.e. a non-solution) under the established constraints.

A.REI.11* Using graphs, tables, or successive approximations, show that the solution to the equation f(x) = g(x) is the x-value where the y-values of f(x) and g(x) are the same.

A.CED.1* Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear, quadratic, simple rational, and exponential functions (integer inputs only).

A.SSE.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

Monday	Tuesday	Wednesday	Thursday	Friday
Apr **5**	Apr **6**	Apr **7**	Apr **8**	Apr **9**
UNIT 6				
Functions, Function Notation, Composition, Combinations, Inverse Functions----------I				
Apr **12**	Apr **13**	Apr **14**	Apr **15**	Apr **16**
UNIT 6				
(Systems of) Linear Inequalities & Linear Programming with Applications----------I				
Apr **19**	Apr **20**	Apr **21**	Apr **22**	Apr **23**
UNIT 6				
Absolute Value, Piecewise Functions, Transformations----------I			**Target Date – Unit 6 Review/Assessment**	

Algebra 2 Unit 7 –Inferences and Conclusions from Data

2nd Semester

January 5 - May 26

January 18 (MLK Holiday); February 15 (President's Day Holiday); February 16 (Student Holiday) March 29-April 2 (Spring Break)

Algebra 2 Georgia Standards of Excellence — 2020-2021 Pacing Guide

μEssential ΣSupporting *Additional

Unit 7: Inferences and Conclusions from Data ≈ 3 weeks

The Unit Framework published by the state contains a list of "In this Unit, Students Will…" as it does for all other units. For the statistics unit, this list is not as descriptive as the standards themselves and actually leaves some crucial ideas found in the standards and also in the tasks provided by the state out completely. The list below is far more descriptive and gives you the concepts in the same order as they appear in the Holt workbook, for simplicity. For this unit, the Holt book is actually a very good guide to the intent of the standards and using it as a way to frame the instruction in this unit is a good idea. The standards for this unit, while listed below as in your other units, appear throughout the Modules/Lessons. That is to say, many of these statistics standards are so broad that they repeat over and over again among the eight ideas listed below in the teaching map. You will find standards introduced in one lesson, defined in another, and the actual calculation in another lesson. Many standards are interwoven throughout, disappear for two lessons, and then come back up again later.

TEACHING MAP FOR UNIT 7:

Concept 1 – Gathering and Displaying Data	Concept 2 – Data Distributions S.ID.2, S.ID.4	Concept 3 – Making Inferences from Data
◦Data Gathering Techniques ◦Terms and Notation ◦Sampling Method ◦Types of Data ◦Shape, Center, and Spread Calculating Statistics, Representing Data, Analyzing Shape ◦Distribution Shapes ◦One Variable Statistics	◦Probablities of Random Variables ◦Theoretical Probability ◦Frequency/Relative Frequency ◦Theoretical vs. Experimental Comparisons ◦Normal Distributions ◦Normal vs. Approximately Normal ◦Empirical Rule Standards Normal Distrib., Z-Scores and Z-Tables ◦Sampling Distributions, Sample Mean, Central Limit Theorem ◦Central Limit Theorem ◦Standard Error ◦Calculate Frequency, Create, Distribution/Graph	◦Confidence Intervals and Margins of Error ◦Calculate Conf. Interval/Margin of Error (Pop Proportion) ◦Calculate Conf. Interval/Margin of Error (Pop Mean) ◦Compare two treatments using data ◦Surveys, Experiments, Observational Studies ◦Types of Statistical Research ◦Error/Bias ◦Observational vs. Experimental Studies ◦Evaluate statistical reports ◦Significance of Results, hypotheses, null hypotheses, difference of means ◦State hypotheses/null hypotheses ◦Compare control results to experimental ◦Perform Permutations Test ◦Explain statistical errors

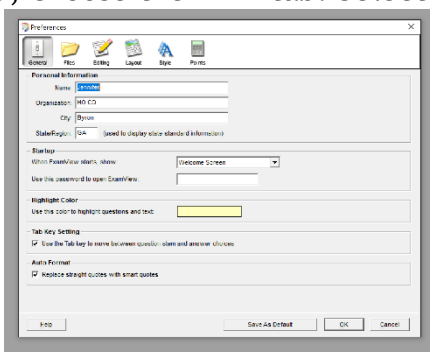
S.IC.1Σ Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
S.ID.2μ Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, mean absolute deviation, standard deviation) of two or more different data sets.
S.ID.4μ 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 procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.
S.IC.4μ 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.
S.ID.4μ 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 procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.
S.IC.2Σ 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?
S.IC.3μ Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
S.IC.5Σ Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.
S.IC.6Σ Evaluate reports based on data. For example, determining quantitative or categorical data; collection methods; biases or flaws in data.

Monday	Tuesday	Wednesday	Thursday	Friday
Apr **26**	Apr **27**	Apr **28**	Apr **29**	Apr **30**
UNIT 7				
C1: Gathering/Displaying Data				C2: Data Distributions
May **3**	May **4**	May **5**	May **6**	May **7**
UNIT 7				
C2: Data Distributions				C3: Making Inferences from Data
May **10**	May **11**	May **12**	May **13**	May **14**
UNIT 7				
C3: Making Inferences from Data				
May **17**	May **18**	May **19**	May **20**	May **21**
Target Date – Unit 6 Review/Assessment		**Final Exam Review**		
May **24**	May **25**	May **26**	May **27**	May **28**
FINAL EXAMS				
		LAST DAY OF SCHOOL (½ Day)		

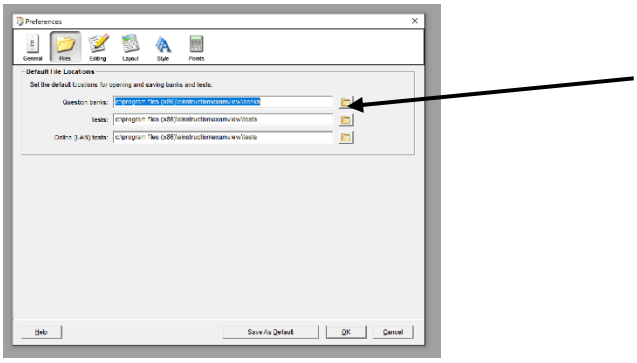
How to Make ExamView Banks Easily Accessible

Open ExamView Test Generator

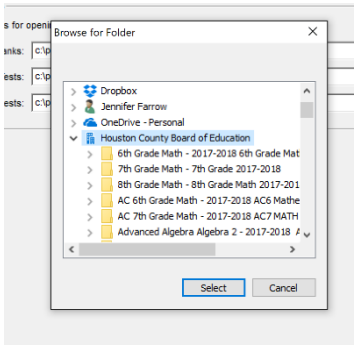
1. After closing the welcome menu, choose the EDIT tab. Select “Preferences”



2. In this window, choose “Files” and then the file folder icons next to Question banks.



3. Navigate to the location of the course materials on your computer -Houston County Board of Education Synced Files. Highlight and select. Click OK.



4. Now when you go to create a test and select questions, ExamView will default to this location. ExamView Banks are located in the ExamView folder and in each Unit’s Assessment folder.