Algebra 2 Mathematics Map/Pacing Guide
2018-19

Topics & Standards *Quarter 1* *Time Frame Weeks 1-8*	**ALGEBRA - SEEING STRUCTURE IN EXPRESSIONS** **Interpret the structure of expressions** • **A.SSE.1** Interpret expressions that represent a quantity in terms of its context. **a.** Interpret parts of an expression, such as terms, factors, and coefficients. **b.** Interpret complicated expressions by viewing one or more of their parts as a single entity. • **A.SSE.1.** Interpret expressions that represent a quantity in terms of its context.★ **a.** Interpret parts of an expression, such as terms, factors, and coefficients. b. Interpret complicated expressions by viewing one or more of their parts as a single entity. **CREATING EQUATIONS** **Create equations that describe numbers or relationships** • **A.CED.1** Create equations and inequalities in one variable and use them to solve problems. Include equations and inequalities arising from linear, quadratic, simple rational, and exponential functions. **c.** Extend to include more complicated function situations with the option to solve with technology. (A2, M3) • **A.CED.3** Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. a. While functions will often be linear, exponential, or quadratic, the types of problems should draw from more complicated situations. (A2, M3) **Use polynomial identities to solve problems.** • 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. **FUNCTIONS – INTERPRETING FUNCTIONS** **Interpret functions that arise in applications in terms of the context** • **F.IF.4** For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.* • **F.IF.6** Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. **Analyze functions using different representations** • **F.IF.8** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

(Revised July 2018)

Algebra 2 Mathematics Map/Pacing Guide
2018-19

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. (A2, M3)

NUMBER AND QUANTITY - THE COMPLEX NUMBER SYSTEM

Perform arithmetic operations with complex numbers.

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

Use complex numbers in polynomial identities and equations.

- **N.CN.7** Solve quadratic equations with real coefficients that have complex solutions.

Curriculum Units & Assessment (Evidence)	*Opportunities for Integration*	*Resources (Curriculum & Textbook)*	*Key Concept tools & practices for Differentiation*
Units: Systems of Equations and Quadratic Functions **Formative & Summative Assessments** • 4-7 tasks that reach DOK 3-4 • At least (1) GRASPS per quarter & • Illuminate weekly **MGraw-Hill Glencoe Assessment Resources (Formative, Pre/Post, and Summative):** • Chapter Readiness Checks, Chapter Tests,	**Other Resources** • ODE Math Model Curriculum - https://education.ohio.gov/getattachment/Topics/Learning-in-Ohio/Mathematics/Model-Curricula-in-Mathematics/HS_Course_Alg-2-_Math_3_Model-Curriculum.pdf.aspx?lang=en-US • Critical Areas of Focus https://education.ohio.gov/getattachment/Topics/Learning-in-Ohio/Mathematics/Ohio-s-	**Glencoe Algebra II** • Chapter 3: Systems of Equations and Inequalities • Chapter 4: Quadratic Functions and Equations ***Be sure to incorporate when needed the following instructional resources available for each chapter; found in the "Resources" tab:** • Intro. Video & Animations • Interactive Guides • Anticipation Guides & Student Built Vocabulary • eSolutions • "Before you Read" & "Key Points" notes guide	**Available on ConnectED:** • Dinah Zike's Foldables • Virtual Manipulatives • *"abc* Vocab" Activities • TI Easy Files • Multi-lingual Glossary **Other tools and practices:** • Graphing Calculators • Graphing Software • Graphs and equations of real-world applications that apply to quadratic functions • Examples of real-world situations that lend themselves to writing equations that model the contexts

Algebra 2 Mathematics Map/Pacing Guide
2018-19

	Quizzes, & Mid-chapter tests • Aleks Software	Learning-Standards-in-Mathematics/Transitioning-to-the-2017-Learning-Standards-in-Ma/ALGEBRA-2-Math-3-CAF.pdf.aspx	• Chapter Projects • Interactive Whiteboard Presentations • H.O.T. Questions	• Concept/Anchor Charts • Non-linguistic representations • Discourse and questioning

Topics & Standards

Quarter 2

Time Frame Weeks 1-8

ALGEBRA - SEEING STRUCTURE IN EXPRESSIONS

Interpret the structure of expressions

• A.SSE.2 Use the structure of an expression to identify ways to rewrite it. For example, to factor 3x(x – 5) + 2(x – 5), students should recognize that the "x – 5" is common to both expressions being added, so it simplifies to (3x+2)(x – 5); or 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 $(x^2 – y^2)(x^2 + y^2)$.

CREATING EQUATIONS

Create equations that describe numbers or relationships

- **A.CED.1** Create equations and inequalities in one variable and use them to solve problems. Include equations and inequalities arising from linear, quadratic, simple rational, and exponential functions. ★

  c. Extend to include more complicated function situations with the option to solve with technology. (A2, M3)
- **A.CED.2** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

  c. Extend to include more complicated function situations with the option to graph with technology. (A2, M3)

ARITHMETIC WITH POLYNOMIALS AND RATIONAL EXPRESSIONS

Perform arithmetic operations on polynomials

- **A.APR.1** Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.

  b. Extend to polynomial expressions beyond those expressions that simplify to forms that are linear or quadratic. (A2, M3)

Understand the relationship between zeros and factors of polynomials

- **A.APR.2** Understand 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).*

Rewrite rational expressions

- **A.APR.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.

REASONING WITH EQUATIONS AND INEQUALITIES

Represent and solve equations and inequalities graphically

Algebra 2 Mathematics Map/Pacing Guide
2018-19

	• **A.REI.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, making tables of values, or finding successive approximations. **Understand solving equations as a process of reasoning and explain the reasoning.** • **A.REI.2** Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. **FUNCTIONS - INTERPRETING FUNCTIONS** **Interpret functions that arise in applications in terms of the context** •**F.IF.4** For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.* • **F.IF.5** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.* **c.** Emphasize the selection of a type of function for a model based on behavior of data and context. (A2, M3) **Analyze functions using different representations** • **F.IF.7** Graph functions expressed symbolically and indicate key features of the graph, by hand in simple cases and using technology for more complicated cases. Include applications and how key features relate to characteristics of a situation, making selection of a particular type of function model appropriate.★ **c.** Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. (A2, M3) **d.** Graph polynomial functions, identifying zeros, when factoring is reasonable, and indicating end behavior. (A2, M3) **f.** Graph exponential functions, indicating intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. (A2, M3) • **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 quadratic function and an algebraic expression for another, say which has the larger maximum. (A2, M3) **BUILDING FUNCTIONS** **Build new functions from existing functions** • **F.BF.4** Find inverse functions. **b.** (+) Read values of an inverse function from a graph or a table, given that the function has an inverse. (A2, M3) **c.** (+) Verify by composition that one function is the inverse of another. (A2, M3) **d.** (+) Find the inverse of a function algebraically, given that the function has an inverse. (A2, M3)

Algebra 2 Mathematics Map/Pacing Guide
2018-19

NUMBER AND QUANITY – REAL NUMBER SYSTEM

Extend the properties of exponents to rational exponents.

- **N.RN.1** Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, 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 $(5^{1/3})^3 = 5^{(1/3)3}$ to hold, so $(5^{1/3})^3$ must equal 5.
- **N.RN.2** Rewrite expressions involving radicals and rational exponents using the properties of exponents.
- **N.RN.3** Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.

Curriculum Unis & Assessment (Evidence)	*Opportunities for Integration*	*Resources (Curriculum & supplemental)*	*Key Concept tools & Practices for Differentiation*
Units: Polynomial Functions and Radical Functions **Formative & Summative Assessments** • 4-7 tasks that reach DOK 3-4 • 3-5 FATPs / RAFTs • At least (1) GRASPS per quarter & • At least 1 common short cycle per quarter • Illuminate weekly **MGraw-Hill Glencoe Assessment Resources (Formative, Pre/Post, and Summative):**	**Other Resources** • ODE Math Model Curriculum - https://education.ohio.gov/getattachment/Topics/Learning-in-Ohio/Mathematics/Model-Curricula-in-Mathematics/HS_Course_Alg-2-_Math_3_Model-Curriculum.pdf.aspx?lang=en-US • Critical Areas of Focus https://education.ohio.gov/getattachment/Topics/Learning-in-Ohio/Mathematics/Ohio-s-Learning-Standards-in-	**Glencoe Algebra II** • Chapter 5: Polynomials and Polynomial Functions • Chapter 6: Inverses and Radical Functions and Relations ***Be sure to incorporate when needed the following instructional resources available for each chapter; found in the "Resources" tab:** • Intro. Video & Animations • Interactive Student Guide • Anticipation Guides & Student Built Vocabulary • eSolutions • "Before you Read" & "Key Points" notes guide • Chapter Projects	**Available on ConnectED:** • Dinah Zike's Foldables • Virtual Manipulatives • *"abc* Vocab" Activities • TI Easy Files • Multi-lingual Glossary **Other tools and practices:** • Graphing Calculators • Graphing Software • Graphs and equations of real-world applications that apply to quadratic functions • Examples of real-world situations that lend themselves to writing equations that model the contexts • Concept/Anchor Charts

Algebra 2 Mathematics Map/Pacing Guide
2018-19

	• Chapter Readiness Checks, Chapter Tests, Quizzes, & Mid-chapter tests • Aleks Software	Mathematics/Transitioning-to-the-2017-Learning-Standards-in-Ma/ALGEBRA-2-Math-3-CAF.pdf.aspx	• Interactive Whiteboard Presentations • H.O.T Questions	• Non-linguistic representations • Discourse and questioning

Topic & Standard ***Quarter 3*** ***Time Frame Weeks 1-8***	**ALGEBRA** - **SEEING STRUCTURE IN EXPRESSIONS** **Interpret the structure of expressions** **A.SSE.2** Use the structure of an expression to identify ways to rewrite it. For example, to factor $3x(x – 5) + 2(x – 5)$, students should recognize that the "x – 5" is common to both expressions being added, so it simplifies to $(3x+2)(x – 5)$; or 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 $(x^2 – y^2)(x^2 +y^2)$. **REASONING WITH EQUATIONS AND INEQUALITIES** **Understand solving equations as a process of reasoning and explain the reasoning** • **A.REI.2** Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. **Represent and solve equations and inequalities graphically** • **A.REI.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. **CREATING EQUATIONS** **Create equations that describe numbers or relationships** • **A.CED.1** Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. **c.** Extend to include more complicated function situations with the option to solve with technology. (A2, M3) **ARITHMETIC WITH POLYNOMIALS AND RATIONALEXPRESSIONS** **Rewrite rational expressions** • **A.APR.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. **FUNCTIONS – INTERPRETING FUNCTIONS** **Interpret functions that arise in applications in terms of the context**

(Revised July 2018)

Algebra 2 Mathematics Map/Pacing Guide
2018-19

	• **F.IF.5** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function. ★ **c.** Emphasize the selection of a type of function for a model based on behavior of data and context. (A2, M3) **Analyze functions using different representations** • **F.IF.7** Graph functions expressed symbolically and indicate key features of the graph, by hand in simple cases and using technology for more complicated cases. Include applications and how key features relate to characteristics of a situation, making selection of a particular type of function model appropriate.★ **c.** Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. (A2, M3) **d.** Graph polynomial functions, identifying zeros, when factoring is reasonable, and indicating end behavior. (A2, M3) **f.** Graph exponential functions, indicating intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. (A2, M3) • **F.IF.8** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. **b.** Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as $y = (1.02)^t$, and $y = (0.97)^t$ and classify them as representing exponential growth or decay. (A2, M3) • **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 quadratic function and an algebraic expression for another, say which has the larger maximum.* **LINEAR, QUADRATIC, AND EXPONENTIAL MODELS** **Construct and compare linear, quadratic, and exponential models and solve problems** • **F.LE.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. **BUILDING FUNCTIONS** **Build a function that models a relationship between two quantities** • **F.BF.1** Write a function that describes a relationship between two quantities. **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.
Curriculum Units & Assessment (Evidence)	***Opportunities for Integration***	***Resources (Curriculum /Textbook)***	***Concept Tools & Practices for Differentiation***

Algebra 2 Mathematics Map/Pacing Guide
2018-19

	Units: Functions – Exponential, Logarithmic, and Rational **Formative & Summative Assessments** • 4-7 tasks that reach DOK 3-4 • At least (1) GRASPS per quarter & • Illuminate weekly **MGraw-Hill Glencoe Assessment Resources (Formative, Pre/Post, and Summative):** • Chapter Readiness Checks, Chapter Tests, Quizzes, & Mid-chapter tests • Aleks Software	**Other Resources** • ODE Math Model Curriculum - https://education.ohio.gov/getattachment/Topics/Learning-in-Ohio/Mathematics/Model-Curricula-in-Mathematics/HS_Course_Alg-2-_Math_3_Model-Curriculum.pdf.aspx?lang=en-US • Critical Areas of Focus https://education.ohio.gov/getattachment/Topics/Learning-in-Ohio/Mathematics/Ohio-s-Learning-Standards-in-Mathematics/Transitioning-to-the-2017-Learning-Standards-in-Ma/ALGEBRA-2-Math-3-CAF.pdf.aspx	**Glencoe Algebra II** • Chapter 7: Exponential and Logarithmic Functions and Relations • Chapter 8: Rational Functions and Relations ***Be sure to incorporate when needed the following instructional resources available for each chapter; found in the "Resources" tab:** • Intro. Video & Animations • Interactive Student Guides • Anticipation Guides & Student Built Vocabulary • eSolutions • "Before you Read" & "Key Points" notes guide • Chapter Projects • Interactive Whiteboard Presentations • H.O.T. Questions	**Available on ConnectED:** • Dinah Zike's Foldables • Virtual Manipulatives • *"abc* Vocab" Activities • TI Easy Files • Multi-lingual Glossary **Other tools and practices:** • Graphing Calculators • Graphing Software • Graphs and equations of real-world applications that apply to quadratic functions • Examples of real-world situations that lend themselves to writing equations that model the contexts • Concept/Anchor Charts • Non-linguistic representations • Discourse and questioning
Topic & Standard Quarter 4	**STATISTICS - MAKING INFERENCES AND JUSTIFYING CONCLUSIONS** **Understand and evaluate random processes underlying statistical experiments** • **S.IC.1** Understand statistics as a process for making inferences about population parameters based on a random sample from that population.			

(Revised July 2018)

Algebra 2 Mathematics Map/Pacing Guide
2018-19

Time Frame Weeks 1-8	• **S.IC.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? **Make inferences and justify conclusions from sample surveys, experiments, and observational studies** • **S.IC.3** Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each. • **S.IC.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. • **S.IC.5** Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between sample statistics are statistically significant. • **S.IC.6** Evaluate reports based on data. **INTERPRETING CATEGORICAL AND QUANTITATIVE DATA** **Summarize, represent, and interpret data on a single count or measurement variable** • **S.ID.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. • **S.ID.5** Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. • **S.ID.6** Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.★ **a.** Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions, or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models. (A2, M3) **b.** Informally assess the fit of a function by discussing residuals. (A2, M3) **TRIGONOMETRIC FUNCTIONS** **Extend the domain of trigonometric functions using the unit circle** • **F.FT.1** Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. • **F.FT.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. **Model periodic phenomena with trigonometric functions** • **F.FT.5** Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.* **Prove and apply trigonometric identities** • **F.FT.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. **ALGEBRA - SEEING STRUCTURE IN EXPRESSIONS**

Algebra 2 Mathematics Map/Pacing Guide
2018-19

	Interpret the structure of expressions • **A.SSE.1** Interpret expressions that represent a quantity in terms of its context. **c.** Interpret complicated expressions by viewing one or more of their parts as a single entity.

	Curriculum Units & Assessment (Evidence)	*Opportunities for Integration*	*Resources (Curriculum /Textbook)*	*Concept Tools & Practices for Differentiation*
	Units: Trigonometric Functions and Probability **Formative & Summative Assessments** • 4-7 tasks that reach DOK 3-4 • At least (1) GRASPS per quarter & • Illuminate weekly **MGraw-Hill Glencoe Assessment Resources (Formative, Pre/Post, and Summative):**	**Other Resources** • ODE Math Model Curriculum - https://education.ohio.gov/getattachment/Topics/Learning-in-Ohio/Mathematics/Model-Curricula-in-Mathematics/HS_Course_Alg-2-_Math_3_Model-Curriculum.pdf.aspx?lang=en-US • Critical Areas of Focus https://education.ohio.gov/getattachment/Topics/L	**Glencoe Algebra II** • Chapter 12: Trigonometric Functions • Chapter 11: Probability and Functions • Chapter 9: Conic Sections ***Be sure to incorporate when needed the following instructional resources available for each chapter; found in the "Resources" tab:** • Intro. Video & Animations • Interactive Student Guides • Anticipation Guides & Student Built Vocabulary	**Available on ConnectED:** • Dinah Zike's Foldables • Virtual Manipulatives • *"abc* Vocab" Activities • TI Easy Files • Multi-lingual Glossary **Other tools and practices:** • Graphing Calculators • Graphing Software • Graphs and equations of real-world applications that apply to quadratic functions • Examples of real-world situations that lend themselves to writing equations that model the contexts

Algebra 2 Mathematics Map/Pacing Guide
2018-19

	• Chapter Readiness Checks, Chapter Tests, Quizzes, & Mid-chapter tests • Aleks Software	earning-in-Ohio/Mathematics/Ohio-s-Learning-Standards-in-Mathematics/Transitioning-to-the-2017-Learning-Standards-in-Ma/ALGEBRA-2-Math-3-CAF.pdf.aspx	• eSolutions • "Before you Read" & "Key Points" notes guide • Chapter Projects • Interactive Whiteboard Presentations • H.O.T. Questions	• Concept/Anchor Charts • Non-linguistic representations • Discourse and questioning