SUBJECT AREA: Algebra II with Trigonometry Common Core
GRADE LEVEL: 10,11
SEMESTER: 1,2

UNIT TITLE/ESSENTIAL QUESTION(S)	UNIT TIMELINE	UNIT SKILLS AND CONTENT	CORE TEXTS AND MATERIALS	FORMATIVE & SUMMATIVE ASSESSMENTS	CRSE ALIGNMENT	NEXT GENERATION/ CONTENT STANDARDS
Unit 1 **TITLE: Functions and the Cornerstones of Algebra II** **EQ:** How are the properties of functions and functional operations and notation useful? We will also spend time and review topics from Algebra I	**Approximately** **3 weeks**	Make sense of problems and persevere in solving them Reason abstractly and quantitatively Model with mathematics	**Core Texts:** Savvas Digital Curriculum Mathematics Grades 9-12 Examples from NYSED REGENTS exams More examples from NYSED REGENTS exams **Digital Resources:** IXLtarget skill building Jamboard for student collaboration during lessons **Functions Guide** **Graphing tool**	**Formative:**Exit tickets, our cheat sheet protocol, “This or That”, “PAO Strategy” and “PROVE ME WRONG” Strategies may be used. **Summative:** Students will complete open-response and multiple choice question assessment, aligned with the objectives used to design the essential question. They will be assessed on various properties of a function and how to	**In this unit, students will...** Experience multiple perspectives on a topic and be afforded the opportunity to draw your own conclusions on that topic. Take risks and view mistakes as opportunities to grow academically and emotionally. Work cooperatively toward goals and hold each other accountable in supportive ways.	**Emphasize Mathematics Practices 1, 2, 4, 5, 6** Functions - Interpreting Functions 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,

				find the inverse of a function. Benchmark Tests: To check for progress IXL Skills will be assigned. A score of an 80 or above is the classroom goal and expectation. This will also be used as a Diagnostic Exam		where applicable, to the quantitative relationship it describes. F.BF.A.1: Compositions of Functions F-IF.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. F-IF.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. F-IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). F.BF.B.4 - Find inverse functions. F.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 (simple radical, rational and exponential functions; emphasize common effect of each transformation across function types)
Unit 2 **TITLE: Systems of Equations** **EQ:** How are the techniques of substitution, elimination and graphing used to solve a system of linear equations with two and three variables? ***PBL Unit - Fall Semester***	**Approximately 3 weeks**	Make sense of problems and persevere in solving them Construct viable arguments and critique the reasoning of others Model with mathematics	**Core Texts:** Savvas Digital Curriculum Mathematics Grades 9-12 Examples from NYSED REGENTS exams More examples from NYSED REGENTS exams **Digital Resources:** IXLtarget skill building Jamboard for student collaboration during lessons	**Formative:** Exit tickets, our cheat sheet protocol, "This or That", "PAO Strategy" and "PROVE ME WRONG" Strategies may be used. **Summative:** **2 var-systems** Quizzes via Google forms. They will be asked to solve a 2 variable system using elimination, substitution and graphing. One of	**In this unit, students will…** Experience multiple perspectives on a topic and be afforded the opportunity to draw your own conclusions on that topic. Draw upon your past learning, prior experiences, and the richness of your cultural background to make meaning of new concepts and apply learning on an ongoing basis.	**Emphasize Mathematics Practices 1, 3, 4** 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. A.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

			Graphing tool Systems of Equation Guide https://www.showme.com/sh?h=oroeM7s	each. They will also have to answer which point is NOT a solution to the system and explain why. **Summative:** **3 var-systems** Chart paper activity where small groups solve a 3 variable system. They are graded based off of a rubric. IXL Skills will be assigned. A score of an 80 or above is the classroom goal and expectation. This will also be used as a Diagnostic Exam	Work cooperatively toward goals and hold each other accountable in supportive ways.	the other produces a system with the same solutions. A.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. A.REI.C.6: Solving Linear Systems 3 variables
Unit 3 **TITLE: Quadratic functions and factoring** **EQ:** How can we analyze quadratic functions to discover	**Approximately 2 weeks**	Make sense of problems and persevere in solving them Reason abstractly and quantitatively	**Core Texts:** Savvas Digital Curriculum Mathematics Grades 9-12 Examples from NYSED REGENTS exams	**Formative:** Exit tickets, our cheat sheet protocol, “This or That”, “PAO Strategy” and “PROVE ME WRONG” Strategies may be used.	**In this unit, students will…** Experience multiple perspectives on a topic and be afforded the opportunity to draw your own conclusions on that topic.	**Emphasize Mathematics Practices 1, 2, 5** F.IF.7a Graph linear and quadratic functions and show intercepts, maxima, and minima.

the difference between quadratics and linear functions, ultimately connecting it to the real world.			More examples from NYSED REGENTS exams **Digital Resources:** IXLtarget skill building Jamboard for student collaboration during lessons Factoring guide for all types of factoring: Finding the roots of a polynomial guide Desmos Activity	**Summative:** Students will complete open-response and multiple choice question assessment, aligned with the objectives used to design the essential question. Benchmark Tests: To check for progress IXL Skills will be assigned. A score of an 80 or above is the classroom goal and expectation. This will also be used as a Diagnostic Exam	Draw upon your past learning, prior experiences, and the richness of your cultural background to make meaning of new concepts and apply learning on an ongoing basis.	F.IF.4, F.IF.8, F.IF.8c, F.IF.9 Graphing Quadratic Functions A.SSE.3a Factor a quadratic expression to reveal the zeros of the function it defines.
Unit 4 **TITLE: Complex Numbers** **EQ:** How can you analyze a quadratic to determine the nature of the roots,	**Approximately 1 week**	Make sense of problems and persevere in solving them Reason abstractly and quantitatively	**Core Texts:** Savvas Digital Curriculum Mathematics Grades 9-12 Examples from NYSED REGENTS exams	**Formative:** Exit tickets, our cheat sheet protocol, “This or That”, “PAO Strategy” and “PROVE ME WRONG” Strategies may be used.	**In this unit, students will…** Express respectful agreement or disagreement with opinions, validating the knowledge of peers, or challenging	**Emphasize Mathematics Practices 1, 2, 5** 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.

ultimately connecting it to the real world ?			More examples from NYSED REGENTS exams **Digital Resources:** IXLtarget skill building Jamboard for student collaboration during lessons Discovery of imaginary numbers video Imaginary numbers guide Multiplying complex numbers guide Complex numbers in real life	**Summative:** Students will complete open-response and multiple choice question assessment, aligned with the objectives used to design the essential question. Cheat Sheet Strategy IXL Skills will be assigned. A score of an 80 or above is the classroom goal and expectation. This will also be used as a Diagnostic Exam	their viewpoints in constructive ways. Take risks and view mistakes as opportunities to grow academically and emotionally. Connect in-school learning with the world outside the classroom.	N.CN.2 Use the relation i 2 = -1 and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers. N.CN.C.7 - Solve quadratic equations with real coefficients that have complex solutions
Unit 5 **TITLE: Radical Equations, Exponents** **EQ:** How do you solve equations that contain radicals or rational exponents	**Approximately 2 weeks**	Make sense of problems and persevere in solving them Reason abstractly and quantitatively Construct viable arguments and critique the reasoning of others	**Core Texts:** Savvas Digital Curriculum Mathematics Grades 9-12 Examples from NYSED REGENTS exams More examples from NYSED REGENTS exams	**Formative:** Exit tickets, our cheat sheet protocol, "This or That", "PAO Strategy" and "PROVE ME WRONG" Strategies may be used.	**In this unit, students will...** Respectfully, and with care, engage in difficult conversations, particularly those that challenge power and privilege in our society.	**Emphasize Mathematical Practices 1, 2, 3, 4,** A.REI.A.2 - Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise N.RN.A.1 - Explain how the definition of the meaning of

using the appropriate properties?			**Digital Resources:** IXLtarget skill building Jamboard for student collaboration during lessons Fractional exponent guide Change from radical form to fraction exponent form Solving radical equations guide Real World Quadratic Formula Activities	Chart paper activity where students create a word problem of their own. They solve it correctly and incorrectly and provide an explanation of why it is incorrect. **Summative:** Students will complete open-response and multiple choice question assessment, aligned with the objectives used to design the essential question. IXL Skills will be assigned. A score of an 80 or above is the classroom goal and expectation. This will also be used as a Diagnostic Exam	Connect in-school learning with the world outside the classroom. Work cooperatively toward goals and hold each other accountable in supportive ways.	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.A.2 - Rewrite expressions involving radicals and rational exponents using the properties of exponents. Includes expressions with variable factors, such as the cubic root of $27x^5y$

Unit 6 **TITLE: Power functions, polynomials, rational functions** **EQ:** How do you add, subtract, and multiply polynomials into their simplest form?	**Approximately 2 weeks**	Make sense of problems and persevere in solving them Reason abstractly and quantitatively Model with mathematics	**Core Texts:** Savvas Digital Curriculum Mathematics Grades 9-12 Examples from NYSED REGENTS exams More examples from NYSED REGENTS exams **Digital Resources:** IXLtarget skill building Jamboard for student collaboration during lessons Polynomial & Rational Functions Resources Polynomial & Rational Functions Guide Graphing Tool to check for the number of roots Row Game - Simplifying Rational Expressions	**Formative:** Exit tickets, our cheat sheet protocol, "This or That", "PAO Strategy" and "PROVE ME WRONG" Strategies may be used. **Summative:** Students will complete open-response and multiple choice question assessment, aligned with the objectives used to design the essential question. Benchmark Tests: To check for progress IXL Skills will be assigned. A score of an 80 or above is the classroom goal and expectation. This will also be used as a Diagnostic Exam	**In this unit, students will…** Experience multiple perspectives on a topic and be afforded the opportunity to draw your own conclusions on that topic. Advocate for varied ways of learning (i.e. project-based learning, presentations, station work, small group work) that accommodate the diverse learning styles and interests of those in the class community.	**Emphasize Mathematics Practices 1, 2, 4, and 7** A.CED.A.1 - Create equations and inequalities in one variable and use them to solve problems (linear, quadratic, exponential (integer inputs only), simple roots) A.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 A.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* A.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 systems
Unit 7A **TITLE: Exponential and Logarithmic Functions** **EQ:** How can we analyze logarithmic and exponential functions to discover the difference between them with linear and quadratic functions, ultimately connecting it to the real world. ***PBL Unit -Spring Semester*** **EQ:** How do you use the concept of exponential growth to work with the principle of compound interest?	**Approximately 2-3 weeks** **PBL unit**	Make sense of problems and persevere in solving them Reason abstractly and quantitatively Model with mathematics	**Core Texts:** Savvas Digital Curriculum Mathematics Grades 9-12 Examples from NYSED REGENTS exams More examples from NYSED REGENTS exams **Digital Resources:** IXLtarget skill building Jamboard for student collaboration during lessons Exponential & Logarithmic Function Resources Exponential Growth Penny Activity Projects	**Formative:** Chart paper activity where students create a word problem of their own. They solve it correctly and incorrectly and provide an explanation of why it is incorrect. **Summative:** Students will complete open-response and multiple choice question assessment, aligned with the objectives used to design the essential question. Benchmark Tests: To check for progress IXL Skills will be assigned. A score of an 80 or above is the classroom goal and	**In this unit, students will…** Generate ideas about people or concepts that peers may like to learn about and share these ideas with your teachers and school leaders. Connect in-school learning with the world outside the classroom. Collaborate peers to engage in meaningful long-term projects, project-based learning activities, and field visits that allow all students to demonstrate their knowledge and growth over time and align to the varied learning styles and interests of those in the class community.	**Emphasize Mathematics Practices 1, 2, 4, 5, and 7** N.RN.A.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.A.2 - Rewrite expressions involving radicals and rational exponents using the properties of exponents. Includes expressions with variable factors, such as the cubic root of $27x^5y$ A.SSE.B.3c - Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. Use the properties of exponents to transform expressions for exponential functions. *For example the expression 1.15^t*

				expectation. This will also be used as a Diagnostic Exam		*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.C.7e - Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. Focus on using key features to guide selection of appropriate type of model function. F.LE.4 For exponential models, express as a logarithm the solution to abct = d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.
Unit 7B **TITLE: Regression** **EQ:** Find a linear function to fit a set of data. Find a quadratic, cubic, and quartic functions to fit the data. Which seems to be the best model?	**Approximately 2 days**	Make sense of problems and persevere in solving them Reason abstractly and quantitatively Model with mathematics	**Core Texts:** Savvas Digital Curriculum Mathematics Grades 9-12 Examples from NYSED REGENTS exams **Digital Resources:** Jmap questions Regents questions Project:	**Formative:** Exit tickets, our cheat sheet protocol, “This or That”, “PAO Strategy” and “PROVE ME WRONG” Strategies may be used. **Summative:** Students will be presented with a	**In this unit, students will…** Respectfully, and with care, engage in difficult conversations, particularly those that challenge power and privilege in our society.. Connect in-school learning with the	

			NCSSM project idea	real world problem with data provided for them. They will be asked to find which regression equation best fits the data. Then, they will use their model to predict future outcomes. Example: **#36**	world outside the classroom.	
Unit 8 **TITLE: Sequences and Series** **EQ:** How do sequences and series model real-world problems and their solutions?	**Approximately 1 week**	Make sense of problems and persevere in solving them Reason abstractly and quantitatively Model with mathematics	**Core Texts:** Savvas Digital Curriculum Mathematics Grades 9-12 Examples from NYSED REGENTS exams More examples from NYSED REGENTS exams **Digital Resources:** IXLtarget skill building Jamboard for student collaboration during lessons Sequences and series website help	**Formative:** Exit tickets, our cheat sheet protocol, “This or That”, “PAO Strategy” and “PROVE ME WRONG” Strategies may be used. **Summative:** Students will create a real world word problem that represents either a geometric sequence or an arithmetic sequence. They will also be asked to answer questions about their sequence.	**In this unit, students will…** Respectfully, and with care, engage in difficult conversations, particularly those that challenge power and privilege in our society. Express respectful agreement or disagreement with opinions, validating the knowledge of peers, or challenging their viewpoints in constructive ways. Connect in-school learning with the	**Emphasize Mathematics Practices 1, 2, 4, and 7** F.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* $n \geq 1$ F.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 (linear, exponential, quadratic A-SSE.4. Derive the formula for the sum of a finite geometric series

			[Sequences and serious resources](#) [Desmos Activity Builder](#)	I[XL](#) Skills will be assigned. A score of an 80 or above is the classroom goal and expectation. This will also be used as a Diagnostic Exam	world outside the classroom.	
Unit 9 **TITLE: The Circular Functions (Trigonometry)** **EQ:** How can we analyze circular functions to discover the difference between circular functions and various other functions, ultimately connecting it to the real world.	**Approximately 2 weeks**	Reason abstractly and quantitatively Model with mathematics	**Core Texts:** [Savvas](#)Digital Curriculum Mathematics Grades 9-12 Examples from NYSED [REGENTS](#) exams More examples from [NYSED REGENTS](#) exams **Digital Resources:** I[XL](#)target skill building [Jamboard](#) for student collaboration during lessons [Unit Circle Printables - Drawing Activity](#) [Unit Circle Paper Plate Activity](#)	**Formative:** Exit tickets, our cheat sheet protocol, “This or That”, “PAO Strategy” and “PROVE ME WRONG” Strategies may be used. **Summative:** Students will complete open-response and multiple choice question assessment, aligned with the objectives used to design the essential question. **Extended assessment:** Students will fill out a blank unit circle	**In this unit, students will…** Take risks and view mistakes as opportunities to grow academically and emotionally. Connect in-school learning with the world outside the classroom. Work cooperatively toward goals and hold each other accountable in supportive ways.	**Emphasize Mathematics Practices 2, 4, 5, 7** F.TF.1 Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. F.TF.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. G.SRT.6 Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles. G.SRT.8 Use trigonometric ratios and the Pythagorean

			Unit Circle Guide The Circular Functions Resources Modeling a Periodic Function Activity	with all of the special angles, quadrantal angles and accompanying coordinates. Radian Man IXL Skills will be assigned. A score of an 80 or above is the classroom goal and expectation. This will also be used as a Diagnostic Exam		Theorem to solve right triangles in applied problems. F.TF.5 Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.
Unit 10 **TITLE: Probability & Statistics** EQ: What are the different statistical tools that can be used to collect and analyze data?	**Approximately 2 weeks**	Make sense of problems and persevere in solving them Reason abstractly and quantitatively Construct viable arguments and critique the reasoning of others	**Core Texts:** Savvas Digital Curriculum Mathematics Grades 9-12 Examples from NYSED REGENTS exams More examples from NYSED REGENTS exams **Digital Resources:** IXLtarget skill building Jamboard for student collaboration during lessons	**Formative:**Exit tickets, our cheat sheet protocol, “This or That”, “PAO Strategy” and “PROVE ME WRONG” Strategies may be used. **Statistics Summative Assessment:** Students will complete open-response and multiple choice question assessment, aligned with the	**In this unit, students will…** Connect in-school learning with the world outside the classroom. Collaborate peers to engage in meaningful long-term projects, project-based learning activities, and field visits that allow all students to demonstrate their knowledge and growth over time and align to the varied learning styles and interests of	**Emphasize Mathematical Practices 1, 2, 3, 4, 5, 6, and 7** S.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”) S.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

			Great online resource for questions Probability Resources Statistics Resources Probability & Statistics Khan Academy Quarter Flipping Activity	objectives used to design the essential question. **Probability Summative Assessment:** Students will use data to support or oppose a mathematical claim. They will prove that flipping a heads or tails gets closer to 50% the more trials they run within their groups and record their results. Benchmark Tests: To check for progress IXL Skills will be assigned. A score of an 80 or above is the classroom goal and expectation. This will also be used as a Diagnostic Exam	those in the class community. Draw upon your past learning, prior experiences, and the richness of your cultural background to make meaning of new concepts and apply learning on an ongoing basis.	determine if they are independent S.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*. S.CP.A.4 - Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. *For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results*

						S.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* S.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 S.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.
Unit 11 **TITLE: Focus & Directrix** **EQ:** How do you derive the equation of a parabola given a focus and directrix?	**Approximately 1 week**	Reason abstractly and quantitatively Model with mathematics	**Core Texts:** Savvas Digital Curriculum Mathematics Grades 9-12 Examples from NYSED REGENTS exams More examples from NYSED REGENTS exams	**Formative:** Exit tickets, our cheat sheet protocol, "This or That", "PAO Strategy" and "PROVE ME WRONG" Strategies may be used. **Summative:**	**In this unit, students will…** Take risks and view mistakes as opportunities to grow academically and emotionally. Work cooperatively toward goals and hold each other	**Emphasize Mathematical Practices 2, 4 and 6** G.GPE.A.2-Derive the equation of a parabola given a focus and directrix

			Digital Resources: IXLtarget skill building Jamboard for student collaboration during lessons Desmos Activity	Students will be given one question. They will need to derive the equation of a parabola given a certain focus and directrix. Graph paper will be provided as an extension/challenge to this assessment. IXL Skills will be assigned. A score of an 80 or above is the classroom goal and expectation. This will also be used as a Diagnostic Exam	accountable in supportive ways.	