Algebra 2 1st Quad Expectations

Chapter (McGraw-Hill Algebra 2)	CCSS covered	Key Vocabulary	Vertical Alignment
Chapter 0 *(9 Days Suggested Pacing)* **Algebra 1 Content** (Prerequisites Review)**(Not assessed on final exam)**			
Chapter 1 *(9 Days Suggested Pacing)*		**Mathematical Practices:** 1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning. **Variable, algebraic expression order of operations, formula real numbers, rational numbers, irrational numbers integers, whole numbers, natural numbers, open sentence, equation, solution, absolute value empty set, set-builder notation, compound inequality, intersection, union, replacement set, reciprocal, solution set, symmetry, variable**	**Before Chapter 1** (Related Topics from Algebra 1) • use symbols to represent unknowns and variables • use the Commutative, Associative, and Distributive Properties to simplify algebraic expressions • formulate linear equations and inequalities to solve problems, and solve the equations and inequalities **After Chapter 1** (Preparation for Precalculus) • define functions, describe characteristics of functions, and translate among verbal, numerical, graphical, and symbolic representations of functions **Essential Question:** How are symbols useful in mathematics? *Sample answer: Symbols allow you to express mathematical concepts in a condensed form.* What mathematical symbols do you know? *Sample answers: addition, subtraction, multiplication, division, equals sign, greater than, less than, grouping symbols, pi*
Lesson 1-1: Expressions and Formulas	**A.SSE.1.a** Interpret parts of an expression, such as terms, factors, and coefficients. **A.SSE.1.b** Interpret complicated expressions by viewing one or more of their parts as a single entity.		
Lesson 1-2: Properties of Real Numbers	**A.SSE.2** Use the structure of an expression to identify ways to rewrite it.		
Lesson 1-3: Solving Equations	**A.CED.1** Create equations and inequalities in one variable and use them to solve problems.		
Lesson 1-4: Solving Absolute Value Equations	**A.SSE.1.b** Interpret complicated expressions by viewing one or more of their parts as a single entity. **A.CED.1** Create equations and inequalities in one variable and use them to solve problems.		
Lesson 1-5: Solving Inequalities	**A.CED.1** Create equations and inequalities in one variable and use them to solve problems. **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.		
Lesson 1-6: Solving Compound and Absolute Value Inequalities			

Chapter 2 *(13 Days Suggested Pacing)*			
Lesson 2-1: Relations and 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. **F.IF.5** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.	**Mathematical Practices:** 1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning. **one-to-one function** **onto function** **discrete relation** **continuous relation** **vertical line test** **independent variable dependent variable** **linear equation** **linear function** **rate of change** **bivariate data** **positive correlation** **negative correlation** **line of fit** **regression line** **piecewise-linear function** **absolute value function** **parent function** **quadratic function** **linear inequality**	**Before Chapter 2** (Related Topics from Algebra 1) • identify domains and ranges for given situations • determine intercepts of the graphs of linear functions • determine slopes from graphs, tables, and algebraic representations • graph and write equations of lines • use data to determine functional relationships between quantities • formulate linear inequalities to solve problems and investigate methods for solving them **After Chapter 2** (Preparation for Precalculus) • describe parent functions symbolically and graphically, including $f(x) = \|x\|$ • determine the domain and range of functions using graphs, tables, and symbols • use regression to determine the appropriateness of a linear function to model real-life data **Essential Question:** How can mathematical ideas be represented? *You can represent mathematical ideas verbally,*
Lesson 2-2: Linear Relations and 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. **F.IF.9** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).		
Lesson 2-3: Rate of Change and Slope	**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. **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.		
Lesson 2-4: Writing Linear Equations	**A.SSE.1.b** Interpret complicated expressions by viewing one or more of their parts as a single entity. **A.CED.2** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.		
Lesson 2-5: Scatter Plots and Lines of Regression	**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.		
Lesson 2-6: Special 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. **F.IF.7.b** Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.		

Lesson 2-7: Parent Functions and Transformations	**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. **F.BF.3** Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology.		*algebraically, numerically and graphically. For example, an equation can be described in words or could be represented by a table of values or a graph*
Lesson 2-8: Graphing Linear and Absolute Value Inequalities	**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.		

Chapter 3 *(15 Days Suggested Pacing)*		**Mathematical Practices:** 1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning. **break-even point** **consistent** **inconsistent** **independent** **dependent** **substitution method** **elimination method** **feasible region** **bounded** **unbounded** **optimize** **dimensions** **scalar** **determinant** **Cramer's Rule** **coefficient matrix** **identity matrix** **square matrix** **inverse matrix** **variable matrix** **constant matrix**	**Before Chapter 3** (Related Topics from Algebra 1) • graph equations of lines • transform and solve equations **After Chapter 3** (Preparation for Precalculus) • define functions, describe characteristics of functions, and translate among verbal, numerical, graphical, and symbolic representations of functions • use functions and their properties to model and solve real-life problems **Essential Question:** How can you find the solution to a math problem? *Sample answers: Use a graph; analyze a table of values; solve an equation; guess and check.*
Lesson 3-1: Solving Systems of Equations	**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.		
Lesson 3-2: Solving Systems of Inequalities by Graphing	**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.		
Lesson 3-3: Optimization with Linear Programming	**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.		
Lesson 3-4: Systems of Equations in Three Variables	**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.		
Lesson 3-5: Operations with Matrices			
Lesson 3-6: Multiplying Matrices	**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.		
Lesson 3-7: Solving Systems of Equations Using Cramer's Rule	**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.		
Lesson 3-8: Solving Systems of Equations Using Inverse Matrices	**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.		

Glencoe

ALGEBRA 2 CCSS

Contents in Brief and Pacing

Contents	Pacing (Days)	Block Pacing
Chapter 0 Preparing for Advanced Algebra		
Unit 1 Linear Relations and Functions		
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Unit 2 Quadratic, Polynomial, and Radical Functions and Relations		
Chapter 4 Quadratic Functions and Relations	14	7
Chapter 5 Polynomials and Polynomial Functions	14	7
Chapter 6 Inverses and Radical Functions and Relations	11	6
Unit 3 Advanced Functions and Relations		
Chapter 7 Exponential and Logarithmic Functions and Relations	14	10
Chapter 8 Rational Functions and Relations	11	5
Chapter 9 Conic Sections	12	7
Unit 4 Discrete Mathematics		
Chapter 10 Sequences and Series	13	7
Chapter 11 Probability and Statistics	11	8
Unit 5 Trigonometry		
Chapter 12 Trigonometric Functions	15	8
Chapter 13 Trigonometric Identities and Equations	8	4
Total Days	160	89

Number and Quantity

The Complex Number System N-CN

Perform arithmetic operations with complex numbers.

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.

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.

7. Solve quadratic equations with real coefficients that have complex solutions.

8. (+) Extend polynomial identities to the complex numbers.

9. (+) Know the Fundamental Theorem of Algebra; show that it is true or quadratic polynomials.

Algebra

Seeing Structure in Expressions A-SSE

Interpret the structure of expressions.

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.

2. Use the structure of an expression to identify ways to rewrite it.

Write expressions in equivalent forms to solve problems.

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. ★

Arithmetic with Polynomials and Rational Expressions A-APR

Perform arithmetic operations on polynomials.

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.

Understand the relationship between zeros and factors of polynomials.

2. Know and apply the Remainder Theorem: For a polynomial $p(x)$ and a number a, the remainder on division by $x - a$ is $p(a)$, so $p(a) = 0$ if and only if $(x - a)$ is a factor of $p(x)$.

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.

Use polynomial identities to solve problems.

4. Prove polynomial identities and use them to describe numerical relationships.

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

Rewrite rational expressions.

6. Rewrite simple rational expressions in different forms; write $\frac{a(x)}{b(x)}$ in the form $q(x)+\frac{r(x)}{b(x)}$, 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.

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.

Creating Equations ★ A-CED

Create equations that describe numbers or relationships.

1. Create equations and inequalities in one variable and use them to solve problems.

2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context.

4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

Reasoning with Equations and Inequalities A-REI

Understand solving equations as a process of reasoning and explain the reasoning.

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.

11. Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or g (x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions. ★

Functions

Interpreting Functions F-IF

Interpret functions that arise in applications in terms of the context.

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. ★

5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.

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.

7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★

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

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

e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.

8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

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.

b. Use the properties of exponents to interpret expressions for exponential functions.

9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

Building Functions F-BF

1. Build a function that models a relationship between two quantities.

b. Combine standard function types using arithmetic operations.

Build new functions from existing functions.

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.

4. Find inverse functions.

a. Solve an equation of the form $f(x) = c$ for a simple function f that has an inverse and write an expression for the inverse.

Linear, Quadratic, and Exponential Models F-LE

Construct and compare linear and exponential models and solve problems.

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.

Trigonometric Functions F-TF

Extend the domain of trigonometric functions using the unit circle.

1. Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.

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.

5. Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline. ★

Prove and apply trigonometric identities.

8. Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and use it to calculate trigonometric ratios.

Statistics and Probability

Interpreting Categorical and Quantitative Data S-ID

Summarize, represent, and interpret data on a single count or measurement variable.

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.

Making Inferences and Justifying Conclusions S-IC

Understand and evaluate random processes underlying statistical experiments

1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.

2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.

Make inferences and justify conclusions from sample surveys, experiments, and observational studies

3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.

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.

5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.

6. Evaluate reports based on data.

Using Probability to Make Decisions S-MD

6. (+) Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).

7. (+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).

(+) Advanced Mathematics Standards

★ Mathematical Modeling Standards