Houghton Mifflin Harcourt
Algebra 1: Analyze, Connect, Explore
Common Core Edition ©2014

correlated to the

Common Core State Standards for Mathematics
8th Grade Algebra 1

Standard	Descriptor	Citations
Standards for Mathematical Practice		
SMP.1	Make sense of problems and persevere in solving them.	*The mathematical practices standards are integrated throughout the book. See, for example, the citations below.* SE: 112, 170, 185, 225–226, 239, 394, 431–435
SMP.2	Reason abstractly and quantitatively.	*The mathematical practices standards are integrated throughout the book. See, for example, the citations below.* SE: 37–42, 44, 162, 186, 226, 262, 292
SMP.3	Construct viable arguments and critique the reasoning of others.	*The mathematical practices standards are integrated throughout the book. See, for example, the citations below.* SE: 36, 40–41, 206, 240, 373
SMP.4	Model with mathematics.	*The mathematical practices standards are integrated throughout the book. See, for example, the citations below.* SE: 107–108, 111–112, 131, 199, 284, 291

Standard	Descriptor	Citations
SMP.5	Use appropriate tools strategically.	*The mathematical practices standards are integrated throughout the book. See, for example, the citations below.* SE: 15, 90–92, 163–167, 178, 193–197, 269, 446, 453
SMP.6	Attend to precision.	*The mathematical practices standards are integrated throughout the book. See, for example, the citations below.* SE: 7–10, 14, 16, 22, 262, 283
SMP.7	Look for and make use of structure.	*The mathematical practices standards are integrated throughout the book. See, for example, the citations below.* SE: 52, 170, 218, 254, 351, 366
SMP.8	Look for and express regularity in repeated reasoning.	*The mathematical practices standards are integrated throughout the book. See, for example, the citations below.* SE: 29–33, 58–60, 64, 138, 178, 344, 359–360, 393

Standard	Descriptor	Citations
Standards for Mathematical Content		
Unit 1	**Relationships between Quantities and Reasoning with Equations**	
Reason quantitatively and use units to solve problems.		
N-Q.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.	SE: 15–22, 51–56, 65–72, 187–192
N-Q.2	Define appropriate quantities for the purpose of descriptive modeling.	SE: 65–72, 89–96, 255–262
N-Q.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	SE: 7–14
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.	SE: 51–56, 57–64, 65–72, 587–594, 595–602

Standard	Descriptor	Citations
Create equations that describe numbers or relationships.		
A-CED.1	Create equations and inequalities in one variable and use them to solve problems.	SE: 89–96, 97–106, 367–374, 461–468, 669–676, 563–570, 571–578, 579–586
A-CED.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	SE: 179–186, 201–206, 219–226, 337–344, 367–374, 381–386, 627–634, 635–642, 643–650, 661–668, 693–700
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.	SE: 89–96, 97–106, 277–284, 285–292, 293–302, 303–310, 311–318
A-CED.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.	SE: 107–112
Understand solving equations as a process of reasoning and explain the reasoning.		
A-REI.1	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.	SE: 89–96, 97–106, 107–112
Solve equations and inequalities in one variable.		
A-REI.3	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.	SE: 89–96, 97–106, 107–112

Standard	Descriptor	Citations
Unit 2	**Linear and Exponential Functions**	
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.	SE: 29–36
N-RN.2	Rewrite expressions involving radicals and rational exponents using the properties of exponents.	SE: 29–36
Analyze and solve linear equations and pairs of simultaneous linear equations.		
8.EE.8	Analyze and solve pairs of simultaneous linear equations a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. c. Solve real-world and mathematical problems leading to two linear equations in two variables.	SE: 277–284, 285–292, 293–302, 303–310, 669–676, 697–698

Standard	Descriptor	Citations
Solve systems of equations.		
A-REI.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.	SE: 303–310
A-REI.6	Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.	SE: 277–284, 285–292, 293–302, 303–310
Represent and solve equations and inequalities graphically.		
A-REI.10	Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).	SE: 119–124
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. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.	SE: 125–132, 661–668, 701–708, 717–724, 725–726, 769
A-REI.12	Graph the solutions to a linear inequality in two variables as a half plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.	SE: 233–240, 311–318

Standard	Descriptor	Citations
Define, evaluate, and compare functions.		
8.F.1	Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.	SE: 125–132, 187–192, 227–232, 627–634, 635–642, 643–650, 693–700
8.F.2	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).	SE: 187–192, 693–700, 701–708, 731–738, 739–746, 747–754, 755–762
8.F.3	Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear.	SE: 179–186, 187–192, 193–200, 201–206, 337–344, 627–634, 677–686
Understand the concept of a function and use function notation.		
F-IF.1	Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$.	SE: 125–132, 187–192
F-IF.2	Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.	SE: 125–132, 187–192, 227–232, 627–634, 635–642, 643–650, 693–700
F-IF.3	Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.	SE: 133–140, 213–218, 353–360

Standard	Descriptor	Citations
Use functions to model relationships between quantities.		
8.F.4	Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (*x, y*) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.	SE: 179–186, 187–192, 193–200, 201–206
8.F.5	Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.	SE: 163–170, 171–178, 179–186, 193–200, 345–352, 627–634, 635–642, 643–650, 651–660, 669–676, 693–700, 701–708
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.	SE: 163–170, 171–178, 179–186, 193–200, 345–352, 627–634, 635–642, 643–650, 651–660, 669–676, 693–700, 701–708
F-IF.5	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.	SE: 125–132, 155–162, 187–192, 337–344, 345–352, 627–634, 693–700
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.	SE: 171–178, 201–206, 677–686

Standard	Descriptor	Citations
Analyze functions using different representations.		
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. a. Graph linear and quadratic functions and show intercepts, maxima, and minima. e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.	SE: 155–162, 163–170, 171–178, 179–186, 337–344, 345–352, 627–634, 635–642, 643–650, 693–700, 701–708, 709–716, 731–738, 747–754
F-IF.9	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).	SE: 187–192, 693–700, 701–708, 731–738, 739–746, 747–754, 755–762
Build a function that models a relationship between two quantities.		
F-BF.1	Write a function that describes a relationship between two quantities. a. Determine an explicit expression, a recursive process, or steps for calculation from a context. b. Combine standard function types using arithmetic operations.	SE: 133–140, 201–206, 213–218, 219–226, 353–360, 367–374, 627–634, 635–642, 643–650, 693–700
F-BF.2	Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.	SE: 213–216, 241–242, 323, 353–360

Standard	Descriptor	Citations
Build new functions from existing functions.		
F-BF.3	Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k \cdot f(x)$, $f(kx)$, 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.	SE: 193–200, 361–366, 635–642, 643–650, 651–658, 693–700, 701–708, 709–716, 739–746, 755–762
Construct and compare linear and exponential models and solve problems.		
F-LE.1	Distinguish between situations that can be modeled with linear functions and with exponential functions. a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.	SE: 171–178, 179–186, 213–218, 345–352, 353–360, 387–394, 677–686
F-LE.2	Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).	SE: 201–206, 213–218, 219–226, 337–344, 345–352, 353–360, 367–374
F-LE.3	Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.	SE: 387–394, 677–686

Standard	Descriptor	Citations
Interpret expressions for functions in terms of the situation they model.		
F-LE.5	Interpret the parameters in a linear or exponential function in terms of a context.	SE: 187–192, 193–200, 219–226, 255–262, 345–352, 381–386
Unit 3	**Descriptive Statistics**	
Summarize, represent, and interpret data on a single count or measurement variable.		
S-ID.1	Represent data with plots on the real number line (dot plots, histograms, and box plots).	SE: 439–446, 447–454, 455–460, 461–468
S-ID.2	Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.	SE: 431–438, 439–446, 455–460, 461–468a
S-ID.3	Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).	SE: 439–446

Standard	Descriptor	Citations
Investigate patterns of association in bivariate data.		
8.SP.1	Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.	SE: 247–254, 255–262, 263–270, 381–386, 461–468
8.SP.2	Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.	SE: 247–254, 255–262, 263–270, 381–386, 461–468
8.SP.3	Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.	SE: 255–262, 263–270
8.SP.4	Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables.	SE: 411–416, 417–424

Standard	Descriptor	Citations
Summarize, represent, and interpret data on two categorical and quantitative variables.		
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.	SE: 411–416, 417–424
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. b. Informally assess the fit of a function by plotting and analyzing residuals. c. Fit a linear function for a scatter plot that suggests a linear association.	SE: 247–254, 255–262, 263–270, 381–386, 461–468
Interpret linear models.		
S-ID.7	Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.	SE: 255–262, 263–270
S-ID.8	Compute (using technology) and interpret the correlation coefficient of a linear fit.	SE: 247–254, 263–270
S-ID.9	Distinguish between correlation and causation.	SE: 247–254

Standard	Descriptor	Citations
Unit 4	**Expressions and Equations**	
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.	SE: 51–56, 57–64, 65–72, 587–594, 595–602
A-SSE.2	Use the structure of an expression to identify ways to rewrite it.	SE: 57–64, 65–72, 509–516, 523–532, 533–540, 541–548, 549–556
Write expressions in equivalent forms to solve problems.		
A-SSE.3	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. a. Factor a quadratic expression to reveal the zeros of the function it defines. b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. c. Use the properties of exponents to transform expressions for exponential functions.	SE: 337–344, 345–352, 353–360, 523–532, 533–540, 541–548, 549–556, 571–578, 579–586, 587–594

Standard	Descriptor	Citations
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.	SE: 485–492, 493–500, 501–508, 509–516
Create equations that describe numbers or relationships.		
A-CED.1	Create equations and inequalities in one variable and use them to solve problems.	SE: 89–96, 97–106, 367–374, 461–468, 669–676, 563–570, 571–578, 579–586
A-CED.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	SE: 179–186, 201–206, 219–226, 337–344, 367–374, 381–386, 627–634, 635–642, 643–650, 661–668, 693–700
A-CED.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.	SE: 107–112

Standard	Descriptor	Citations
Solve equations and inequalities in one variable.		
A-REI.4	Solve quadratic equations in one variable. a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form. b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b.	SE: 563–570, 571–578, 579–586, 587–594, 595–602, 603–610, 661–668, 669–676
Solve systems of equations.		
A-REI.7	Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.	SE: 669–676, 697–698

Standard	Descriptor	Citations
Unit 5	**Quadratic Functions and Modeling**	
Use properties of rational and irrational numbers.		
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.	SE: 37–44
Understand and apply the Pythagorean Theorem.		
8.G.6	Explain a proof of the Pythagorean Theorem and its converse.	SE: AL1–AL12
8.G.7	Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.	SE: AL1–AL6
8.G.8	Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.	SE: AL13–AL18

Standard	Descriptor	Citations
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.	SE: 163–170, 171–178, 179–186, 193–200, 345–352, 627–634, 635–642, 643–650, 651–660, 669–676, 693–700, 701–708
F-IF.5	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.	SE: 125–132, 155–162, 187–192, 337–344, 345–352, 627–634, 693–700
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.	SE: 171–178, 201–206, 677–686
Analyze functions using different representations.		
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. a. Graph linear and quadratic functions and show intercepts, maxima, and minima. b. Graph square root, cube root, and piecewise defined functions, including step functions and absolute value functions.	SE: 155–162, 163–170, 171–178, 179–186, 337–344, 345–352, 627–634, 635–642, 643–650, 693–700, 701–708, 709–716, 731–738, 747–754

Standard	Descriptor	Citations
F-IF.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.	SE: 345–352, 353–360, 571–578, 579–586, 587–594, 651–660
F-IF.9	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).	SE: 187–192, 693–700, 701–708, 731–738, 739–746, 747–754, 755–762
Build a function that models a relationship between two quantities.		
F-BF.1	Write a function that describes a relationship between two quantities. a. Determine an explicit expression, a recursive process, or steps for calculation from a context. b. Combine standard function types using arithmetic operations.	SE: 133–140, 201–206, 213–218, 219–226, 353–360, 367–374, 627–634, 635–642, 643–650, 693–700
Build new functions from existing functions.		
F-BF.3	Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k \cdot f(x)$, $f(kx)$, 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.	SE: 193–200, 361–366, 635–642, 643–650, 651–658, 693–700, 701–708, 709–716, 739–746, 755–762

Standard	Descriptor	Citations
Build new functions from existing functions.		
F-BF.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.	SE: 227–232, 241–242, 323, 375–376, 397
Construct and compare linear and exponential models and solve problems.		
F-LE.3	Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.	SE: 387–394, 677–686