Algebra 1 Math Content Connectors

Algebra 1

PROCESS STANDARDS FOR MATHEMATICS

The Process Standards demonstrate the ways in which students should develop conceptual understanding of mathematical content, and the ways in which students should synthesize and apply mathematical skills.

PROCESS STANDARDS FOR MATHEMATICS	
PS.1: Make sense of problems and persevere in solving them.	Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway, rather than simply jumping into a solution attempt. They consider analogous problems and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” and "Is my answer reasonable?" They understand the approaches of others to solving complex problems and identify correspondences between different approaches. Mathematically proficient students understand how mathematical ideas interconnect and build on one another to produce a coherent whole.
PS.2: Reason abstractly and quantitatively.	Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

PS.3: Construct viable arguments and critique the reasoning of others.	Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They analyze situations by breaking them into cases and recognize and use counterexamples. They organize their mathematical thinking, justify their conclusions and communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. They justify whether a given statement is true always, sometimes, or never. Mathematically proficient students participate and collaborate in a mathematics community. They listen to or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

PROCESS STANDARDS FOR MATHEMATICS	
PS.4: Model with mathematics.	Mathematically proficient students apply the mathematics they know to solve problems arising in everyday life, society, and the workplace using a variety of appropriate strategies. They create and use a variety of representations to solve problems and to organize and communicate mathematical ideas. Mathematically proficient students apply what they know and are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

PS.5: Use appropriate tools strategically.	Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Mathematically proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. Mathematically proficient students identify relevant external mathematical resources, such as digital content, and use them to pose or solve problems. They use technological tools to explore and deepen their understanding of concepts and to support the development of learning mathematics. They use technology to contribute to concept development, simulation, representation, reasoning, communication and problem solving.
PS.6: Attend to precision.	Mathematically proficient students communicate precisely to others. They use clear definitions, including correct mathematical language, in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They express solutions clearly and logically by using the appropriate mathematical terms and notation. They specify units of measure and label axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently and check the validity of their results in the context of the problem. They express numerical answers with a degree of precision appropriate for the problem context.
PS.7: Look for and make use of structure.	Mathematically proficient students look closely to discern a pattern or structure. They step back for an overview and shift perspective. They recognize and use properties of operations and equality. They organize and classify geometric shapes based on their attributes. They see expressions, equations, and geometric figures as single objects or as being composed of several objects.
PS.8: Look for and express regularity in repeated reasoning.	Mathematically proficient students notice if calculations are repeated and look for general methods and shortcuts. They notice regularity in mathematical problems and their work to create a rule or formula. Mathematically proficient students maintain oversight of the process, while attending to the details as they solve a problem. They continually evaluate the reasonableness of their intermediate results.

MATHEMATICS: ALGEBRA 1

The Mathematics standards for Algebra 1 are supplemented by the Process Standards for Mathematics.

The Mathematics standards for Algebra are made up of six strands: Real Numbers and Expressions; Functions; Linear Equations, Inequalities, and Functions; Systems of Equations

and Inequalities; Quadratic and Exponential Equations and Functions; and Data Analysis and Statistics. The skills listed in each strand indicate what students in grade 8 should know and be able to do in Mathematics.

REAL NUMBERS AND EXPRESSIONS

Indiana Academic Standards	Content Connectors
MA.AI.RNE.1: Understand the hierarchy and relationships of numbers and sets of numbers within the real number system.	**MA.AI.RNE.1.a.1**: Classify numbers within the real number system.
MA.AI.RNE.2: 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.	
MA.AI.RNE.3: Rewrite and evaluate numeric expressions with positive rational exponents using the properties of exponents.	**MA.AI.RNE.3.a.1**: Use properties of integer exponents to produce equivalent expressions.
MA.AI.RNE.4: Simplify square roots of non-perfect square integers and algebraic monomials.	**MA.AI.RNE.4.a.1**: Simplify square roots of nonperfect square integers.
MA.AI.RNE.5: Simplify algebraic rational expressions, with numerators and denominators containing monomial bases with integer exponents, to equivalent forms.	**MA.AI.RNE.5.a.1**: Simplify numeric rational expressions.
MA.AI.RNE.6: Factor common terms from polynomials and factor polynomials completely. Factor the difference of two squares, perfect square trinomials, and other quadratic expressions.	**MA.AI.RNE.6.a.1**: Factor common terms from polynomials.
MA.AI.RNE.7: Understand polynomials are closed under the operations of addition, subtraction, and multiplication with integers; add, subtract, and multiply polynomials and divide polynomial by monomials.	**MA.AI.RNE.7.a.1**: Add and subtract polynomials.
	MA.AI.RNE.7.a.2: Multiply polynomials.
	MA.AI.RNE.7.a.3: Divide a polynomial by a monomial.

FUNCTIONS

MA.AI.F.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. Understand that 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. Understand the graph of *f* is the graph of the equation y = f(x).	**MA.AI.F.1**.a.1: Distinguish between functions and non-functions within graphs or tables.
MA.AI.F.2: Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear, has a maximum or minimum value). Sketch a graph that exhibits the qualitative features of a function that has been verbally described. Identify independent and dependent variables and make predictions about the relationship.	**MA.AI.F.2a.1**: Given a graph, describe the defining features of a function. **MA.AI.F.2a.2**: Given the qualitative features, sketch a graph. **MA.AI.F.2a.3**: Given a sketch, make predictions about the relationship between the variables.
MA.AI.F.3: Identify the domain and range of relations represented in tables, graphs, verbal descriptions, and equations.	**MA.AI.F.3.a.1**: Identify the domain and range from a table or graph.
MA.AI.F.4: Understand and interpret statements that use function notation in terms of a context; relate the domain of the function to its graph and to the quantitative relationship it describes.	**MA.AI.F.4.a.1**: Interpret statements that use function notation in terms of a context.

LINEAR EQUATIONS, INEQUALITIES, AND FUNCTIONS

MA.AI.L.1: Understand that the steps taken when solving linear equations create new equations that have the same solution as the original. Solve fluently linear equations and inequalities in one variable with integers, fractions, and decimals as coefficients. Explain and justify each step in solving an equation, starting from the assumption that the original equation has a solution. Justify the choice of a solution method.	**MA.AI.L.1.a.1:** Solve equations with integer coefficients using one or two steps.
MA.AI.L.2: Represent real-world problems using	**MA.AI.L.2.a.1**: Translate a real-world problem into

linear equations and inequalities in one variable and solve such problems. Interpret the solution and determine whether it is reasonable.	a one-variable linear equation.
MA.AI.L.3: Represent real-world and other mathematical problems using an algebraic proportion that leads to a linear equation and solve such problems.	**MA.AI.L.3.a.1**: Represent a real-world situation using a proportion.
MA.AI.L.4: Represent linear functions as graphs from equations (with and without technology), equations from graphs, and equations from tables and other given information (e.g., from a given point on a line and the slope of the line).	**MA.AI.L.4.a.1**: Identify the rate of change (slope) and y-intercept from graphs.
MA.AI.L.5: Represent real-world problems that can be modeled with a linear function using equations, graphs, and tables; translate fluently among these representations, and interpret the slope and intercepts	**MA.AI.L.5.a.1**:
MA.AI.L.6: Translate among equivalent forms of equations for linear functions, including slopeintercept, point-slope, and standard. Recognize that different forms reveal more or less information about a given situation.	**MA.AI.L.6.a.1**: Describe the attributes of an equation given various forms.
MA.AI.L.7: Represent real-world problems using linear inequalities in two variables and solve such problems; interpret the solution set and determine whether it is reasonable. Solve other linear inequalities in two variables by graphing.	**MA.AI.L.7.a.1**: Identify solutions from the graph of a linear inequality within a real-world problem.
MA.AI.L.8: Solve compound linear inequalities in one variable, and represent and interpret the solution on a number line. Write a compound linear inequality given its number line representation.	**MA.AI.L.8.a.1**: Find a solution of compound inequalities given a graph.
MA.AI.L.9: Solve absolute value linear equations in one variable.	**MA.AI.L.9.a.1**: Evaluate the absolute value of an expression.
MA.AI.L.10: Graph absolute value linear equations in two variables.	**MA.AI.L.10.a.1**:

MA.AI.L.11: Solve equations and formulas for a specified variable, including equations with coefficients represented by variables.	**MA.AI.L.11.a.1**: Solve literal equations for a specified variable.

SYSTEMS OF EQUATIONS AND INEQUALITIES

MA.AI.SEI.1: Understand the relationship between a solution of a pair of linear equations in two variables and the graphs of the corresponding lines. Solve pairs of linear equations in two variables by graphing; approximate solutions when the coordinates of the solution are non-integer numbers.	**MA.AI.SEI.1.a.1**: Identify the solution to a system of linear equations given a graph.
MA.AI.SEI.2: Understand 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. Solve pairs of linear equations in two variables using substitution and elimination.	**MA.AI.SEI.2.a.1**: Solve a system of linear equations.
MA.AI.SEI.3: Write a system of two linear equations in two variables that represents a real-world problem and solve the problem with and without technology. Interpret the solution and determine whether the solution is reasonable.	**MA.AI.SEI.3.a.1**: Choose a system of linear equations that represents a given real-world problem.
MA.AI.SEI.4: Represent real-world problems using a system of two linear inequalities in two variables and solve such problems; interpret the solution set and determine whether it is reasonable. Solve other pairs of linear inequalities by graphing with and without technology.	**MA.AI.SEI.4.a.1**: Identify the solution set to a system of inequalities.

QUADRATIC AND EXPONENTIAL EQUATIONS AND INEQUALITIES

MA.AI.QE.1: Distinguish between situations that can be modeled with linear functions and with exponential functions. Understand that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. Compare linear functions and exponential functions that model realworld situations using tables, graphs, and equations.	**MA.AI.QE.1.a.1**: Given multiple graphs, describe the function as linear or not linear.
MA.AI.QE.2: Represent real-world and other mathematical problems that can be modeled with exponential functions using tables, graphs, and equations of the form y = ab^x (for integer values of x > 1, rational values of b > 0 and b ≠ 1); translate fluently among these representations and interpret the	**MA.AI.QE.2.a.1**: With a model, answer questions about exponential functions.
values of a and b.	
MA.AI.QE.3: Graph exponential and quadratic equations in two variables with and without technology.	**MA.AI.QE.3.a.1**: Determine if points lie on a graph of an exponential or quadratic function.
MA.AI.QE.4: Solve quadratic equations in one variable by inspection (e.g., for x^2 = 49), finding square roots, using the quadratic formula, and factoring, as appropriate to the initial form of the equation.	**MA.AI.QE.4.a.1**: Solve equations using square roots.
MA.AI.QE.5: Represent real-world problems using quadratic equations in one or two variables and solve such problems with and without technology. Interpret the solution and determine whether it is reasonable.	**MA.AI.QE.5.a.1**: Determine if points lie on a graph of a quadratic function of a real-world situation.
MA.AI.QE.6: Use the process of factoring to determine zeros, lines of symmetry, and extreme values in real-world and other mathematical problems involving quadratic functions; interpret the results in the real-world contexts.	**MA.AI.QE.6.a.1**: Describe attributes of a quadratic function in a real-world problem.
MA.AI.QE.7: Describe the relationships among the solutions of a quadratic equation, the zeros of the function, the x-intercepts of the graph, and the factors of the expression.	**MA.AI.QE.7.a.1**: Identify zeros of a quadratic function.

DATA ANALYSIS AND STATISITICS

MA.AI.DS.1: Distinguish between random and nonrandom sampling methods, identify possible sources of bias in sampling, describe how such bias can be controlled and reduced, evaluate the characteristics of a good survey and well-designed experiment, design simple experiments or investigations to collect data to answer questions of interest, and make inferences from sample results.	**MA.AL.DS.1.a.1**: Determine whether a sampling method was random or nonrandom.
MA.AI.DS.2: Graph bivariate data on a scatter plot and describe the relationship between the variables.	**MA.AI.DS.2.a.1**: Graph bivariate data using scatter plots and identify possible associations between the variables.
MA.AI.DS.3: Use technology to find a linear function that models a relationship for a bivariate data set to	**MA.AI.DS.3.a.1**: Use the line of best fit to find a point that answers a question about the data.
make predictions; interpret the slope and y-intercept, and compute (using technology) and interpret the correlation coefficient.	
MA.AI.DS.4: Distinguish between correlation and causation.	**MA.AI.DS.4.a.1**: Decide whether the correlation between bivariate data is a result of causation.
MA.AI.DS.5: 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 (including joint, marginal, and conditional relative frequencies) to describe possible associations and trends in the data.	**MA.AI.DS.5.a.1**: Interpret a two-way table summarizing data on two categorical variables collected from the same subjects using relative frequencies calculated for rows or columns.
MA.AI.DS.6: Understand that statistics and data are non-neutral and designed to serve a particular interest. Analyze the possibilities for whose interest might be served and how the representations might be misleading.	