High School Integrated Math I Blueprint

In the three years prior to Integrated Math 1, students have already begun their study of algebraic concepts. They have investigated variables and expressions, solved equations, constructed and analyzed tables, used equations and graphs to describe relationships between quantities, and studied linear equations and systems of linear equations.

The fundamental purpose of Mathematics I is to formalize and extend the mathematics that students learned in the middle grades. The critical areas, organized into units, deepen and extend understanding of linear relationships, in part by contrasting them with exponential phenomena, and in part by applying linear models to data that exhibit a linear trend. Mathematics 1 uses properties and theorems involving congruent figures to deepen and extend understanding of geometric knowledge from prior grades. The final unit in the course ties together the algebraic and geometric ideas studied. The Mathematical Practice standards apply throughout Math I and together with the content standards prescribe that students experience math as a coherent, useful, and logical subject that makes use of their ability to make sense of problem situations.

Suggested Quarter/Time	Instructional Focus 1 (IM1IF1)	CCSS Mathematical Content	CCSS Mathematical Practice	Content
1st/10 days	**Relationships between Quantities**	**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 Clusters consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **N.Q.2 -** Define appropriate quantities for the purpose of descriptive modeling. **N.Q.3** - Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. **Interpret the structure of expressions.** **A.SSE.1** - Interpret expressions that represent a quantity in terms of its context. *Limit to linear expressions and to exponential expressions with integer exponents.* 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. *For example, interpret $P(1+r)^n$ as the product of P and a factor not depending on P.* **Create equations that describe numbers or**	**Directly addressed practices are underlined** 1. M*a*ke 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.	**myOER:** Wild Water Adventure Sorting Equations & Identities Lesson examples above address at least one (or more) of the Common Core State Standards included in this Instructional Focus. To find more lessons for this instructional focus, please use the **Advanced Search** and type the keyword – **IM1IF1**. **Teacher:**

		relationships. **A.CED.1** - Create equations and inequalities in one variable and use them to solve problems. *Limit to linear and exponential equations, and in the case of exponential equations, limit to integer inputs.* **A.CED.2 -** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. **A.CED.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. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.* **A.CED.4** - Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law V = IR to highlight resistance R.*		

Suggested Quarter/Time	Instructional Focus 2 (IM1IF2)	CCSS Mathematical Content	CCSS Mathematical Practice	Content
1st–2nd/55 days	**Linear and Exponential Relationships**	**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). *Focus on linear and exponential equations and be able to adapt and apply that learning to other types of equations in future courses.* **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. *Focus on cases where f(x) and g(x) are linear or exponential.* **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	**Directly addressed practices are underlined** 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.	**myOER:** Walk the Line Focusing on Graphs Defining Regions Using Inequalities Lesson examples above address at least one (or more) of the Common Core State Standards included in this Instructional Focus. To find more lessons for this instructional focus, please use the **Advanced Search** and type the keyword – **IM1IF2**. **Teacher:**

		inequalities in two variables as the intersection of the corresponding half-planes. **Understand the concept of a function and use functions 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). **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. **F.IF.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 ≥ 1. *Students should experience a variety of types of situations modeled by functions. Detailed analysis of any particular class of functions at this stage is not advised. Students should apply these concepts throughout their future mathematics courses.* *Draw examples from linear and exponential functions. Draw connection between F.IF.3 and F.BF.2 which required students to write arithmetic and geometric sequences. Emphasize arithmetic and geometric sequences as examples of linear and exponential functions.* **Interpret functions that arise in applications in terms of a context** **F.IF.4** - For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.* *Focus on linear and exponential functions.* **F.IF.5** - Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function. *Focus on linear and exponential functions.*		

		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. *Focus on linear functions and exponential functions whose domain is a subset of the integers.* **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*. Focus on linear and exponential functions. Include comparisons of two functions presented algebraically. For example, compare the growth of two linear functions, or two exponential functions.* a. Graph linear and quadratic functions and show intercepts, maxima, and minima. b. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. **F.IF.9** - Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum. **Build a function that models a relationship between two quantities** **F.BF.1** - Write a function that describes a relationship between two quantities. *Limit to F.BF.1a, 1b, and 2 to linear and exponential functions.* a. Determine an explicit expression, a recursive process, or steps for calculation from a context. b. Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model. **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. **Build new functions from existing functions** **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. Include recognizing even and odd functions from their graphs and algebraic expressions for them. *Focus on vertical translations of graphs of linear and exponential functions. Relate the vertical translation of a linear function to its y-intercept. While applying other transformations to a linear graph is appropriate at this level, it may be difficult for student to identify or distinguish between the effects of the other transformations included in this standard.* **Construct and compare linear, quadratic, 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. **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). *Draw on and consolidate previous work in grade 8 on finding equations for lines and linear functions.* **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. *Limit to comparisons between linear and exponential models.* **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. *Limit exponential functions to those of the form* $f(x)=b^x+k$		

Suggested Quarter/Time	Instructional Focus 3 (IM1IF3)	CCSS Mathematical Content	CCSS Mathematical Practice	Content
2nd-3rd/25 days	**Reasoning with Equations**	**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. *Focus on and master linear equations and be able to extend and apply their reasoning to other types of equations in future courses.* **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. *Extend earlier work with solving linear equations to solving linear inequalities in one variable and to solving literal equations that are linear in the variable being solved for. Include simple exponential equations that rely only on application of the laws of exponents, such as $5^x=125$ or $2^x=1/16$* **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. **A.REI.6** - Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. *Focus on justification of the methods used. Include cases where the two equations describe the same line (yielding infinitely many solutions) and cases where two equations describe parallel lines (yielding no solution); connect to GPE.5 when it is taught in Geometry, which requires students to prove the slope criteria for parallel lines.*	**Directly addressed practices are underlined** 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.	**myOER:** Graphing Systems of Two Linear Equations Optimization Problems: Boomerangs Lesson examples above address at least one (or more) of the Common Core State Standards included in this Instructional Focus. To find more lessons for this instructional focus, please use the **Advanced Search** and type the keyword – **IM1IF3**. **Teacher:**

Suggested Quarter/Time	Instructional Focus 4 (IM1IF4)	CCSS Mathematical Content	CCSS Mathematical Practice	Content
3rd/30 days	**Descriptive**	**Summarize, represent, and interpret data on a**	**Directly addressed practices**	**myOER:**

	Statistics	**single count or measurement variable** **S.ID.1** - Represent data with plots on the real number line (dot plots, histograms, and box plots). **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. **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). *In grades 6-8 students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.* **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. **S.ID.6** - Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. *Focus on linear models, but may be used to preview quadratic functions in unit 5 of this course.* a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear and exponential models. 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. *Students model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.* **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. **S.ID.8** - Compute (using technology) and interpret the correlation coefficient of a linear fit. **S.ID.9** - Distinguish between correlation and causation.	**are underlined** 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.	I Know What You Did Last Summer Systems on a Mission Lesson examples above address at least one (or more) of the Common Core State Standards included in this Instructional Focus. To find more lessons for this instructional focus, please use the **Advanced Search** and type the keyword – **IM1IF4**. **Teacher:**

		Introduce the correlation coefficient. The focus is on the computation and interpretation of the correlation coefficient as a measure of how well the data fit the relationship. The important distinction between a statistical relationship and a cause-and-effect relationship arises in S.ID.9.		

Suggested Quarter/Time	Instructional Focus 5 (IM1IF5)	CCSS Mathematical Content	CCSS Mathematical Practice	Content
3rd – 4th/20 days	**Congruence, Proof, and Constructions**	**Experiment with transformations in the plane.** **G.CO.1** - Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. **G .CO.2** - Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch). **G.CO.3** - Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself. **G.CO.4 -** Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments. **G.CO.5** - Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another. **Understand congruence in terms of rigid motions.** **G.CO.6 -** Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent. **G.CO.7 -** Use the definition of congruence in terms of rigid motions to show that two triangles	**Directly addressed practices are underlined** 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.	**myOER:** Let's Go Hunting! Geometric Quilts Proofs of the Pythagorean Theorem Lesson examples above address at least one (or more) of the Common Core State Standards included in this Instructional Focus. To find more lessons for this instructional focus, please use the **Advanced Search** and type the keyword – **IM1IF5**. **Teacher:**

		are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent. **G.CO.8** - Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions. **Make geometric constructions.** **G.CO.12** - Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line. **G.CO.13** - Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.		

Suggested Quarter/Time	Instructional Focus 6 (IM1IF6)	CCSS Mathematical Content	CCSS Mathematical Practice	Content
3rd – 4th/20 days	**Connecting Algebra and Geometry through Coordinates**	**Use coordinates to prove simple geometric theorems algebraically.** **G.GPE.4 -** Use coordinates to prove simple geometric theorems algebraically. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2). **G.GPE.5** - Prove the slope criteria for parallel and perpendicular lines; use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point). **G.GPE.7**- Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.	**Directly addressed practices are underlined** 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.	**myOER:** Finding Equations of Parallel and Perpendicular Lines As The Crow Flies Lesson examples above address at least one (or more) of the Common Core State Standards included in this Instructional Focus. To find more lessons for this instructional focus, please use the **Advanced Search** and type the keyword – **IM1IF6**. **Teacher:**

Content-myOER:

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Adapted from The Charles A. Dana Center at the University of Texas at Austin; CommonCoreTools.me by Bill McCallum; and Common Core State Standards for Mathematics, http://doe.sd.gov/board/packets/documents/Sept10/CommonCore_document3.pdf, http://www.corestandards.org/assets/CCSSI_Mathematics_Appendix_A.pdf