Integrated Math I | M1

Integrated Math I emphasizes linear and exponential expressions, equations, and functions. This course also focuses on geometric congruence and interpreting linear models from quantitative data. Students continue their learning and understanding of categorical and quantitative data. Students are also introduced to reasoning with equations by solving systems of equations in two variables.

The major work of Integrated Math I is from the following domains and clusters:

- **Seeing Structure in Expressions**
  - Interpret the structure of expressions.
  - Write expressions in equivalent forms to solve problems.
- **Creating Equations**
  - Create equations that describe numbers or relationships.
- **Reasoning with Equations and Inequalities**
  - Solve equations and inequalities in one variable.
  - Represent and solve equations and inequalities graphically.
- **Interpreting Functions**
  - Understand the concept of a function and use function notation.
  - Interpret functions that arise in applications in terms of the context.
- **Building Functions**
  - Build a function that models a relationship between two quantities.
- **Congruence**
  - Understand congruence in terms of rigid motions.
  - Prove geometric theorems.
- **Interpreting Categorical and Quantitative Data**
  - Interpret linear models.

Supporting work is from the following domains and clusters:

- **Quantities**
  - Reason quantitatively and use units to solve problems.
- **Reasoning with Equations and Inequalities**
  - Solve systems of equations.
- **Interpreting Functions**
  - Analyze functions using different representations.
- **Linear and Exponential Models**
  - Construct and compare linear and exponential models and solve problems.
  - Interpret expressions for functions in terms of the situation they model.
- **Congruence**
  - Experiment with transformations in the plane.
- **Interpreting Categorical and Quantitative Data**
  - Summarize, represent, and interpret data on a single count or measurement variable.
  - Summarize, represent, and interpret data on two categorical and quantitative variables.

Number and Quantity

Quantities* (N.Q)

Cluster Headings	Content Standards	Scope & Clarifications
A. Reason quantitatively and use units to solve problems.	**M1.N.Q.A.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.	*There are no assessment limits for this standard. The entire standard is assessed in this course.*
	M1.N.Q.A.2 Identify, interpret, and justify appropriate quantities for the purpose of descriptive modeling.	*Clarification: Descriptive modeling refers to understanding and interpreting graphs; identifying extraneous information; choosing appropriate units; etc.* *Tasks are limited to linear or exponential equations with integer exponents.*
	M1.N.Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	*There are no assessment limits for this standard. The entire standard is assessed in this course.*

Algebra

Seeing Structure in Expressions (A.SSE)

Cluster Headings	Content Standards	Scope & Clarifications
A. Interpret the structure of expressions.	**M1.A.SSE.A.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.	*For example, interpret $P(1 + r)^n$ as the product of P and a factor not depending on P.* *Tasks are limited to linear and exponential expressions, including related numerical expressions.*

Cluster Headings	Content Standards	Scope & Clarifications
B. Write expressions in equivalent forms to solve problems.	**M1.A.SSE.B.2** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.★ **a.** Use the properties of exponents to rewrite exponential expressions.	*For M1.A.SSE.B.2a:* *For example, the growth of bacteria can be modeled by either $f(t) = 3^{(t+2)}$ or $g(t) = 9(3^t)$ because the expression $3^{(t+2)}$ can be rewritten as $(3^t)(3^2) = 9(3^t)$.* *Tasks have a real-world context. As described in the standard, there is an interplay between the mathematical structure of the expression and the structure of the situation such that choosing and producing an equivalent form of the expression reveals something about the situation.*

Creating Equations★ (A.CED)

Cluster Headings	Content Standards	Scope & Clarifications
A. Create equations that describe numbers or relationships	**M1.A.CED.A.1** Create equations and inequalities in one variable and use them to solve problems.	*i) Tasks are limited to linear or exponential equations with integer exponents.* *ii) Tasks have a real-world context.* *iii) In the linear case, tasks have more of the hallmarks of modeling as a mathematical practice (less defined tasks, more of the modeling cycle, etc.).*
	M1.A.CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations with two variables on coordinate axes with labels and scales.	*i) Tasks are limited to linear equations* *ii) Tasks have a real-world context.* *iii) Tasks have the hallmarks of modeling as a mathematical practice (less defined tasks, more of the modeling cycle, etc.).*

Cluster Headings	Content Standards	Scope & Clarifications
A. Create equations that describe numbers or relationships	**M1.A.CED.A.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.	*For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.* *There are no assessment limits for this standard. The entire standard is assessed in this course.*
	M1.A.CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.	*i) Tasks are limited to linear equations.* *ii) Tasks have a real-world context.*

Reasoning with Equations and Inequalities (A.REI)

Cluster Headings	Content Standards	Scope & Clarifications
A. Solve equations and inequalities in one variable.	**M1.A.REI.A.1** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.	*There are no assessment limits for this standard. The entire standard is assessed in this course.*
B. Solve systems of equations.	**M1.A.REI.B.2** Write and solve a system of linear equations in context.	*Solve systems both algebraically and graphically.* *Systems are limited to at most two equations in two variables.*
C. Represent and solve equations and inequalities graphically.	**M1.A.REI.C.3** 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).	*There are no assessment limits for this standard. The entire standard is assessed in this course.*

Cluster Headings	Content Standards	Scope & Clarifications
C. Represent and solve equations and inequalities graphically.	**M1.A.REI.C.4** 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 approximate solutions using technology. ⋆	*Include cases where f(x) and/or g(x) are linear, absolute value, and exponential functions. For example: f(x) = 3x + 5.* *i) Tasks that assess conceptual understanding of the indicated concept may involve any of the function types mentioned in the standard except exponential and logarithmic functions.* *ii) Finding the solutions approximately is limited to cases where f(x) and g(x) are polynomial.* *iii) Tasks are limited to linear and absolute value functions.*
	M1.A.REI.C.5 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.	*There are no assessment limits for this standard. The entire standard is assessed in this course.*

Functions

Interpreting Functions (F.IF)

Cluster Headings	Content Standards	Scope & Clarifications
A. Understand the concept of a function and use function notation.	**M1.F.IF.A.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*).	*There are no assessment limits for this standard. The entire standard is assessed in this course.*

Cluster Headings	Content Standards	Scope & Clarifications
A. Understand the concept of a function and use function notation.	**M1.F.IF.A.2** Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.	*There are no assessment limits for this standard. The entire standard is assessed in this course.*
B. Interpret functions that arise in applications in terms of the context.	**M1.F.IF.B.3** 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; and end behavior.* *i) Tasks have a real-world context.* *ii) Tasks are limited to linear functions, absolute value, and exponential functions with domains in the integers.*
	M1.F.IF.B.4 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.* *i) Tasks have a real-world context.* *ii) Tasks are limited to linear functions, piecewise functions (including step functions and absolute value functions), and exponential functions with domains in the integers.*
	M1.F.IF.B.5 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.⋆	*i) Tasks have a real-world context.* *ii) Tasks are limited to linear functions, piecewise functions (including step functions and absolute value functions), and exponential functions with domains in the integers.*

Cluster Headings	Content Standards	Scope & Clarifications
C. Analyze functions using different representations.	**M1.F.IF.C.6** Graph functions expressed symbolically and show key features of the graph, by hand and using technology. **a.** Graph linear and quadratic functions and show intercepts, maxima, and minima.	*Tasks are limited to linear functions.*
	M1.F.IF.C.7 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).	*i) Tasks have a real-world context.* *ii) Tasks are limited to linear functions, piecewise functions (including step functions and absolute value functions), and exponential functions with domains in the integers.*

Building Functions (F.BF)

Cluster Headings	Content Standards	Scope & Clarifications
A. Build a function that models a relationship between two quantities.	**M1.F.BF.A.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.	*i) Tasks have a real-world context.* *ii) Tasks are limited to linear functions and exponential functions with domains in the integers.*
	M1.F.BF.A.2 Write arithmetic and geometric sequences with an explicit formula and use them to model situations.★	*There are no assessment limits for this standard. The entire standard is assessed in this course.*

Linear and Exponential Models★ (F.LE)

Cluster Headings	Content Standards	Scope & Clarifications
A. Construct and compare linear and exponential models and solve problems.	**M1.F.LE.A.1** Distinguish between situations that can be modeled with linear functions and with exponential functions. **a.** Recognize 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 factor per unit interval relative to another.	*There are no assessment limits for this standard. The entire standard is assessed in this course.*
	M1.F.LE.A.2 Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a table, a description of a relationship, or input-output pairs.	*There are no assessment limits for this standard. The entire standard is assessed in this course.*
	M1.F.LE.A.3 Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly.	*Tasks are limited linear and exponential functions.*
B. Interpret expressions for functions in terms of the situation they model.	**M1.F.LE.B.4** Interpret the parameters in a linear or exponential function in terms of a context.	*For example, the total cost of an electrician who charges 35 dollars for a house call and 50 dollars per hour would be expressed as the function y = 50x + 35. If the rate were raised to 65 dollars per hour, describe how the function would change.* *Tasks have a real-world context.*

Geometry

Congruence (G.CO)

Cluster Headings	Content Standards	Scope & Clarifications
A. Experiment with transformations in the plane.	**M1.G.CO.A.1** Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, plane, distance along a line, and distance around a circular arc.	*There are no assessment limits for this standard. The entire standard is assessed in this course.*
	M1.G.CO.A.2 Represent transformations in the plane in multiple ways, including technology. Describe transformations as functions that take points in the plane (pre-image) as inputs and give other points (image) as outputs. Compare transformations that preserve distance and angle measure to those that do not (e.g., translation versus horizontal stretch).	*There are no assessment limits for this standard. The entire standard is assessed in this course.*
	M1.G.CO.A.3 Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry the shape onto itself.	*There are no assessment limits for this standard. The entire standard is assessed in this course.*
	M1.G.CO.A.4 Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.	*There are no assessment limits for this standard. The entire standard is assessed in this course.*
	M1.G.CO.A.5 Given a geometric figure and a rigid motion, draw the image of the figure in multiple ways, including technology. Specify a sequence of rigid motions that will carry a given figure onto another.	*There are no assessment limits for this standard. The entire standard is assessed in this course.*
B. Understand congruence in terms of rigid motions.	**M1.G.CO.B.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 determine informally if they are congruent.	*There are no assessment limits for this standard. The entire standard is assessed in this course.*

Cluster Headings	Content Standards	Scope & Clarifications
B. Understand congruence in terms of rigid motions.	**M1.G.CO.B.7** Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.	*There are no assessment limits for this standard. The entire standard is assessed in this course.*
	M1.G.CO.B.8 Explain how the criteria for triangle congruence (ASA, SAS, AAS, and SSS) follow from the definition of congruence in terms of rigid motions.	*There is no additional scope or clarification information for this standard.*
C. Prove geometric theorems.	**M1.G.CO.C.9** Prove theorems about lines and angles.	*Proving includes, but is not limited to, completing partial proofs; constructing two-column or paragraph proofs; using transformations to prove theorems; analyzing proofs; and critiquing completed proofs.* *Theorems include but are not limited to: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.*
	M1.G.CO.C.10 Prove theorems about triangles.	*Proving includes, but is not limited to, completing partial proofs; constructing two-column or paragraph proofs; using transformations to prove theorems; analyzing proofs; and critiquing completed proofs.* *Theorems include but are not limited to: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.*

Cluster Headings	Content Standards	Scope & Clarifications
C. Prove geometric theorems.	**M1.G.CO.C.11** Prove theorems about parallelograms.	*Proving includes, but is not limited to, completing partial proofs; constructing two-column or paragraph proofs; using transformations to prove theorems; analyzing proofs; and critiquing completed proofs.* *Theorems include but are not limited to: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.*

Statistics and Probability

Interpreting Categorical and Quantitative Data (S.ID)

Cluster Headings	Content Standards	Scope & Clarifications
A. Summarize, represent, and interpret data on a single count or measurement variable.	**M1.S.ID.A.1** Represent single or multiple data sets with dot plots, histograms, stem plots (stem and leaf), and box plots.	*There are no assessment limits for this standard. The entire standard is assessed in this course.*
	M1.S.ID.A.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.	*There are no assessment limits for this standard. The entire standard is assessed in this course.*
	M1.S.ID.A.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).	*There are no assessment limits for this standard. The entire standard is assessed in this course.*

Cluster Headings	Content Standards	Scope & Clarifications
B. Summarize, represent, and interpret data on two categorical and quantitative variables.	**M1.S.ID.B.4** 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. Use given functions or choose a function suggested by the context. **b.** Fit a linear function for a scatter plot that suggests a linear association.	*i) Tasks have real-world context.* *ii) Tasks are limited to linear functions and exponential functions with domains in the integers.*
C. Interpret linear models.	**M1.S.ID.C.5** Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.	*There are no assessment limits for this standard. The entire standard is assessed in this course.*
	M1.S.ID.C.6 Compute (using technology) and interpret the correlation coefficient of a linear fit.	*There are no assessment limits for this standard. The entire standard is assessed in this course.*
	M1.S.ID.C.7 Distinguish between correlation and causation.	*There are no assessment limits for this standard. The entire standard is assessed in this course.*

Major content of the course is indicated by the light green shading of the cluster heading and standard's coding.

	Major Content		Supporting Content