Approved 2013

Integrated Math 2
Unit 1: Parallel and Perpendicular Lines

Pacing: 12 days plus 3 days for enrichment and reteaching

Mathematical Practices
Mathematical Practices #1 and #3 describe a classroom environment that encourages thinking mathematically and are critical for quality teaching and learning. *Practices in bold are to be emphasized in the unit.* 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.

Domain and Standards Overview
Make geometric constructions Prove simple geometric theorems about parallel and perpendicular lines

Integrated Math 2
Unit 1: Parallel and Perpendicular Lines

Priority and Supporting CCSS	Explanations and Examples
G-CO1: Know precise definitions of angle, perpendicular line, parallel line.	Understand basic (undefined) terms of geometry and basic postulates of geometry Identify parallel lines, skew lines, perpendicular lines Recognize and write conditional statements, their converses, biconditionals (if applicable), and valid definitions
G-GPE5: Prove the slope criteria for parallel and perpendicular lines.	Relate slopes of parallel or perpendicular line
CC.9-12.G.CO.9 Prove theorems about lines and angles. Theorems include: 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.	Identify angle pairs Prove and apply theorems about angles Identify angles formed by two lines and a transversal Prove and use properties of parallel lines Use a transversal in proving lines parallel Relate parallel and perpendicular lines
G-CO12: Make formal geometric constructions with a variety of tools and methods (compass and straight edge, string, reflective devices, paper folding, dynamic geometric software, etc.).	Use a compass and straight edge to construct congruent angles. Use a compass and straight edge to construct a line parallel to a given line. Use a compass and straight edge to construct a line perpendicular to a given line.

Integrated Math 2
Unit 1: Parallel and Perpendicular Lines

Concepts What Students Need to Know	Skills What Students Need To Be Able To Do	Bloom's Taxonomy Levels
Precise definitions using undefined terms and conditionals • Coplanar • Parallel lines • Angle • Perpendicular lines • Skew • Transversal • Alternate interior, Same-side interior, Corresponding Angles	UNDERSTAND KNOW IDENTIFY	1 1 1
Two lines are parallel or perpendicular using their slopes	DETERMINE	3
The difference between parallel and skew lines	EXPLAIN	2
Slope criteria for • Parallel lines • Perpendicular lines	STATE	1
Tools used in formal construction Methods used in formal construction	IDENTIFY CONSTRUCT	1 3

Integrated Math 2
Unit 1: Parallel and Perpendicular Lines

Essential Questions
In what ways can congruence be useful? How can algebra be useful when expressing geometric properties? How can mathematical reasoning be supported?
Corresponding Big Ideas
Proving and modeling congruence provides a basis for modeling situations geometrically. Algebra can be used to efficiently and effectively describe and apply geometric properties. A well-crafted argument requires a thoughtful and logical progression of mathematically sound statements and supporting evidence.

Standardized Assessment Correlations **(State, College and Career)**
Expectations for Learning (in development) This information will be included as it is developed at the national level. CT is a governing member of the Smarter Balanced Assessment Consortium (SBAC) and has input into the development of the assessment.

Unit Vocabulary
line, coplanar, parallel lines, skew lines, perpendicular lines, slope, counterexample, conditional, converse, biconditional, hypothesis, conclusion, truth value

Integrated Math 2
Unit 1: Parallel and Perpendicular Lines

LEARNING ACTIVITIES

Topic	Section in Text PH Geometry	CCSS
Conditional Statements, Biconditionals, Definitions	2.1 and 2.2	G-CO1
Measure Angles	1.4	G-CO1
Basic Construction (copy angle) Construct line parallel to a given line Construct line perpendicular to a given line	1.5	G-CO12

Unit Assessments
The items developed for this section can be used during the course of instruction when deemed appropriate by the teacher.
Mid test Unit test Performance task(s)

Integrated Math 2

Unit 2: Right Triangles and Trigonometry

Pacing: 7 days plus 2 days for enrichment and reteaching

Mathematical Practices

Mathematical Practices #1 and #3 describe a classroom environment that encourages thinking mathematically and are critical for quality teaching and learning.

Practices in bold are to be emphasized in the unit.
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.

Domain and Standards Overview

Use theorems about triangles.
Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.

Unit 2: Right Triangles and Trigonometry

Priority and Supporting **CCSS**	**Explanations and Examples**
CC.9-12.G.SRT.8 Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems (Triangle inequality theorem)	To use inequalities involving angles and sides of triangles *Students may use geometric simulations (computer software or graphing calculator) to explore theorems about lines and angles.*
CC.9-12.G.SRT.8 Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.*	Use the Pythagorean Theorem and its Converse Use the properties of 45-45-90 and 30-60-90 triangles Use tangent ratios to determine side lengths in triangles Use sine and cosine ratios to determine side lengths in triangles Use angles of elevation and depression to solve problems *Students may use geometric simulations (computer software or graphing calculator) to explore theorems about triangles*

Concepts **What Students Need to Know**	**Skills** **What Students Need To Be Able To Do**	**Bloom's Taxonomy** **Levels**
• the relative size of side lengths and angle measures in a triangle using the Triangle Inequality Theorem and Triangle Angle-Side Theorem (longest side opposite largest angle)	DETERMINE	3
• trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems	USE	3

Integrated Math 2

Unit 2: Right Triangles and Trigonometry

Essential Questions
How might the features of one figure be useful when solving problems about a similar figure?
Corresponding Big Ideas
Properties of right triangles allow for the application of the Pythagorean Theorem and trigonometric ratios to real world situations.

Standardized Assessment Correlations (State, College and Career)
Expectations for Learning (in development) This information will be included as it is developed at the national level. CT is a governing member of the Smarter Balanced Assessment Consortium (SBAC) and has input into the development of the assessment.

Unit Vocabulary
Triangle classifications (acute, obtuse, right), triangle inequality, interior angle sum, hypotenuse, perpendicular, Pythagorean Theorem, radical form, decimal approximation, Pythagorean Converse, trigonometry, opposite side, adjacent side, acute angle, vertex, tangent ratio, sine ratio, cosine ratio, inverse trigonometric ratio

Unit 2: Right Triangles and Trigonometry

Learning Activities		

Topic	Section in Text	CCSS
Triangle Inequality	Geometry PH text: section 5.5	G-SRT8
Pythagorean Theorem	IM2 text: sec 4.9 Geo text: sec 7.2	G-SRT8
Pythagorean Theorem Converse	IM2 text: sec 4.9 Geo text: sec 7.2	G-SRT8
Special Right Triangles	Geo text: sec 7.3	G-SRT8
Trigonometric Ratios	IM2 text: chapter 5 extension, 5.9 Geo text: sections 9.1, 9.2	G-SRT6, G-SRT7 and G-SRT8
Trig Applications	Geo text: sec 9.3	G-SRT8

Integrated Math 2

Unit 2: Right Triangles and Trigonometry

Unit Assessments
The items developed for this section can be used during the course of instruction when deemed appropriate by the teacher.
Mid Test Unit Test Performance Task(s)

Integrated Math 2
Unit 3: Volume

Pacing: 12 days + 2 days for enrichment and reteaching

Mathematical Practices
Mathematical Practices #1 and #3 describe a classroom environment that encourages thinking mathematically and are critical for quality teaching and learning.   *Practices in bold are to be emphasized in the unit.*   **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.

Domain and Standards Overview
Explain volume formulas and use them to solve problems.   Visualize relationships between two-dimensional and three-dimensional objects.   Apply geometric concepts in modeling situations.

Integrated Math 2
Unit 3: Volume

Priority and Supporting **CCSS**	**Explanations and Examples**
CC.9-12.G.GMD.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.*	Find the volume of a solid including the following: prism, cylinder, pyramid, cone, sphere Find the volume of a composite solid Given the volume of a solid, work backwards to find a missing dimension.
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 N-Q 3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	In all problem situations the answer should be reported with appropriate units.

Concepts **What Students Need to Know**	**Skills** **What Students Need To Be Able To Do**	**Bloom's Taxonomy** **Levels**
● Volume formulas for o Cylinders o Pyramids o Cones o Spheres	USE (to solve problems)	3

Integrated Math 2
Unit 3: Volume

Essential Questions
How can two-dimensional figures be used to understand three-dimensional objects? In what ways can geometric figures be used to understand real world situations?

Corresponding Big Ideas
Two-dimensional figures can be "stacked" to create three-dimensional objects and generate volume formulas. Geometric definitions, properties, and theorems allow one to describe, model, and analyze situations in the real world.

Standardized Assessment Correlations (State, College and Career)
Expectations for Learning (in development) This information will be included as it is developed at the national level. CT is a governing member of the Smarter Balanced Assessment Consortium (SBAC) and has input into the development of the assessment.

Unit Vocabulary
Volume, base area, height, perpendicular height, prism, cylinder, pyramid, cone, sphere, in terms of pi, decimal approximation, linear units, square units, cubic units

Integrated Math 2
Unit 3: Volume

Learning Activities

Topic	Section in Text	CCSS
Review: Area formulas	8.7, 8.8	7.G.4, 7.G.6
Review: Volume of Prism and Cylinder	IM2 text: 9.6 Geo text: 10.5	G-GMD1, G-GMD3
Volume of Pyramid and Cone	IM2 text: 9.7 Geo text: 10.6	G-GMD1, G-GMD3
Volume of Spheres	IM2 text: 9.7 extension Geo text: 10.7	G-GMD3
Modeling	Embedded CAPT released items	G-MG1, G-MG2, G-MG3

Unit Assessments
The items developed for this section can be used during the course of instruction when deemed appropriate by the teacher.

Mid test
Unit test
Performance task(s)

Integrated Math 2
Unit 3: Volume

Integrated Math 2

Unit 4: Expressions, Equations and Inequalities

Pacing: 9 days plus 2 days for enrichment and reteaching

Mathematical Practices
Mathematical Practices #1 and #3 describe a classroom environment that encourages thinking mathematically and are critical for quality teaching and learning. *Practices in bold are to be emphasized in the unit.* **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.
Standards Overview
Reason quantitatively and use units to solve problems. Interpret the structure of expressions Create equations that describe numbers or relationships Understand solving equations as a process of reasoning and explain the reasoning Solve equations and inequalities in one variable

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Unit 4: Expressions, Equations and Inequalities

Priority and Supporting **CCSS**	Explanations and Examples*
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.	In all problem situations the answer should be reported with appropriate units. In situations involving money, answers should be rounded to the nearest cent. When data sets involve large numbers (e.g. tables in which quantities are reported in the millions) the degree of precision in any calculation is limited by the degree of precision in the data. These ideas are introduced in the solution to contextual problems in Unit 2 and reinforced throughout the remainder of the course.
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.	
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.**	Understanding the order of operations is essential to unpacking the meaning of a complex algebraic expression and to develop a strategy for solving an equation.

Unit 4: Expressions, Equations and Inequalities

Priority and Supporting CCSS	Explanations and Examples*
b. Interpret complicated expressions by viewing one or more of their parts as a single entity...	Using the commutative, associative and distributive properties enables students to find equivalent expressions, which are helpful in solving equations.
A-CED 1. (part) Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear ... functions*	Here are some examples where students can create equations and inequalities. a. (Two step equation) The bank charges a monthly fee of $2.25 for your Dad's checking account and an additional $1.25 for each transaction with his debit card, whether used at an ATM machine or by using the card to make a purchase. He noticed a transaction charge of $13.50 on this month's statement. He is trying to remember how many times he used the debit card. Can you use the information on the statement help him figure out how many transactions he made? b. (Equations with variables on both sides) Willie and Malia have been hired by two different neighbors to pick-up mail and newspapers while they are on vacation. Willie will be paid $7 plus $3 per day. Malia will be paid $10 plus $3 per day. By which day will they have earned the same amount of money?

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Unit 4: Expressions, Equations and Inequalities

Priority and Supporting **CCSS**	Explanations and Examples*
	c. (Equations which require using the distributive property) Jessica wanted to buy 7 small pizzas but she only had four, $2 off, coupons. So, she bought four with the discount and paid full price for the other three, and the bill came to $44.50. How much was each small pizza? d. (Inequality) The student council has set aside $6,000 to purchase the shirts. (They plan to sell them later at double the price.) How many shirts can they buy at the price they found online if the shipping costs are $14?
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.*	Begin with a familiar formula such as one for the perimeter of a rectangle: $p = 2l + 2w$. Consider this progression of problems: (a) Values for the variables *l* and *w* are given. We can find *p* by substituting for *l* and *w* and **evaluating the expression** on the right side. (b) Values for the variables *l* and *p* are given. We can find *w* by substituting for *l* and *p* and **solving the equation** for *w*. (c) We can find a formula for *w* in terms of *l* and *p*, by following the **same steps** as in (b) above to solve for *w*. This gives us a **general method** for finding *w* when the other variables are known. (Check this new formula by showing that it gives the correct value for *w* when the values of *l* and *p* from (b) are

Integrated Math 2

Unit 4: Expressions, Equations and Inequalities

Priority and Supporting CCSS	Explanations and Examples*
	substituted.)
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.	For two-step equations, flow charts may be used to help students "undo" the order of operations to find the value of a variable. For example, this flow chart may be used to solve the equation $4x - 2 = 30$. $x \longrightarrow$ multiply by 4 $\longrightarrow$ subtract 2 $\longrightarrow 30$
A-REI 3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.	$x = \_\_ \longleftarrow \boxed{} \longleftarrow \boxed{} \longleftarrow 30$ Then students learn to solve equations by performing the same operation (except for division by zero) on both sides of the equal sign. $4x - 2 = 30$ $+2 \quad +2$ $\dfrac{4x}{4} \quad = \dfrac{32}{4}$ $x \quad = 8$

Integrated Math 2

Unit 4: Expressions, Equations and Inequalities

Priority and Supporting CCSS	Explanations and Examples*
	In solving multiple-step equations students should realize that there may be several valid solution paths. For example here are two approaches to the equation $3x + 10 = 7x - 6$. ✓ $\quad 3x + 10 \quad = 7x - 6 \qquad\qquad\qquad\qquad 3x + 10 = 7x - 6$ ✓ $\quad \underline{-3x \qquad -3x} \qquad\qquad\qquad\qquad\qquad \underline{-7x \qquad -7x}$ ✓ $\qquad\qquad 10 = 4x - 6 \qquad\qquad\qquad -4x + 10 = \quad -6$ ✓ $\qquad\quad \underline{+6 \qquad +6} \qquad\qquad\qquad\qquad\qquad \underline{-10 \qquad -10}$ ✓ $\qquad\quad \underline{16 = 4x} \qquad\qquad\qquad\qquad\qquad \underline{-4x \quad = -16}$ ✓ $\qquad\qquad 4 \quad 4 \qquad\qquad\qquad\qquad\qquad\quad -4 \qquad\quad -4$ ✓ $\qquad\qquad 4 = x \qquad\qquad\qquad\qquad\qquad\qquad x \qquad = \quad 4$

Integrated Math 2

Unit 4: Expressions, Equations and Inequalities

Concepts What Students Need to Know	Skills What Students Need To Be Able To Do	Bloom's Taxonomy Levels
✓ Order of operations ✓ Expression vs. equation ✓ Inequality ✓ Associative property ✓ Commutative property ✓ Distributive property ✓ Inverse operations	Model (with linear equation or inequality) Solve (linear equation or inequality) Simplify (expression) Use (algebraic properties) Select (appropriate units, degree of precision)	3 3 2 3 5

Essential Questions
How is an expression different than an equation? What does equality mean? What is an inequality? How can we use linear equations and linear inequalities to solve real world problems? What is a solution set for a linear equation or linear inequality? How can models and technology aid in the solving of linear equations and linear inequalities?

Adapted from The Leadership and Learning Center "Rigorous Curriculum Design" model.
*Adapted from the Arizona Academic Content Standards.

Integrated Math 2

Unit 4: Expressions, Equations and Inequalities

Corresponding Big Ideas
To obtain a solution to an equation, no matter how complex, always involves the process of undoing the operations.

Standardized Assessment Correlations (State, College and Career)
CAPT through 2014, Smarter Balance assessment thereafter.

Vocabulary
Variable, algebraic expression, equation, open sentence, simplify, exponent, base, power, evaluate, additive inverse, properties of equalities (multiplicative identify, additive identity, associative, commutative, distributive), term, constant, coefficient, like terms, inverse operations, identity (x=x), solution, solution set.

Learning Activities

Topic	Section in Text Mathematics Course 3	CCSS
Real number operations (review) • Simplify numerical expressions using order of operations, with an emphasis on fractions	1.1, 1.7	A-SSE 1

Adapted from The Leadership and Learning Center "Rigorous Curriculum Design" model.

*Adapted from the Arizona Academic Content Standards.

Integrated Math 2

Unit 4: Expressions, Equations and Inequalities

Variable Expressions • Interpret parts of an expression, such as terms, factors, and coefficients. • Simplify by combining like terms • Associative Property • Commutative Property • Distributive Property • Simplify by using properties • Translate word sentences into variable expressions • Evaluate variable expressions involving the combination of like terms and distribution	2.3	A-SSE.1a A-SSE.1b A-SSE.2
Solve Multi-step Linear Equations • Define the use of inverse operations to solve equations • Justify steps using equality of numbers, properties from algebra • Rearrange formulas to highlight a quantity of interest. • Create and solve equations to solve problems.	2.4	A-CED.1 A-CED.4 A-REI.1 A-REI.3

Adapted from The Leadership and Learning Center "Rigorous Curriculum Design" model.

*Adapted from the Arizona Academic Content Standards.

Integrated Math 2

Unit 4: Expressions, Equations and Inequalities

Solve Multi-step Inequalities		
• Define the use of inverse operations to solve inequalities	2.6, 2.7	A-CED.1
		A-CED.4
• Justify steps using equality of numbers, properties from algebra *inequality sign reversal when multiplying or dividing by a negative number.**		
		A-REI.1
• Graph solution sets on a number line		A-REI.3
• Create and solve inequalities to solve problems.		

Unit Assessments
The items developed for this section can be used during the course of instruction when deemed appropriate by the teacher.
End-of-unit test Performance Task CAPT Practice Problems – See appendix

Integrated Math 2
Unit 5: Transformations

Pacing: 6 days + 2 days for enrichment and reteaching

Mathematical Practices
Mathematical Practices #1 and #3 describe a classroom environment that encourages thinking mathematically and are critical for quality teaching and learning.   *Practices in bold are to be emphasized in the unit.*   **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.**

Domain and Standards Overview
Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.   Verify experimentally the properties of dilations given by a center and a scale factor.   Apply geometric concepts in modeling situations.

Integrated Math 2
Unit 5: Transformations

Priority and Supporting **CCSS**	**Explanations and Examples**
CC.9-12.G.CO.4 Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.	Students may use geometry software and/or manipulatives to model transformations. Students may observe patterns and develop definitions of rotations, reflections, and translations.
CC.9-12.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).	Students may use geometry software and/or manipulatives to model and compare transformations.
CC.9-12.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.	Students may use geometry software and/or manipulatives to model transformations and demonstrate a sequence of transformations that will carry a given figure onto another.
CC.9-12.G.SRT.1 Verify experimentally the properties of dilations given by a center and a scale factor: a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged. b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.	A dilation is a transformation that moves each point along the ray through the point emanating from a fixed center, and multiplies distances from the center by a common scale factor. Students may use geometric simulation software to model transformations. Students may observe patterns and verify experimentally the properties of dilations.

Integrated Math 2
Unit 5: Transformations

Concepts What Students Need to Know	Skills What Students Need To Be Able To Do	Bloom's Taxonomy Levels
Transformations – isometries	DEFINE	2
Translations, Reflections, Rotations, Compositions	DEFINE	2
o Graph using graph paper, tracing paper, geometry software	GRAPH	3
o Determine the coordinates of an image when a transformation rule is applied to the preimage	CALCULATE	3
o Communicate using arrow notation, lines of reflection, centers of rotation, angles of rotation	COMMUNICATE IN WRITING/USING MATHEMATICAL NOTATION	3
Dilations (non-isometry)	DEFINE	2
o Graph using graph paper, tracing paper, geometry software	GRAPH	3
o Determine the coordinates of an image when transformation information is applied to the preimage	CALCULATE	3

Essential Questions
In what ways can geometric figures be used to understand real world situations? In what ways can congruence be useful? How might the features of one figure be useful when solving problems about a similar figure?
Corresponding Big Ideas

Integrated Math 2
Unit 5: Transformations

Geometric definitions, properties, and theorems allow one to describe, model, and analyze situations in the real world.

Standardized Assessment Correlations **(State, College and Career)**
Expectations for Learning (in development) This information will be included as it is developed at the national level. CT is a governing member of the Smarter Balanced Assessment Consortium (SBAC) and has input into the development of the assessment.

Unit Vocabulary
Transformation, congruence transformation, isometry, image, pre-image, prime notation, coordinates, translation, arrow notation, vector, reflection, symmetry, mirror, line of reflection, equidistant, rotation, center of rotation, counter clockwise, angle of rotation, dilation, scale factor, ratio

Learning Activities

Topic	Section in Text	CCSS
Isometric Transformations	IM2 text: 3.8	G9-12.CO.2

Integrated Math 2
Unit 5: Transformations

Translations	Geo text: 12.2	G9-12.CO.4 G9-12.CO.5
Reflections	IM2 text: 3.9 Geo text: 12.1	G9-12.CO.2 G9-12.CO.4 G9-12.CO.5
Rotations	IM2 text: 3.10 Geo text: 12.3	G9-12.CO.2 G9-12.CO.4 G9-12.CO.5

Compositions of transformations
 	
   o Glide reflections
   o Rotation translations
   o Rotation reflections
	IM2: Teacher created worksheets
	
	Geo text: 12.4
		G9-12.CO.2
		G9-12.CO.4
		G9-12.CO.5

Dilations	IM2 text: 5.6 Geo text: 12.7	G9-12.SRT.1

Unit Assessments
The items developed for this section can be used during the course of instruction when deemed appropriate by the teacher.
Unit test Performance task(s)

Integrated Math 2

Unit 6: Functions

Pacing: 6 days plus 2 days for enrichment and reteaching

Mathematical Practices
Mathematical Practices #1 and #3 describe a classroom environment that encourages thinking mathematically and are critical for quality teaching and learning. *Practices in bold are to be emphasized in the unit.* **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.**
Standards Overview
Understand the concept of a function and use function notation Analyze functions using different representation – equations, tables, graphs Interpret functions that arise in applications in terms of the context

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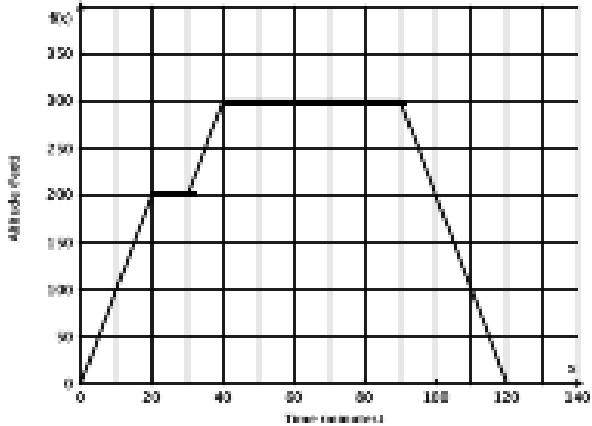# Integrated Math 2

Unit 6: Functions

Priority and Supporting **CCSS**	Explanations and Examples*
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*).	The domain of a function given by an algebraic expression, unless otherwise specified, is the largest possible domain. Mapping diagrams may be used to introduce the concepts of domain and range. The vertical line test may be used to determine whether a graph represents a function.
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.	Examples: If f(x) = x^2 + 4x – 12, find f(2) Let f(x) = 10x – 5; find f(1/2), f(-6), f(a) If P(*t*) is the population of Tucson *t* years after 2000, interpret the statements P(0) = 487,000 and P(10)-P(9) = 5,900.

Integrated Math 2

Unit 6: Functions

Priority and Supporting CCSS	Explanations and Examples*
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....**	
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 factory, then the positive integers would be an appropriate domain for the function.**	Students may explain orally, or in written format, the existing relationships.
F-IF 9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).	Students may be asked to match graphs with tables or equations with which they may represent, and to explain their reasoning.

Integrated Math 2

Unit 6: Functions

Priority and Supporting CCSS	Explanations and Examples*
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).	The graph below shows the height of a hot air balloon as a function of time. Explain what the point (50, 300) on this graph represents.

Integrated Math 2

Unit 6: Functions

Concepts What Students Need to Know	Skills What Students Need To Be Able To Do	Bloom's Taxonomy Levels
✓ Independent variable ✓ Dependent variable	Determine (whether or not a relation is a function)	4
✓ Ordered pair ✓ Mapping Diagram	Determine (range and domain of a function)	4
✓ Table ✓ Graph	Model (a real world situation with a function)	3
✓ Equation for a function	Evaluate (a function)	3
✓ Function notation	Represent a function (with table, graph, equation, mapping diagram)	3
✓ Domain ✓ Range	Determine based on real world situation – continuous vs. discrete	3
✓ Relative max or min values	Determine for Absolute value function	3
✓ Increasing/decreasing functions	Determine from the graph	3
✓ Vertical Line test	Determine (whether or not a graphed relation is a function)	2
✓ X-intercept ✓ Y-intercept	Interpret its meaning in its real world context	4

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Integrated Math 2

Unit 6: Functions

Essential Questions
What is a function?
What are the different ways that functions may be represented?
How can functions be used to model real world situations, make predictions, and solve problems

Corresponding Big Ideas
Functions are a mathematical way to describe relationships between two quantities that vary.

Standardized Assessment Correlations (State, College and Career)
CAPT through 2014, Smarter Balance assessment thereafter.

Unit Vocabulary
Function, independent and dependent variable, domain, range, relation, vertical line test, function notation, discrete and continuous data, Intercepts, Intervals of increasing / decreasing / positive / negative/constant, input, output, ordered pairs, co-ordinate points, coordinate plane, axis, table of values, mapping, set, evaluate, function rule, end behavior of a linear, slope, slope intercept form

Integrated Math 2

Unit 6: Functions

	Learning Activities	

Topic	Section in Text **PH Mathematics Course 3**	CCSS
Introduction to Functions • Determine whether a relation is a function given a relation expressed with a set, table or graph • Determine domain and range values for a variety of functions • Relate the domain of a function to its graph and where applicable, to the quantitative relationship it describes. • Use function notation to communicate pairings of input and output values • Evaluate functions for inputs in their domain • Understand that the graph of an equation in two variables is the set of all its solutions plotted on the coordinate plane	IM2 Text:12.2, 12.3,12.5 Alg 1 text: 1.4 Objective 2 Alg 1 text: 5.1-5.3, 5.5, 5.6	F-IF.2 F-IF.1 A-REI.10

Integrated Math 2

Unit 6: Functions

• Interpret statements that use function notation in terms of a context.		
Functions – **Linear** vs. non-linear (square root, cube root, piecewise defined, step, and absolute value functions) • Compare graphs of functions and relate to their equations • Sketch graphs showing key features (x and y intercepts, intervals of increasing / decreasing / positive / negative, relative max / min, symmetry, end behavior) given a verbal description of the relationship • Interpret key features of the graphs and tables in terms of the quantities of a function that models a relationship between two quantities • Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions.)	IM2 text: 12.6 6.7 scatterplot - linear 6.8 abs value 8.7 exponentials 10.1 quadratics 11.4 sq. root 12.1 rational	F-IF.4 F-IF.9

Unit Assessments
The items developed for this section can be used during the course of instruction when deemed appropriate by the teacher.

Integrated Math 2

Unit 6: Functions

End-of-Unit Test
Performance Task
CAPT released items selected by their alignment to the unit content, are imbedded in the cumulative unit assessment.
Other CAPT released items may be used for instructional purposes throughout the unit. See appendix.

Integrated Math 2

Unit 7: Linear Functions

Pacing: 12 days plus 2 days for enrichment and reteaching

Mathematical Practices
Mathematical Practices #1 and #3 describe a classroom environment that encourages thinking mathematically and are critical for quality teaching and learning. *Practices in bold are to be emphasized in the unit.* **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.**

Standards Overview
Interpret functions that arise in applications in terms of the context Analyze functions using different representations Construct and compare linear and solve problems Interpret expressions for functions in terms of the situation they model

Integrated Math 2

Unit 7: Linear Functions

Priority and Supporting **CCSS**	Explanations and Examples*
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.*	For linear functions, the rate of change is also the slope of the line. Example: A cell phone company uses the function $y = 0.03x + 14.99$ to determine the monthly charge, y, in dollars, for a customer using the phone fo x minutes. Interpret the slope of this function in the context of this problem and indicate the appropriate units.
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 ...functions and show intercepts..	Example: Find the x-intercept and the y-intercept for each of these lines. y = –3x + 18 y – 7 = 2/3(x + 4) 6x + 4y = 96

2

Integrated Math 2

Unit 7: Linear Functions

Priority and Supporting **CCSS**	**Explanations and Examples***
F-IF 8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.	For linear functions, the slope intercept form easily reveals the slope and the y-intercept. From the standard form one can easily determine both intercepts. The point-slope form focuses attention on a particular point on the graph and is directly related to the definition of slope.
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... over equal intervals.** b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another....	Given several tables of values, determine which represent linear functions, and explain why.

Input	*Output*
1	8
2	6
3	4
4	2
5	0

Input	*Output*
1	3
2	4
3	6
4	9
5	13

x	*y*
0	1
1	2
4	3
7	4
8	5

Integrated Math 2

Unit 7: Linear Functions

Priority and Supporting CCSS	Explanations and Examples*
F-LE 2. Construct linear ... functions, including arithmetic ... sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).	Example: Sara's starting salary is $32,500. Each year she receives a $700 raise. Write a sequence in explicit form to describe the situation. Draw a graph representing this situation. Is this function discrete or continuous?

F-LE 5. Interpret the parameters in a linear ... function in terms of a context.	Use technology to explore the effects of the parameters m and b in the linear functions $y = mx + b$ by holding first one parameter and then the other constant while allowing the other one to vary.
	
	Example:
	
	A student club is raising funds to fight cancer. They raffle off a gift basket and sell raffle tickets. The function that gives their profit is $f(x) = 2x - 80$, where x is the number of tickets sold.
	
	    a. How much did they spend on the gift basket?
	    b. How much do they charge for each ticket?
	    c. If they raise the price of a ticket, which parameter will change, the slope or the y-intercept? Explain.

Integrated Math 2

Unit 7: Linear Functions

Concepts What Students Need to Know	Skills What Students Need To Be Able To Do	Bloom's Taxonomy Levels
✓ Rate of change	Find (slope given two points, given graph rise/run)	1
✓ Constant additive change	Interpret (slope as rate of change)	2
✓ Slope	Determine (whether function is linear)	3
	Find (slopes of parallel and perpendicular lines)	3
✓ x-intercept ✓ y-intercept	Interpret (parameters of linear function)	4
✓ slope-intercept form	Find (equation of a line)	3
✓ point-slope form ✓ standard form	Rearrange (equation of a line into a different form)	3
	Model (linear function)	3
	Graph (linear function)	3
✓ Inequalities in two variables	Create linear (inequalities)	3
	Graph linear (inequalities)	3

Adapted from The Leadership and Learning Center "Rigorous Curriculum Design" model.

*Adapted from the Arizona Academic Content Standards.

Integrated Math 2

Unit 7: Linear Functions

Essential Questions
What is a linear function?
What are the different ways that linear functions may be represented?
What is the significance of a linear function's slope and y-intercept?
How may linear functions help us analyze real world situations and solve practical problems?

Corresponding Big Ideas
Linear functions are characterized by a constant average rate of change (or constant additive change).

Unit Vocabulary
Linear function, independent and dependent variable, discrete, continuous, function notation, exponential and quadratic function, slope, intercepts, arithmetic sequence, average-rate-of-change, velocity, slope-intercept form, point-slope form, standard form

Integrated Math 2

Unit 7: Linear Functions

Learning Activities		
Topic	**Section in the Text**	**CCSS**
Determining the rate-of-change • Calculate and interpret the average-rate-of-change using information provided symbolically or given in a table or graph or provided in a verbal description	IM 2 text: section 3.3 Sec 3.3 extension	F-IF 6
Graphing lines • Graph linear functions expressed symbolically or verbally using the slope and X- Y- intercepts • Graph manually and using technology	IM 2 text: section 3.4	F-IF 7
Developing and constructing linear functions • Develop linear functions (equations) using arithmetic sequences, graphs, verbal descriptions or data provided in tables. • Compare, use and understand the benefits of the different forms of a linear function – slope-intercept, point-slope and standard forms • Interpret the parameters in a linear function in terms of their context – slope, intercepts • Understand the unique aspects of horizontal and vertical lines	IM 2 text: section 12.1, 12.4 Algebra 1 text (standard form and point-slope form)	F-IF 8 F-LE 2 F-LE 5 F-LE 1

Integrated Math 2

Unit 7: Linear Functions

Linear Inequalities • Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality)	Algebra 1 text:	F-LE 2 F-LE 5

Standardized Assessment Correlations **(State, College and Career)**
CAPT through 2014, Smarter Balance assessment thereafter.

Unit Assessments **The items developed for this section can be used during the course of instruction when deemed appropriate by the teacher.**
End-of-unit test Performance task CAPT released items – see appendix

Adapted from The Leadership and Learning Center "Rigorous Curriculum Design" model.
*Adapted from the Arizona Academic Content Standards.

Integrated Math 2

Unit 8: Systems of Linear Equations and Inequalities

Pacing: 6 days plus 2 days for enrichment and reteaching

Mathematical Practices
Mathematical Practices #1 and #3 describe a classroom environment that encourages thinking mathematically and are critical for quality teaching and learning. *Practices in bold are to be emphasized in the unit.* **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.
Standards Overview
Create equations that describe numbers or relationships Solve systems of equations Represent and solve equations and inequalities graphically

Integrated Math 2

Unit 8: Systems of Linear Equations and Inequalities

Priority and Supporting CCSS	Explanations and Examples*
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...	Example: Given two sets of data that can be modeled with linear functions, find the intersection of the two trend lines, if it exists, and interpret the solution. For instance, if these trends continue, when will the women catch the men and what percentage of women will be earning $50,000 - $74,999?

Number of years since 2000	% of men earning $50,000 - $74,999	% of women earning $50,000 - $74,999
3	20.2	13.3
4	20.5	14.2
5	20.7	15.1

Priority and Supporting CCSS	Explanations and Examples*
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.	Example: Given that the sum of two numbers is 10 and their difference is 4, what are the numbers? Explain how your answer can be deduced from the fact that they two numbers, x and y, satisfy the equations $x + y = 10$ and $x - y = 4$.

Integrated Math 2

Unit 8: Systems of Linear Equations and Inequalities

Priority and Supporting CCSS	Explanations and Examples*
A-REI 6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.	.The system solution methods can include but are not limited to graphical, elimination/linear combination, substitution, and modeling. Systems can be written algebraically or can be represented in context. Students may use graphing calculators, programs, or applets to model and find approximate solutions for systems of equations. Examples: Solve the system of equations: $x + y = 11$ and $3x - y = 5$. Use a second method to check your answer. Your class is planning to raise money for a class trip to Washington, DC, by selling your own version of Connecticut Trail Mix. You find you can purchase a mixture of dried fruit for $3.25 per pound and a nut mixture for $5.50 per pound. The class plans to combine the dried fruit and nuts to make a mixture that costs $4.00 per pound, which will be sold at a higher price to make a profit. You anticipate you will need 180 pounds of trail mix. How many pounds of dried fruit and how many pounds of mixed nuts do you need?
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 ...functions.*	Students need to understand that numerical solution methods (data in a table used to approximate an algebraic function) and graphical solution methods may produce approximate solutions, and algebraic solution methods produce precise solutions that can be represented graphically or numerically. Students may use graphing calculators or programs to generate tables of values, graph, or solve a variety of functions.

Integrated Math 2

Unit 8: Systems of Linear Equations and Inequalities

Concepts What Students Need to Know	Skills What Students Need To Be Able To Do	Bloom's Taxonomy Levels
✓ Systems of linear equations ✓ Solution to a system of linear equations ✓ Graphing method ✓ Substitution method ✓ Elimination method ✓ Systems of linear inequalities graphing method	Solve (systems using graphs) Solve (systems using algebraic methods) Model (with systems of linear equations) Interpret (solution of systems of linear equations)	3 3 3 2

Essential Questions
What does the number of solutions (none, one or infinite) of a system of linear equations represent? What are the advantages and disadvantages of solving a system of linear equations graphically versus algebraically? What does the solution set of a system of linear inequalities represent?
Corresponding Big Ideas
A system of linear equations is an algebraic way to compare two equations that model a situation and find the breakeven point or choose the most efficient or economical plan. A system of linear equalities is a graphic way to compare two inequalities that model a situation and find the feasibility region.

Integrated Math 2

Unit 8: Systems of Linear Equations and Inequalities

Standardized Assessment Correlations (State, College and Career)
CAPT through 2014, Smarter Balance assessment thereafter.

Vocabulary
System of linear equations, system of linear inequalities, no solution, infinitely many solutions, substitution method, elimination method, constraints, scale, coordinate axes, labels, solutions, half-plane, boundary, intersection

Learning Activities		
Topic	**Section in Text**	**CCSS**
Systems of Linear Equations • Find approximate solution using graphing • Find exact solution by substitution method • Find exact solution by elimination method • Explain why the x coordinate of the point of intersection is the solution to the equation f(x)=g(x) • Interpret solutions of systems (one solution, no solutions, infinitely many solutions) • Applications of Linear Systems	IM2 text: 3.7 Alg 1 text: 7.1 7-2 7-3 7-4	CC.9-12.A.CED.3 CC.9-12.A.REI.6 CC.9-12.A.REI.5 CC9.12.A.REI.11
Systems of Linear Inequalities • Find approximate solution using graphing • Interpret solution of systems • Applications of Linear Inequality Systems	Alg 1text: 7.6	CC.9-12.A.CED.3 CC9-12.A.REI.11 CC9-12.A.REI.12

Integrated Math 2

Unit 8: Systems of Linear Equations and Inequalities

Unit Assessments
The items developed for this section can be used during the course of instruction when deemed appropriate by the teacher. Performance Task End-of-Unit Test