COURSE DESCRIPTION

Algebra 2 Foundations SH is designed to provide foundational knowledge and intervention for students taking CC Algebra 2 and for students who are preparing to be enrolled in CC Algebra 2. The course is also used to provide intervention for the students who are enrolled in CC Algebra 2 but are experiencing difficulty in mastering the core standards and academic language of CC Algebra 2. Algebra 2 Foundations SH is an elective mathematics course provided to students as a second course to support the core CC Algebra 2 course. The course is designed to enhance the student's knowledge of prerequisite skills and academic language that are needed to access the standards-based CC Algebra 2 course.

COURSE SYLLABUS

Students enrolled in this ***intervention course*** need **to be assessed** in an ongoing basis to determine their needs for support and intervention. Teachers are encouraged to tailor instruction through ongoing assessment to provide true differentiated instruction. The outcome of the initial and ongoing assessments are analyze to identify skill and concept requirements necessary for any Common Core State Standard, compare those requirements to the student's existing skill set, and analyze any potential student deficits.

The aim of the intervention in CC Algebra 2 is to provide explicit, systematic, intensive instruction for at-risk populations. As teachers strive to assist struggling students to reach the Common Core State Standards expectations, they must be able to accurately identify areas of student deficit and to match any student to an appropriate academic intervention plan. The idea of the CC Algebra 2 intervention is to create evidence-based intervention plans that customized to individual students and that are tied to specific Common Core Standards.

According to the California CCSS Mathematics Framework (November, 2013),

> "Universal Access in education is a concept which utilizes strategies for planning for the widest variety of learners from the beginning of the lesson design and not "added on" as an afterthought. Universal Access is not a set of curriculum materials or specific time set aside for additional assistance but rather a schema. For students to benefit from universal access, teachers may need assistance in planning instruction, differentiating curriculum, infusing Specially Designed Academic Instruction in English (SDAIE) techniques, using the California English Language Development Standards (CA ELD standards), and using grouping strategies effectively."

Therefore, through careful planning for modifying curriculum, instruction, grouping, and assessment techniques, teachers can be well prepared to adapt instruction to meet the needs of diverse learners in their classrooms.

RATIONALE FOR SELECTED STANDARDS TO SUPPORT CC ALGEBRA 2

Standards selected for this course were based on the differences between Common Core Standards versus California Standards for Algebra 2. Standards were chosen to fill in the foundational knowledge (gaps) for students who have not previously taken Common Core Courses. The objective is to support students transitioning from California Standards to Common Core. For example, a student taking CC Algebra 2 has not received the learning progressions from CC 6 Math through CC Geometry required to be successful in CC Algebra 2. An overview of each Unit's focus is provided to assist the teacher in designing instruction that supports the CC Algebra 2 Course.

UNIT 1 OVERVIEW - Function Notation is one of the changes in CC Algebra 1. Students who previously took California Standards Algebra 1 did not receive instruction in this cluster. In addition, when evaluating intersecting functions, students in Algebra 1, previously only looked at linear functions intersecting, not functions from various Function Families. These concepts are foundational for success in CC Algebra 2.

UNIT 2 OVERVIEW - Factoring of Polynomial of degree higher than 2, has now been shifted to CC Algebra 1. Students who previously took California Standards Algebra 1 did not receive instruction in this cluster. Instruction in factoring is essential for students to be successful in polynomial operations.

UNIT 3 OVERVIEW - Previously, in Algebra 1, students only analyzed linear and quadratic functions separately. Students did not compare different families of Functions to each other. In CC Algebra 1, students receive instruction on comparing different Function Families. More specifically, exponential functions of growth and decay were moved to CC Algebra 1. Students who previously took California Standards Algebra 1 did not receive instruction in this cluster.

UNIT 4 OVERVIEW

For students to be successful in CC Algebra 2 instruction in the following concepts must be focused.

- Ratios & Portions
- Using units of measurements appropriately
- Understanding all behavior of all Function types
- Unit Circle
- Trigonometric Functions and their graphs

Students who previously took California Standards Algebra 1 did not receive instruction in these clusters.

UNIT 5 OVERVIEW - Part of the Common Core shift is to embed the domain of Statistics & Probability in all CC Courses. Students taking CC Algebra 2, missed prerequisite knowledge from 6th Grade Math to Geometry to be successful in CC Algebra 2.

Multi-tier Mathematics Interventions

Gersten et. al. (2009) in the Practice Guide "Assisting Students Struggling with Mathematics: RtI for Elementary and Middle School" presented evidence for the effectiveness of combinations of systematic and explicit instruction that include teacher demonstrations and think alouds early in the lesson, unit, or module; student verbalization of how a problem was solved; scaffolded practice; and immediate corrective feedback. In instruction that is systematic, concepts are introduced in a logical, coherent order and students have many opportunities to apply each concept. Below are the recommendations applicable to Algebra 1 (Recommendations 3 and 4 received strong evidence rating).

Recommendation 1. Screen all students to identify those at risk for potential mathematics difficulties and provide interventions to students identified as at risk. *It is suggested that you use any of the following instruments to screen students: MDTP, Scholastic Math Inventory, Easy CMB, etc.*

Recommendation 2. Instructional materials for students receiving interventions should focus intensely on in-depth treatment of whole numbers in kindergarten through grade 5 and on rational numbers in grades 4 through 8. These materials should be selected by committee.

Recommendation 3. Instruction during the intervention should be explicit and systematic. This includes providing models of proficient problem solving, verbalization of thought processes, guided practice, corrective feedback, and frequent cumulative review.

Recommendation 4. Interventions should include instruction on solving word problems that is based on common underlying structures. *Teachers may consider using some of the strategies in "Improving Mathematical Problem Solving in Grades 4 Through 8" in teaching students problem solving*.

Recommendation 5. Intervention materials should include opportunities for students to work with visual representations of mathematical ideas and interventionists should be proficient in the use of visual representations of mathematical ideas.

Recommendation 6. Interventions at all grade levels should devote about 10 minutes in each session to building fluent retrieval of basic arithmetic facts.

Recommendation 7. Monitor the progress of students receiving supplemental instruction and other students who are at risk.

Concepts/Clusters CC Algebra 2	Standards to Support CC Algebra 2	Unit	Resources / Strategies
Analyze and solve linear equations and pairs of simultaneous linear equations.	8.EE.7 Solve linear equations in one variable. a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form x = a, a = a, or a = b results (where a and b are different numbers). b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. 8.EE.8 Analyze and solve pairs of simultaneous linear equations. a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. For example, 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6. c. Solve real-world and mathematical problems leading to two linear equations in two variables. For example, given coordinates	1	**Illustrative Mathematics** • Coupon versus discount • Solving Equations • Sammy's Chipmunk and Squirrel Observations • How Many Solutions? 8.EE.8 • Fixing the Furnace 8.EE.8 • Cell Phone Plans 8.EE.8 • Kimi and Jordan 8.EE.8 • Folding a Square into Thirds 8.EE.8 • The Intersection of Two Lines 8.EE.8a • Quinoa Pasta 1 8.EE.8c • Summer Swimming 8.EE.8c

	for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair. 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.		
Represent and solve equations and inequalities graphically.	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.	1	1) Use visualization of various graphs by using Graphing Calculator, Geometry Sketchpad 2) A-REI.11 http://www.illustrativemathematics.org/illustrations/1551 3) A-REI.11 http://www.illustrativemathematics.org/illustrations/645

Suggested Student-Generated Evidence:

- A list of situations accurately matched with graphical representations and annotated to justify selection of the match; summary of relationship between intersection point and solution.
- Original system of equations with two variables representing a real-world situation
- Solution to a system of equations along with description of the method used to find the solution and justification of why a given pair of numbers represents the solution
- Justification of the selection of one method of solving a system of equations (graphing, substitution, elimination, other) and explaining the relative applicability of technology

<table>
<tr><th>Implementing Math Practices</th><th>Mathematical Practices</th><th>Guiding Questions</th></tr>
<tr><td>As you begin the year, it is advised that you start with MP1 and MP 3 to set up your expectations of your classroom. This will help you and your students become proficient in the use of these practices. All other practices may be evident based on tasks and classroom activities.</td><td>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.</td><td>MP1:

1. How could you describe what you are trying to find?
2. What do you notice about John’s function
3. What information is given in the problem?
4. Describe the relationship between the quantities?
5. Describe what you have already tried?

MP3:

1. What mathematical evidence supports your solution?
2. How can you prove that its Kim’s function?
3. How did you test whether your approach worked?
4. What is the same and what is different about Kim’s function?</td></tr>
<tr><th colspan="2">Strategies for Implementing Math Practices:</th><th>Think-Ink-Share:</th></tr>
<tr><td colspan="2">John and Kim wrote down two different functions that have the same rate of change. The table shown below represents John’s function.

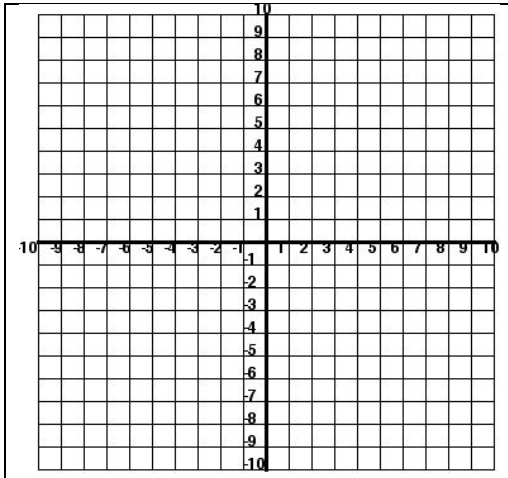
<table><tr><td>x</td><td>y</td></tr><tr><td>3</td><td>1</td></tr><tr><td>0</td><td>– 2</td></tr><tr><td>6</td><td>4</td></tr></table></td><td>Give students a structure for sharing their solutions and providing sentence starters to guide accountable talk.

I think the best way to solve this is……

I would not solve it this way because……

I agree/disagree because……

I don’t think that will work because……</td></tr>
</table>

 Johns Function Draw a Function that could be Kim's function.	Let me show you what I am thinking with a …… I try……I think……will happen I solve the problem like this because……

Unit 2			
Concepts/Clusters CC Algebra 2	**Standards to Support CC Algebra 2**	**Unit**	**Resources / Strategies**
Use polynomial identities to solve problems.	A.SSE.1 Interpret expressions that represent a quantity in terms of its context.★ a. Interpret parts of an expression, such as terms, factors, and coefficients. b. Interpret complicated expressions by viewing one or more of their parts as single entity. *For example, interpret P(1+r)n as the product of P and a factor not depending on P.* A.SSE.2 Use the structure of an expression to identify ways to rewrite it. *For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$.*	2	1) Define expression, coefficient and factor 2) Use algebra tiles, charts, and graphic organizers 3) A-SSE.1 & A-SSE.2 http://www.illustrativemathematics.org/illustrations/436 4) A-SSE.2 http://www.illustrativemathematics.org/illustrations/198 5) A-SSE.1 & A-SSE.2 http://www.illustrativemathematics.org/illustrations/21

	A.APR.1 Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials. Create equations that describe numbers or relationships. 7.EE.1 Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.		6) A-SSE.2 http://www.illustrativemathematics.org/illustrations/796 7) 7.EE.1 http://www.illustrativemathematics.org/illustrations/543 8) A.APR.1 Powers of 11

Suggested Student-Generated Evidence:

- Graphic organizer used to interpret expressions that represent quantity in term of a context.
- Accurately matched expressions by viewing more than one of their parts as single entity.
- Identify the structure of an expression by writing an original expression such as the Ohm's law, Hooks law, etc. in different ways.
- Students model a real-world scenario that would result to an expression along with explanation including a graph and table.

Implementing Math Practices	Mathematical Practices	Guiding Questions
	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.	**MP 8** ▪ What observations do you make about...? ▪ What do you notice when...? ▪ What parts of the problem might you eliminate? simplify? ▪ What patterns do you find in...? ▪ How do you know if something is a pattern? ▪ What ideas have we learned before that were useful in solving this problem? ▪ What are some other problems that are similar to this one? ▪ How does this relate to...? In what ways does this problem connect to other mathematical concepts?
Strategies for Implementing Math Practices:		**Think-Ink-Share:**
▪ Requires students to look for the structure within mathematics in order to solve the problem. (i.e. – decomposing numbers by place value, working with properties, etc.).		See the examples in Unit 1

Apply general mathematical rules to specific situations. • Look for the overall structure and patterns in mathematics. • See complicated things as single objects or as being composed of several objects. **Example**: Suppose P and Q give the sizes of two different animal populations, where $Q>P$. In (a)–(f), say which of the given pair of expressions is larger. Briefly explain your reasoning in terms of the two populations. $P+Q$ and $2P$ $PP+Q$ and $P+Q2$ $(Q-P)/2$ and $Q-P/2$ $P+50t$ and $Q+50t$ $PP+Q$ and 0.5 PQ and QP	

Unit 3			
Concepts/Clusters CC Algebra 2	**Standards to Support CC Algebra 2**	**Unit**	**Resources / Strategies**
Define, evaluate, and compare functions	**Functions** 8.F.2 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change. 8.F.3 Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. For example, the function A = s2 giving the area of a square as a function of	3	**Illustrative Mathematics** Battery Charging: 8.F.2 **Mathematics Assessment Project** Modeling Situations with Linear Equations : 8.F.2, 8.F.4 **Inside Mathematics** House Prices: 8.F.3, 8.F.4

	its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.		
Use functions to model relationships between quantities. Interpret functions that arise in applications in terms of the context.	8.F.4 Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values. 8.F.5 Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally. 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. F-IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.	3	**Illustrative Mathematics** 1) Video Streaming 8.F.4 2) High School Graduation 8.F.4 3) Chicken and Steak, Variation 1 8.F.4 4) 8.F Baseball Cards 8.F.4 5) Chicken and Steak, Variation 2 8.F.4 6) 8.F Distance across the channel 8.F.4 7) Delivering the Mail, Assessment Variation 8.F.5 8) Tides 8.F.5 9) Distance 8.F.5 10) Bike Race 8.F.5 11) Riding by the Library 8.F.5

	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. Analyze functions using different representations.		
Analyze Functions Using Different Representations.	F.IF.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-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. F-IF.7c Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. F-IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions)	3	1) Use visualization by using graphing calculator, geometry sketchpad, or other software 2) Compare and contrast linear function with other functions (Parent Functions) 3) HS Function Domain https://www.illustrativemathematics.org/HSF
Suggested Student-Generated Evidence:			

- Original scenario accurately presented as a function with variables and the relationship between them defined
- Accurately matched linear and exponential functions with graphical and numeric representations
- Original function accurately describing a real-world scenario along with explanation including a graph and table
- Accurate classification of relations as functions or not functions given representations as tables, equations, and graphs

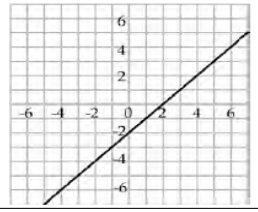
Implementing Math Practices	**Mathematical Practices**	**Guiding Questions**
Emphasize MP3 and MP 4 in this Unit. Unit 3 has function modeling at its core and the time spent engaging the students in modeling activities would help you and your students become proficient in the use of these practices. All other practices may be evident based on tasks and classroom activities.	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.	**MP 4** 1. What graph model could you construct to represent the problem? 2. What are some ways to represent the quantities in this situation? 3. What's an function or expression that matches the graph or the table? 4. Where did you see one of the quantities in the task in your function or expression? 5. Would it help to create a diagram, graph, table, in this situation? 6. What are some ways to visually represent the model? What could we build the function that might apply in this situation?

Strategies for Implementing Math Practices:	**Think-Ink-Share:**
▪ Is structured so that students represent the problem situation and their solution symbolically, graphically, and/or pictorially (may include technological tools) appropriate to the context of the problem. ▪ Invites students to create a context (real-world situation) that explains numerical/symbolic representations. ▪ Asks students to take complex mathematics and make it simpler by creating a model that will represent the relationship between the quantities.	Give students a structure for sharing their solutions and providing sentence starters to guide accountable talk. I think the best way to find the matching function is…… I would not compare the functions this way because…… I agree/disagree because…… I don't think that will work because…… Let me show you what I am thinking with a ……

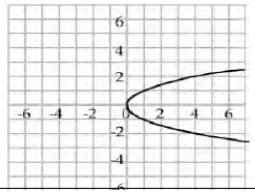
- Requires students to identify variables, compute and interpret results, report findings, and justify the reasonableness of their results and procedures within context of the task.

Find relationships between graphs, equations, tables and rules

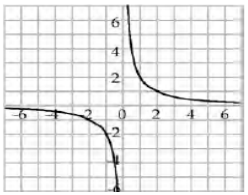
- Explain your reasons

Graph B	Equation B	Table B	Rule B
	$y^2 = x$		x multiplied by y is equal to 2

x	-2	-1	0	1	2	3
y	4	1	0	1	4	9

Graph C	Equation C	Table C	Rule C
	$y = x^2$		y is 2 less than x

x	0	1	4	9	16
y	0	±1	±2	±3	±4

Graph D	Equation D	Table D	Rule D
	$y = x - 2$		x is the same as y multiplied by y

x	-2	-1	0	1	2	4
y	-1	-2	±∞	2	1	0.5

I try……I think……will happen
I model the function like this because……

Unit 4			
Concepts/Clusters CC Algebra 2	**Standards to Support CC Algebra 2**	**Unit**	**Resources / Strategies**
Extend the domain of the trigonometric functions using the unit circle.	F-TF.1.Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.	4	1) Use protractor, graphing calculator, sketchpad or other software 2) F-TF.1 & F-TF.2.1 http://illuminations.nctm.org/LessonDetail.aspx?id=L785

Prove and apply trigonometric identities.	F-TF.2.1.Graph all 6 basic trigonometric functions.		
Model periodic phenomena with trigonometric functions.	6.RP.2. Understand the concept of a unit rate *a*/*b* associated with a ratio *a*:*b* with *b* ≠ 0, and use rate language in the context of a ratio relationship. *For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger."*1 6.RP.3. Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities. 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.*	4	1) Define the definition of ratio and unit rate 2) Group work to solve the real-world problems 3) Tape diagram, double number line, or other thinking map to analyze the data 4) Define function, domain, and range 5) Use graphing calculators to show the shift of function. Identify Horizontal, vertical, or scalar factor of the graph 6) Define intercepts, intervals, increasing function, decreasing function, relative maximums, relative minimums, symmetries, end behavior, and periodicity 7) Have students discuss these vocabulary in groups and apply them in real-world application 8) Use geometry sketchpad or other software for visualization 9) Use technology as a visualization 10) Graphic organizers to organize data 11) 6.RP http://www.illustrativemathematics.org/illustrations/76 12) 6.RP http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/061/original/illustrative_mathematics_61.pdf?1343857022

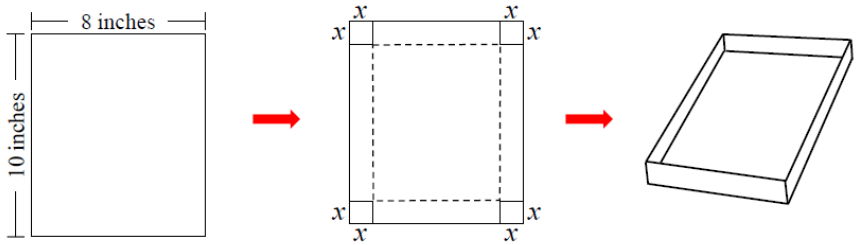
	F.IF.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.*★ F.LE.1 Distinguish between situations that can be modeled with linear functions and with exponential functions. b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. F-TF.1.Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. 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.		13) HS Function Domain https://www.illustrativemathematics.org/HSF

Suggested Student-Generated Evidence:

- Accurately build a function that models a relationship between two quantities.
- Explain correctly the reasoning behind the selection of domain and range of a function.
- Match the intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity in a graph and table.
- Graph all 6 basic trigonometric functions.

- Accurately convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

Implementing Math Practices	Mathematical Practices	Guiding Questions
	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.	**MP 4** 1. What graph model could you construct to represent the problem? 2. What are some ways to represent the quantities in this situation? 3. What's an function or expression that matches the graph or the table? 4. Where did you see one of the quantities in the task in your function or expression? 5. Would it help to create a diagram, graph, table, in this situation? 6. What are some ways to visually represent the model? What could we build the function that might apply in this situation?

Strategies for Implementing Math Practices:	Think-Ink-Share:
F.IF.4 Example: Use the diagram to answer the question.  By cutting four equal squares out of a piece of paper, folding on the dotted lines shown in the diagram, and taping the corners, an open rectangular box can be created. ***Part A*** Build a function to model the relationship between volume of the box (*V*) and the side length of the cut-out squares (*x)*. Simplify your function as much as possible by multiplying and combining like terms. ***Part B***	See the examples in Unit 1 and Unit 3

What is the domain (x) and range (V) of your function? Explain your reasoning or show your work in a table. Graph the resulting function and explain the key features of the graph.

F.LE.1 Example:

The following tables show the values of linear, quadratic, and exponential functions at various values of x. Indicate which function type corresponds to each table. Justify your choice.

A		B		C		D	
x	$f(x)$	$g(x)$	x	x	$h(x)$	x	$m(x)$
1	6	7	1	1	6	1	56
2	9	14	2	2	9	2	28
3	12	28	3	3	14	3	14
4	15	56	4	4	21	4	7

Table A: $f(x) =$ _____

Table B: $g(x) =$ _____

Table C: $h(x) =$ _____

Table D: $m(x) =$ _____

Unit 5

Concepts/Clusters CC Algebra 2	Standards to Support CC Algebra 2	Unit	Resources / Strategies
Summarize, represent, and interpret data on a single count or measurement data.	6.SP.1. Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. *For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.* 6.SP.2. Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.	5	1) Define Statistic, variability 2) Use acronym such as SOCS (Symmetry, Outlier, Center, Spread) to define distribution 3) Compare and Contrast mean, median, mode using the thinking map 4) Define Standard deviation and how spread affects the distribution 5) Use graphing calculators and other software devices to draw data and analyze data

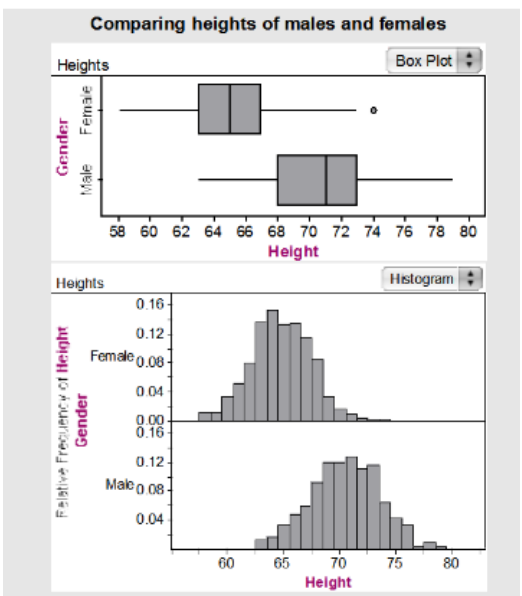
	6.SP.3. Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number. 6.SP.4. Display numerical data in plots on a number line, including dot plots, histograms, and box plots. 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.		6) Use graphic organizer to teach statistic vocabulary 7) 6.SP http://map.mathshell.org/materials/tasks.php?taskid=396#task396 8) 6.SP.1, 6.SP.2 & 6.SP.4 http://insidemathematics.org/problems-of-the-month/pom-throughthegrapevine.pdf 9) 6.SP.3 http://insidemathematics.org/common-core-math-tasks/6th-grade/6-2003%20Baseball%20Players.pdf 10) S.ID http://map.mathshell.org/materials/download.php?fileid=1230
Understand and evaluate random processes underlying statistical experiments. Make inferences and justify conclusions from sample surveys experiments, and observational studies.	6.SP.1. Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. *For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.* 7.SP.1. Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is	5	1) Define statistic using graphic organizer and have students discuss using think-pair-share 2) Define sample vs population using graphic organizer 3) Card or dice game to introduce probability in groups 4) 7.SP http://www.illustrativemathematics.org/illustrations/260 5) 7.SP http://www.illustrativemathematics.org/illustrations/235 6) 7.SP http://www.illustrativemathematics.org/illustrations/559/

	representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences. 7.SP.2. Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. *For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.*		

Suggested Student-Generated Evidence:

- Mean word length estimated in a book by randomly sampling words from the book
- The winner of a school election based on randomly sampled survey data predicted.
- Accurately gauge how far off the estimate or prediction might be.
- Determine the mean height and standard deviation of different samples using the information provided in a box plot and a histogram.
- Correctly write statistical questions about variability in a data.

Implementing Math Practices	Mathematical Practices	Guiding Questions
	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.	**MP 6** 1. What mathematical terms apply in this situation? 2. How did you know your solution was reasonable? 3. Explain how you might show that your solution answers the problem. 4. Is there a more efficient strategy? 5. How are you showing the meaning of the quantities? 6. What symbols or mathematical notations are important in this problem?

	8. Look for and express regularity in repeated reasoning.	7. What mathematical language..., definitions..., properties can you use to explain...? 8. How could you test your solution to see if it answers the problem?
Strategies for Implementing Math Practices:		**Think-Ink-Share:**
 *Heights of U.S. males and females in the 20–29 age group.* Source: *U.S. Census Bureau, Statistical Abstract of the United States: 2009*, Table 201.	The graphs below show two ways of comparing height data for males and females in the 20-29 age group. Both involve plotting the data or data summaries (box plots or histograms) on the same scale, resulting in what are called parallel (or) questions about it just from knowledge of these three facts (shape, center, and spread). For either group, about 68% of the data values will be within one standard deviation of the mean. Students also observe that the two side – by - side) box plots and parallel histograms. How can you describe the mean and standard deviation? Determine the mean height and standard deviation of the boys using the chart provided.	See Units 1 and 3 for examples.

References:

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