Newport-Mesa Unified School District
Office of Secondary Curriculum and Instruction
High School Course of Study

Course Title	Algebra 1AB	**Course Code**	*M0418-419*

Transcript Title:	Algebra 1AB	**Grades Levels:**	9-12	**Board Adoption Date:**	***6/23/20***
Content Area:	Math	**GPA Scale:**	4.0	**Date Course Submitted:**	***6/2020***
Credential Required:	Math	**Graduation Subject Areas:**	Math	***CALPADSCode:***	***9249***
UC/CSU "A-G" Area Approvals:			**School Site/person that wrote and submitted the course:**	Ed Center/ Caroline Karr & Stephanie Marvicsin	
Recommend Skills:	1st through 8th grade Math				
Next course(s):	Geometry				
Textbook to be used:	*Illustrative Mathematics, Algebra 1*				

COURSE DESCRIPTION

Students begin the course with one-variable statistics, building on ideas from middle school. From there, students move on to expand their understanding of linear equations, inequalities, and systems of linear equations and inequalities. Next, students study functions, continuing the work begun in grade 8. They see categories of functions, starting with linear functions (including their inverses) and piecewise-defined functions (including absolute value functions), followed by exponential and quadratic functions. The course ends with a close look at quadratic equations.

STANDARDS ADDRESSED

The Algebra 1 course is designed around and informed by the following standards:

- *Common Core State Standards for Mathematics (June 2010)*

SUPPORTS AND EXTENSIONS

<u>Supports for English Language Learners</u>
Embedded within the curriculum are instructional supports and practices to help teachers address the specialized academic language demands in math when planning and delivering lessons, including the demands of reading, writing, speaking, listening, conversing, and representing in math (Aguirre & Bunch, 2012). The framework for supporting English language learners (ELLs) in this curriculum includes four design principles (support sense-making, optimize output, cultivate conversation, and maximize meta-awareness) for promoting mathematical language use and development in curriculum and instruction. The design principles and related routines work to make language development an integral part of planning and delivering instruction while guiding teachers to amplify the most important language that students are expected to bring to bear on the central mathematical ideas of each unit.

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Supports for Students with Disabilities
The additional supports for students with disabilities are activity-specific and provide teachers with strategies to increase access and eliminate barriers without reducing the mathematical demand of the task. Designed for students with disabilities, they are also appropriate for many students who need additional support to access rigorous, grade-level content. The additional supports for students with disabilities were designed using the Universal Design for Learning Guidelines (http://udlguidelines.cast.org). Each support aligns to one of the three principles of UDL: engagement, representation, and action and expression.

Extensions
Select classroom activities include an opportunity for differentiation for students ready for more of a challenge. Every extension problem is made available to all students with the heading "Are You Ready for More?" These problems go deeper into grade-level mathematics and often make connections between the topic at hand and other concepts. They are intended to be used on an opt-in basis by students if they finish the main class activity early or want to do more mathematics on their own.

EVALUATION

Student achievement will be measured using multiple assessment tools, included but not limited to check-your-readiness pre-assessments, mid-unit assessments, end-of-unit assessments, lesson activities, practice problems, and cool-downs.

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Unit 1: One-variable Statistics		
Unit Overview	**Model Assignments**	**California State Content Standards Covered in this Unit**
The first five lessons of the unit give students an opportunity to review ideas from middle school while taking the analysis of the data displays a little deeper. They represent and interpret data using data displays such as dot plots, histograms, and box plots. They describe distributions using the appropriate terminology. Lessons 6 through 9 familiarize students with spreadsheets and technology that will be used to calculate statistics such as mean, median, quartiles, and standard deviation as well as create data displays. Lessons 10 through 15 explore standard deviation, outliers, and comparing data sets using measures of center and measures of variability. The last lesson gives students a chance to practice their skills by collecting data and analyzing the values.	**Lesson 1: Getting to Know You** **Cool Down: Categorizing Questions** Categorize each of these questions as one of these types, then explain your reasoning for putting the question in that category. • Statistical question requiring numerical data to answer it • Statistical question requiring categorical data to answer it • Non-statistical question 1. On average, how many books does each person in the United States read each year? 2. How many acts are in the play *Romeo and Juliet*? 3. Which book was read most by students in the class this summer? 4. How many books are in the classroom right now?	HSS-ID.A.1 HSS-ID.A.2 HSS-ID.A.3

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Lesson 4: The Shape of Distributions

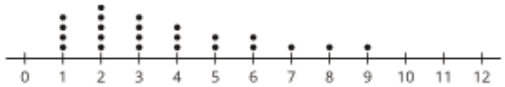
Cool Down: Distribution Types

Describe each of these distributions. If more than one term applies, include all the terms that describe each distribution. Where possible, use the terms:

- symmetric distribution
- skewed distribution
- bell-shaped distribution
- uniform distribution
- bimodal distribution

1.

2.



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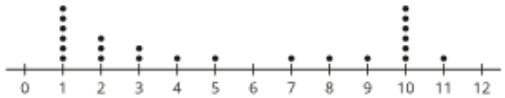

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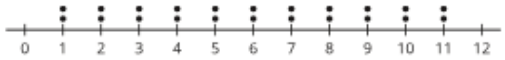

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Lesson 11: Comparing and Contrasting Data Distributions

Cool Down: Which Menu?

A restaurant owner believes that it is beneficial to have different menu items with a lot of variability so that people can have a choice of expensive and inexpensive food. Several chefs offer menus and suggested prices for the food they create. The owner creates dot plots for the prices of the menu items and finds some summary statistics. Which menu best matches what the restaurant is looking for? Explain your reasoning.

Italian:

mean: $9.03

median: $9

MAD: $2.45

IQR: $3.50

Diner:

mean: $3.36

median: $2

MAD: $2.12

IQR: $4

Japanese:

mean: $10.35

median: $10

MAD: $5.55

IQR: $9.50

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	Lesson 14: Outliers **Cool Down: Expecting Outliers** A group of 20 students are asked to report the number of pets they keep in their house. The results are 0, 0, 0, 0, 0, 1, 1, 1, 1, 1, 1, 1, 1, 2, 2, 3, 4, 4, 4, 21 • mean: 2.4 pets • standard deviation: 4.47 pets • Q1: 0.5 pets • median: 1 pet • Q3: 2.5 pets 1. Would any of these values be considered outliers? Explain your reasoning. 2. After being told that they should not count any fish in the report, the value of 3 becomes a 2 and the value of 21 becomes 1. Would these changes affect the median, mean, standard deviation, or interquartile range? If so, would each measure decrease or increase from their original values?	

Unit 2: Linear Equations, Inequalities, and Systems		
Unit Overview	**Model Assignments**	**California State Content Standards Covered in this Unit**
In middle school, students began building an understanding of how variables, expressions, equations, and inequalities could be used to represent quantities and relationships. Students also made connections among different kinds of representations—algebraic, verbal, tabular, and graphical. In this unit, students further develop their capacity to create, manipulate, interpret, and connect these representations and to use them for modeling. In the first few lessons, students		HSA-CED.A.2 HSA-CED.A.3 HSA-CED.A.4 HSN-Q.A.2 HSF-LE.A.2 HSA-REI.A HSA-REI.A.1 HSA-REI.B.3 HSA-REI.C.5 HSA-REI.C.6 HSA-REI.D.10 HSA-REI.D.12

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learn to think of equations as a way to represent constraints or limitations on quantities. Students then investigate different ways to express the same relationship or constraint—by analyzing and writing equivalent equations. Next, students encounter situations that involve two or more constraints. In those cases, we often want to find values that satisfy both or all constraints simultaneously. Systems of equations are helpful for representing these constraints. Students draw on their understanding of systems of linear equations from grade 8 to solve problems, but soon notice the limitations of solving systems by graphing and by substitution. They then learn to solve systems of equations by elimination, to explain why the steps taken to eliminate a variable are valid and productive, and to articulate how the process essentially entails writing a series of equivalent systems. Additionally, students reinforce their awareness that a system of equations could have one solution, no solutions, or infinitely many solutions. In the last third of the unit, students rely on their understanding of equations to explore inequalities in one and two variables. Students see that a solution to an inequality (in one or two variables) is a value or a pair of values that makes the inequality true, and a solution to a system of inequalities in two variables is any pair of values that make both inequalities in the system true. The solution set of a system of inequalities, they learn, can be best	**Lesson 2: Writing Equations to Model Relationships (Part 1)** **Cool Down: Shirt Colors** A school choir needs to make T-shirts for its 75 members and has set aside some money in their budget to pay for them. The members of the choir decided to order from a printing company that charges $3 per shirt, plus a $50 fee for each color to be printed on the shirts. 1. Write an equation that represents the relationship between the number of T-shirts ordered, the number of colors on the shirts, and the total cost of the order. If you use a variable, specify what it represents. 2. In this situation, which quantities do you think can vary? Which might be fixed? **Lesson 7: Explaining Steps for Rewriting Equations** **Cool Down: If This, Then That** 1. The equation $4(x-2)=100$ is a true equation for a particular value of x. Explain why $2(x-2)=50$ is also true for the same value of x. 2. To solve the equation $7.5d=2.5d$, Lin divides each side by $2.5d$, and Elena subtracts $2.5d$ from each side. a. Will both moves lead to the solution? Explain your reasoning. b. What is the solution?	HSA-SSE.A.1

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represented by graphing.

Lesson 12: Writing and Graphing Systems of Linear Equations

Cool Down: Fabric Sale

At a fabric store, fabrics are sold by the yard. A dressmaker spent $36.35 on 4.25 yards of silk and cotton fabrics for a dress. Silk is $16.90 per yard and cotton is $4 per yard.

Here is a system of equations that represent the constraints in the situation.

$$\begin{cases} x + y = 4.25 \\ 16.90x + 4y = 36.35 \end{cases}$$

1. What does the solution to the system represent?

2. Find the solution to the system of equations. Explain or show your reasoning.

Lesson 20: Writing and Solving Inequalities in One Variable

Cool Down: How Many Hours of Work?

Lin's job pays $8.25 an hour plus $10 of transportation allowance each week. She has to work at least 5 hours a week to keep the job, and can earn up to $175 per week (including the allowance).

1. Represent this situation mathematically. If you use variables, specify what each one means.

2. How many hours per week can Lin work? Explain or show your reasoning.

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Lesson 23: Solving Problems with Inequalities in Two Variables

Cool Down: The Band Played On

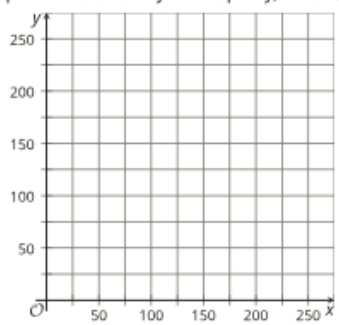
A band is playing at an auditorium with floor seats and balcony seats. The band wants to sell the floor tickets for $15 each and balcony tickets for $12 each. They want to make at least $3,000 in ticket sales.

1. How much money will they collect for selling x floor tickets?

2. How much money will they collect for selling y balcony tickets?

3. Write an inequality whose solutions are the number of floor and balcony tickets sold if they make at least $3,000 in ticket sales.

4. Use technology to graph the solutions to your inequality, and sketch the graph.



Unit 3: Two-variable Statistics

Unit Overview	**Model Assignments**	**California State Content Standards Covered in this Unit**

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In grade 8, students informally constructed scatter plots and lines of fit, noticed linear patterns, and observed associations in categorical data using two-way tables. In this unit, students build on this previous knowledge by assessing how well a linear model matches the data using residuals as well as the correlation coefficient for best-fit lines (found using technology). The unit begins with categorical data arranged in two-way tables that students are asked to analyze. The unit then transitions to bivariate numerical data, which are visualized using scatter plots and lines of best fit. Students use technology to compute the lines of best fit and observe how well the linear models match the data. Residuals and correlation coefficients are used to quantify the goodness of fit for linear models. The unit closes with an exploration of the difference between correlation and causal relationships, as well as an opportunity to apply this learning to areas of interest, like anthropology and sports.

Lesson 2: Relative Frequency Tables

Cool Down: Writing Sample

Eighty students are asked to write a sentence and record the hand they used to write with. A teacher then determines whether each sentence is written neatly or not. The results are summarized in the table.

	neat writing	messy writing
left-handed	5	10
right-handed	34	31

1. Complete the relative frequency table with the correct proportions so that it could be used to answer the question: "Among left-handed writers, what proportion have neat handwriting?"

	neat writing	messy writing
left-handed		
right-handed		

2. Use the table to determine the percentage of right-handed writers who the teacher determined have messy handwriting.

HSN-Q.A.3
HSS-ID.A
HSS-ID.B.5
HSS-ID.B.6
HSS-ID.B.6.a
HSS-ID.B.6.b
HSS-ID.B.6.c
HSS-ID.C.7
HSS-ID.C.8
HSS-ID.C.9

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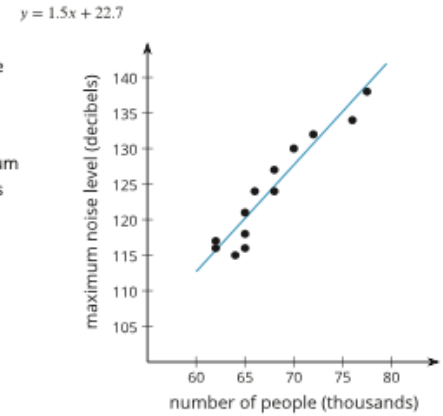
Lesson 4: Linear Models

Cool Down: Roar of the Crowd

The scatter plot shows the maximum noise level when different numbers of people are in a stadium. The linear model is given by the equation $y = 1.5x + 22.7$, where y represents maximum noise level and x represents the number of people, in thousands, in the stadium.



1. The slope of the linear model is 1.5. What does this mean in terms of the maximum noise level and the number of people?

2. A sports announcer states that there are 65,000 fans in the stadium. Estimate the maximum noise level. Is this estimate reasonable? Explain your reasoning.

3. What is the y-intercept of the linear model given? What does it mean in the context of the problem? Is this reasonable? Explain your reasoning.

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Lesson 8: Using the Correlation Coefficient

Cool Down: How Bad Is It, Doc?

Doctors suspect a strain of bacteria found in the hospital is becoming resistant to antibiotics. They put various concentrations of antibiotic in petri dishes and add some of the bacteria to allow it to grow. The bacteria grow into groups in the dish called colonies. After some time, the doctors return to the petri dishes and count the number of colonies for the different amounts of antibiotic.

The data is plotted with a best fit line. The correlation coefficient was $r = -0.83$.

1. What does the sign of the correlation coefficient tell you about the relationship between the number of bacteria colonies and the concentration of antibiotic in the dish?

2. What does the numerical value of the correlation coefficient tell you about the relationship between the number of bacteria colonies and the concentration of antibiotic in the dish?

3. In a follow-up study, a group of scientists collect data that was fit by a linear model with a correlation coefficient of $r = -0.94$. Which study suggests a stronger relationship between the number of bacteria colonies and the concentration of antibiotic—the doctors' study or the scientists' study? Explain your reasoning.

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Lesson 9: Causal Relationships

Cool Down: Just Cause

For each pair of variables, decide whether there is:

- a very weak or no relationship
- a strong relationship that is not a causal relationship
- a causal relationship

Explain your reasoning.

1. number of snow plows owned by a city and mitten sales in the city
2. number of text messages sent per day by a person and number of shirts owned by the person
3. price of a pizza and number of calories in the pizza
4. amount of gas used on a trip and number of miles driven on the trip

Unit 4: Functions

Unit Overview	**Model Assignments**	**California State Content Standards Covered in this Unit**

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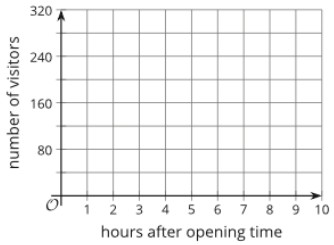
In grade 8, students learned that a function is a rule that assigns exactly one output to each input. They represented functions in different ways—with verbal descriptions, algebraic expressions, graphs, and tables—and used functions to model relationships between quantities, linear relationships in particular. In this unit, students expand and deepen their understanding of functions. They develop new knowledge and skills for communicating about functions clearly and precisely, investigate different kinds of functions, and hone their ability to interpret functions. The unit opens with a refresher on what functions are and what they are not. Students use descriptions, tables, and graphs to reason about the idea of “exactly one output for each input.” Then, students learn that function notation is an efficient way to communicate succinctly about functions and devote some focused time to interpret this new notation and use it. Next, students focus their attention on graphs of functions and on how they help to tell stories about the relationships between the quantities in the functions. Students interpret features of graphs and relate them to features of situations, using terms such as “maximum,” “minimum,” and “intercepts” to describe their observations. Students then go on to take a closer at look at the input and output of a function. They think about possible and reasonable input and output values and learn to identify the domain and range of a function based on contextual and graphical information. Two	**Lesson 3: Interpreting & Using Function Notation** **Cool Down: Visitors in a Museum** An art museum opens at 9 a.m. and closes at 5 p.m. The function V gives the number of visitors in a museum h hours after it opens. 1. Explain what this statement tells us about the situation: $V(1.25) = 28$. 2. Use function notation to represent each statement: a. At 1 p.m., there were 257 visitors in the museum. b. At the time of closing, there were no visitors in the museum. 3. Use the previous statements about the visitors in the museum to sketch a graph that could represent the function.  	HSA-CED.A.4 HSA-REI.A.1 HSA-REI.D.11 HSA-SSE.A.1 HSF-BF.A.1 HSF-BF.A.1.a HSF-BF.B.3 HSF-BF.B.4 HSF-BF.B.4.a HSF-IF.A.1 HSF-IF.A.2 HSF-IF.B HSF-IF.B.4 HSF-IF.B.5 HSF-IF.B.6 HSF-IF.C HSF-IF.C.7 HSF-IF.C.7.b HSN-Q.A HSN-Q.A.2 HSS-ID.B.6 HSS-ID.B.6.a HSS-ID.B.6.c

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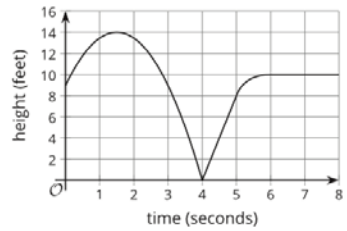
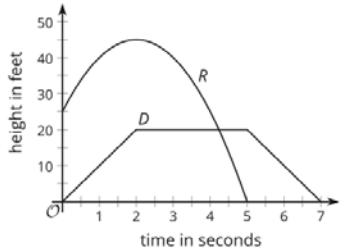
variations of piecewise functions are studied here: step functions and absolute value functions. Later in the unit, students continue to mind inputs and outputs as they explore inverse functions. Students close the unit by applying their insights about functions to model real-world situations and solve problems. In subsequent units and courses, students will use what they learned here to study exponential, quadratic, logarithmic, and periodic functions.	**Lesson 6: Features of Graphs** **Cool Down: The Squirrel** A squirrel runs up and down a tree. The graph shows the height of the squirrel, h (feet), as a function of time, t (seconds).  1. What is the highest point the squirrel reaches? 2. Solve $h(t) = 0$. What does this solution tell you about the squirrel? 3. Find the vertical intercept of the graph. What does it tell you about the squirrel? **Lesson 9: Comparing Graphs** **Cool Down: A Toy Rocket and a Drone Again** Functions R and D give the height, in feet, of a toy rocket and a drone, t seconds after they are released. Here are the graphs of R (for the rocket) and D (for the drone).  1. Which of the inequalities is true: $R(2) > D(2)$ or $R(2) < D(2)$? 2. What was the height of the drone when the toy rocket hit the ground? 3. For what value of t is $R(t) = D(t)$ true? What does this tell you about the drone and the toy rocket?	

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Lesson 12: Piecewise Functions

Cool Down: International Postage

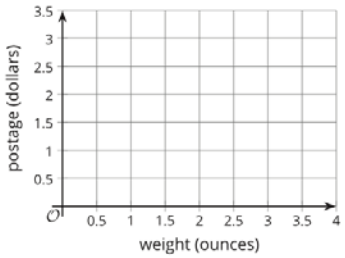
P is a function that gives the cost, in dollars, of mailing a letter from the United States to Mexico in 2018 based on the weight of the letter in ounces, w.

The function is defined by this set of rules:

$$P(w) = \begin{cases} 1.15, & 0 < w \leq 1 \\ 1.72, & 1 < w \leq 2 \\ 2.29, & 2 < w \leq 3 \\ 2.86, & 3 < w \leq 3.5 \end{cases}$$

1. How much does it cost to send a letter that weighs 1.5 ounces? 2 ounces?

2. Sketch a graph of the function on the coordinate plane.



Lesson 14: Absolute Value Functions (Part 2)

Cool Down: Elevations of Places

The term "elevation" is often used to describe the height of a place (such as a city, a mountain, or a valley) compared to sea level. For example, the city of Houston, Texas has an elevation of 105 feet. The surface of the sea has an elevation of 0 feet. Some places are below sea level, so their elevations are negative values.

1. The table shows the elevation, e, of several towns.

e	180	12.1	5.4		-5.4	-36	-180
$f(e)$				0			

Function f gives the vertical distance of each town from sea level. Both e and $f(e)$ are measured in feet. Complete the table of values.

2. Write an equation to represent $f(e)$.

3. Two towns have different elevations, but when the elevations are used as inputs of $f(e)$, they both produce an output of 25.

What are the elevations of the two towns? Why do they produce the same output?

Unit 5: Introduction to Exponential Functions

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Unit Overview	**Model Assignments**	**California State Content Standards Covered in this Unit**
Before starting this unit, students are familiar with linear functions from previous units in this course and from work in grade 8. In this unit, students are introduced to exponential relationships. Students learn that exponential relationships are characterized by a constant quotient over equal intervals, and compare it to linear relationships which are characterized by a constant difference over equal intervals. Students subsequently view these new types of relationships as functions and employ the notation and terminology of functions (for example, dependent and independent variables). They study graphs of exponential functions both in terms of contexts they represent and abstract functions that don't represent a particular context. The context of credit (both in terms of loans and savings) is used through several lessons. In this unit, students learn that the output of an increasing exponential function is eventually greater than the output of an increasing linear function for the same input. In a later unit, students are introduced to quadratic functions. At that time, students will also extend their understanding of exponential functions by how they relate to quadratic functions, understanding that an exponential growth function will eventually exceed both a linear and a quadratic function.	**Lesson 2: Patterns of Growth** **Cool Down: Meow Island and Purr Island** The tables show the cat population on two islands over several years. Describe mathematically, as precisely as you can, how the cat population on each island is changing. year: 0, 1, 2, 3, 4 number of cats on Meow Island: 2, 6, 18, 54, 162 year: 0, 1, 2, 3, 4 number of cats on Purr Island: 2, 6, 10, 14, 18 **Lesson 4: Understanding Decay** **Cool Down: The Depreciating Phone** Suppose that a phone that originally sold for \$800 loses $\frac{3}{5}$ of its value each year after it is released. 1. After 2 years, how much is the phone worth? 2. Write an equation for the value of the phone, p, t years after it is released.	HSF-BF.A HSA-CED.A.2 HSA-SSE.A HSA-SSE.A.1 HSF-BF.A HSF-BF.A.1 HSF-BF.A.1.a HSF-IF.A.2 HSF-IF.B HSF-IF.B.4 HSF-IF.B.5 HSF-IF.B.6 HSF-IF.C.7 HSF-IF.C.7.e HSF-LE.A.1 HSF-LE.A.1.c HSF-LE.A.2 HSF-LE.B.5 HSN-Q.A.1 HSN-Q.A.3 HSS-ID.B.6.a

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Lesson 11: Modeling Exponential Behavior

Cool Down: Drop Height

A ball is dropped from a certain height. The table shows the rebound heights of the ball after a series of bounces.

bounce number	height in centimeters
1	30
2	6
3	1
4	0

From what height, approximately, do you think the ball was dropped? Explain your reasoning.

Lesson 17: Different Compounding Intervals

Cool Down: How Often Is It Calculated?

A savings account pays a 3% nominal annual interest rate and has a balance of $1,000. Any interest earned is deposited into the account and no further deposits or withdrawals are made.

1. Write an expression that represents the balance in one year if interest is compounded annually.
2. If interest is compounded semi-annually (every six months), what interest rate would be used for each calculation?
3. If interest is compounded semi-annually, which expression represents the account balance in t years?
   a. $1{,}000 \cdot (1 + 0.015)^t$
   b. $1{,}000 \cdot \left((1 + 0.015)^2\right)^t$
   c. $1{,}000 \cdot \left((1 + 0.015)^6\right)^t$
   d. $1{,}000 \cdot \left((1 + 0.03)^2\right)^t$

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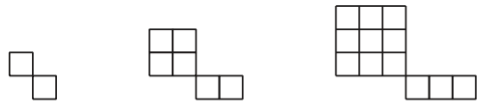
	Lesson 19: Which One Changes Faster? **Cool Down: Which One Gets There First?** The function f is given by $f(x) = 10x + 3$ and the function g is given by $g(x) = 2^x$. For each question, show your reasoning. 1. Which function reaches 50 first? 2. Which function reaches 100 first?	

Unit 6: Introduction to Quadratic Functions		
Unit Overview	**Model Assignments**	**California State Content Standards Covered in this Unit**
Prior to this unit, students have studied what it means for a relationship to be a function, used function notation, and investigated linear and exponential functions. In this unit, they begin by looking at some patterns that grow quadratically. They contrast this growth with linear and exponential growth. They further observe that eventually these quadratic patterns grow more quickly than linear patterns but more slowly than exponential patterns. Students examine the important example of free-falling objects whose height over time can be modeled with quadratic functions. In addition to projectile motion, students examine other situations represented by quadratic functions including area and revenue. Next, students examine the standard and factored forms of quadratic	**Lesson 3: Building Quadratic Functions from Geometric Patterns** **Cool Down: A Quadratic Function?** Here is a pattern of squares.  Step 1 Step 2 Step 3 1. Write an equation to represent the relationship between the step number and the number of squares in the pattern. Briefly describe how each part of the equation relates to the pattern.	HSF-BF.A.1.a HSA-SSE.A HSA-SSE.A.1 HSA-SSE.A.2 HSA-SSE.B.3 HSF-BF.A HSF-BF.A.1 HSF-BF.B.3 HSF-IF.A.2 HSF-IF.B.4 HSF-IF.B.5 HSF-IF.C HSF-IF.C.7 HSF-IF.C.7.a HSF-IF.C.8 HSF-IF.C.8.a HSF-IF.C.9 HSF-LE.A HSF-LE.A.2 HSF-LE.A.3

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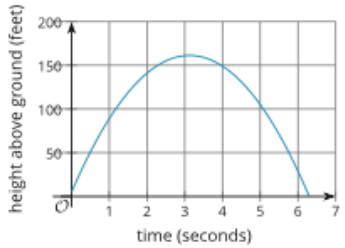
expressions. They investigate how each form is useful for understanding the graph of the function defined by these equivalent forms. Finally, students investigate the vertex form of a quadratic function and understand how the parameters in the vertex form influence the graph.	**Lesson 6: Building Quadratic Functions to Describe Situations (Part 2)** **Cool Down: Rocket in the Air** The height, h, of a stomp rocket (propelled by a short blast of air) above the ground after t seconds is given by the equation $h(t) = 5 + 100t - 16t^2$. Here is a graph that represents h.  1. How does the 5 in the equation relate to the graph? 2. What does $100t$ in the equation mean in terms of the rocket? 3. What does the $-16t^2$ mean in terms of the rocket? 4. About when does the rocket hit the ground?	

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Lesson 9: Standard Form and Factored Form

Cool Down: From One Form to Another

For each expression, write an equivalent expression in standard form. Show your reasoning.

1. $(2x + 5)(x + 1)$

2. $(x - 2)(x + 2)$

Lesson 14: Graphs That Represent Situations

Cool Down: Beach Ball Trajectory

The equation $y = (-16t - 2)(t - 1)$ represents the height in feet of a beach ball thrown by a child as a function of time, t, in seconds.

1. Find the zeros of the function. Explain or show your reasoning.

2. What do the zeros tell us in this situation? Are both zeros meaningful?

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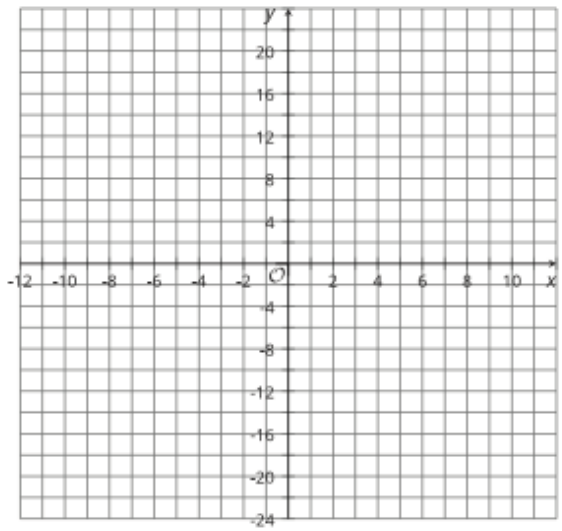
Lesson 16: Graphing from the Vertex Form

Cool Down: Sketching A Graph

1. What are the coordinates of the vertex of the graph defined by $y = (x - 3)^2 + 2$?

2. Find the coordinates of two other points on the graph. Show your reasoning.

3. Sketch a graph that represents the equation.



Unit 7: Quadratic Equations

Unit Overview	**Model Assignments**	**California State Content Standards Covered in this Unit**

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Prior to this unit, students have studied quadratic functions. In this unit, students interpret, write, and solve quadratic equations. They see that writing and solving quadratic equations enables them to find input values that produce certain output values. Students begin solving quadratic equations by reasoning. Next, students learn that equations of the form$(x-m)(x-n)=0$ can be easily solved by applying the zero product property, which says that when two factors have a product of 0, one of the factors must be 0. Students soon recognize that not all quadratic expressions in standard form can be rewritten into factored form. Even when it is possible, finding the right two numbers may be tedious, so another strategy is needed. Students encounter *perfect squares* and notice that solving a quadratic equation is pretty straightforward when the equation contains a perfect square on one side and a number on the other. They learn that we can put equations into this helpful format by *completing the square*, that is, by rewriting the equation such that one side is a perfect square. Although this method can be used to solve any quadratic equation, it is not practical for solving all equations. This challenge motivates the quadratic formula. Once introduced to the formula, students apply it to solve contextual and abstract problems, including those that they couldn't	**Lesson 2: When and Why Do We Write Quadratic Equations?** **Cool Down: The Movie Theatre** A movie theatre models the revenue from ticket sales in one day as a function of the ticket price, p. Here are two expressions defining the same revenue function. $p(120-4p)$ $120p-4p^2$ 1. According to this model, how high would the ticket price have to be for the theater to make $0 in revenue? Explain your reasoning. 2. What equation can you write to find out what ticket price(s) would allow the theater to make $600 in revenue? **Lesson 4: Solving Quadratic Equations with the Zero Product Property** **Cool Down: Solve This Equation!** Find all solutions to $(x+5)(2x-3)=0$. Explain or show your reasoning. **Lesson 9: Solving Quadratic Equations by Using Factored Form** **Cool Down: Conquering More Equations** Solve each equation by rewriting it in factored form and using the zero product property. Show your reasoning. 1. $x^2+12x+11=0$ 2. $x^2-3=1$ 3. $x^2-6x+7=-2$	HSA-CED.A.1 HSA-CED.A.2 HSA-CED.A.3 HSA-REI.A HSA-REI.A.1 HSA-REI.B.4 HSA-REI.B.4.a HSA-REI.B.4.b HSA-REI.C.7 HSA-REI.D HSA-REI.D.10 HSA-SSE.A HSA-SSE.A.2 HSA-SSE.B.3 HSA-SSE.B.3.a HSA-SSE.B.3.b HSF-IF.A.2 HSF-IF.B.4 HSF-IF.B.5 HSF-IF.C HSF-IF.C.7.a HSF-IF.C.8.a HSF-IF.C.9 HSN-Q.A HSN-RN.B HSN-RN.B.3

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previously solve. In the final lesson, students integrate their insights and choose appropriate strategies to solve an applied problem and a mathematical problem (a system of linear and quadratic equations)	**Lesson 12: Completing the Square (Part 1)** **Cool Down: Make It a Perfect Square** 1. What could be added to each expression to make it a perfect square? a. $x^2 + 12x$ b. $x^2 - 6x + 1$ c. $x^2 + 14x - 10$ 2. Solve the equation $x^2 - 16x = -60$ by completing the square. Show your reasoning. **Lesson 24: Using Quadratic Equations to Model Situations and Solve Problems** **Cool Down: Profit from A River Cruise** A travel company uses a quadratic function to model the profit, in dollars, that it expects to earn from selling tickets to a river cruise at d dollars per person. The expression $-d^2 + 100d - 900$ defines this function. Without graphing, find the price that would generate the maximum profit. Then, determine that maximum profit.	