Subject: Math	Grade: 8	Unit #: 3	Title: Thinking with Mathematical Models

UNIT OVERVIEW

<table>
<tr><th colspan="4">STAGE ONE: Identify Desired Results</th></tr>
<tr><td rowspan="11">Established Goals/Standards</td><td rowspan="11">8.EE.5
8.EE.7b
8.EE.8a
8.F.1
8.F.2
8.F.3
8.F.4
8.F.5
8.SP.1
8.SP.2
8.SP.3</td><td colspan="2">Long-Term Transfer Goal</td></tr>
<tr><td colspan="2">At the end of this unit, students will use what they have learned to independently…
Thinking With Mathematical Models (TWMM) is the third unit in which students have an opportunity to explore linear relationships. It follows Variables and Patterns (VP), a focus on algebra, and Moving Straight Ahead (MSA), which built on the algebra skills of Variables and Patterns to focus on linear relationships. In Thinking with Mathematical Models, scholars are formally introduced and provided with the opportunity to develop their understanding of the concept of mathematical models and its applications in problem solving. They will use the algebra skills they obtained in VP and MSA to model real situations and answer questions about these situations.</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>Enduring Understandings
Students will understand that…
Relationships can be modeled with graphs and equations. They will use models to analyze situations and solve problems.
Students will understand that
(linear and non linear relationships)
• Data patterns can be represented using graphs, tables, word descriptions, and algebraic expressions
• The nature of linear functions in context
• Mathematical models can be used to answer questions about linear relationships
• Linear functions can be written using verbal, numerical or graphical information
• Linear equations to solve and analyze
(data analysis)
• Data can be used to make predictions
• A line can be fit to data to show a linear trend and measure closeness of fit
• Scatter plots of bivariate data can be analyzed to determine the</td><td>Essential Questions
Students will consider such questions as…
How can data be approximated by a linear relation?
What is a mathematical model and how can it be used to solve problems?
How can two way tables be used to find associations between variables?</td></tr>
</table>

		strength of the linear association illustrated by scatter plots • (might omit) how to distinguish between categorical and numerical variable	
		Acquisition	
		What knowledge will students learn as part of this unit? What are the key variables in a situation? If there is a pattern relating the variables, is it strong enough to allow predictions to be made? What is the pattern relating the variables? What kind of equation will express the relationship? How can I use the equation to answer questions about the relationship?	*What skills will students learn as part of this unit?* • How to find linear relationships from tables and graphs. • How to write equations using tables, graphs, or descriptions of a linear relationship • Using equations to solve problems • Recognizing and analyzing linear relationships • Comparing linear and nonlinear relationships • Conducting experiments, analyzing data, and writing equations to summarize, or model, the data patterns • Using equations to estimate, or make predictions about, values not in the data set.

STAGE TWO: Determine Acceptable Evidence	
	Assessment Evidence
Criteria for to assess understanding: *(This is used to build the scoring tool.)*	Performance Task focused on Transfer: Unit test
	Other Assessment Evidence: Check ups • Self-assessments of learning targets • Teacher observations • Unit test • Common assessment after investigation 1. We will use Investigation 1 ACE problem #1 as a benchmark task for 8.F.3.

Subject: Math	Grade: 8	Unit #: 3	Title: Thinking with Mathematical Models

Subject: Math Grade: 8 Unit #: 3 Title: Thinking with Mathematical Models

T, M, A *(Code for Transfer, Meaning Making and Acquisition)*	**STAGE THREE: Plan Learning Experiences**	
	Learning Events: Investigation 1: Exploring Data Patterns (3-4 days) Scholars will engage in collecting and analyzing patterns in experimental data and in number sequences. They will experience both linear and nonlinear situations and use mathematical functions as models of patterns and real life situations. Using their understanding of algebra, they will describe the relationships between variables such as bridge length and bridge weight. Using the models created, they will make conjectures about what will happen in real situations. • Problem 1.1: Bridge Thickness and Strength (A) LT: I can describe the relationship between bridge strength and thickness revealed in an experiment. • Problem 1.2: Bridge Length and Strength (A) LT: I can describe the pattern relating bridge strength to bridge length shown in an experiment • Problem 1.3: Custom Construction Parts-Finding patterns (M) LT: I can predict if a pattern between variables will be linear or non linear. Assessment: Check up #1 (1/2 day) Investigation 2: Linear Models and Equations (5-6 days) Scholars will review and extend student understanding and skill in formulating and applying appropriate linear function rules when given problem conditions and/or experimental data. • Problem 2.1: Modeling linear data patterns (A) LT: I can find a linear function that is a good model for a set of data and then measure the accuracy of that model with residuals. • Problem 2.2: Up and down the stair case-exploring slope (M) LT: I can write an equation for a linear function given a graph, table, or two points. • Problem 2.3: Tree Top Fun- equations for linear functions (M) LT: I can use strategies I know to write equations for linear functions	Evidence of learning: *(formative assessment)* • Reflection questions • Ace questions • Class work • Student journals • Teacher observations

	• Problem 2.4: Boat Rental Business- solving linear equations (M) LT: I can determine which strategies are useful to find solutions for linear equations • Problem 2.5: Amusement Park or Movies (M) LT: I can find when the graph of two linear functions intersects and interpret what that intersection point tells us Assessment: Unit Test (1 day)	