Algebra 1 Honors Unit 3: Modeling and Linear Regression

Unit #:	APSDO-00017744	Duration:	5.0 Week(s)	Date(s):	

Team:
Jodi Kryzanski (Author), Tracy Andreana, Sally deGozzaldi, Jennifer Greene, Jeanine LaBrosse, Jaclyn Lawlor, Melinda Litke, Ben Lukowicz, Jennifer Miller, Matthew Mooney, James Murray, Marlaina Napoli, Andrew Riddle, Steven Rivoira, Donna Beaudoin, Nicole Gresh, Steven Muench
Grades:
8, 8 (Honors), 9
Subjects:
Mathematics

Unit Focus

In this unit, Honors students will measure central tendency, the spread of a data set, and identify extreme data points. They will independently construct and interpret scatterplots, identify correlation, and construct viable arguments using data. They will extrapolate and interpolate data to make predictions, generate a line of best fit and a linear regression. They will graph and interpret piece-wise functions. They will model, solve, and interpret problems using linear equations. Graphing calculators will be used to verify results. Honors students will understand which measure of central tendency is appropriate, constraints in equations or inequalities, and the correlation coefficient. Primary instructional materials for this unit include Algebra I, Glencoe/McGraw Hill, 2014. Secondary resources will be added to ensure the complexity, sophistication, and authenticity of the types of problems for our Honors students.

Stage 1: Desired Results - Key Understandings

Established Goals

Common Core
Mathematics: 8

- Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association. *CCSS.MATH.CONTENT.8.SP.A.1*
- Know that straight lines are widely used

Transfer

T1 (T50) Based on an understanding of any problem, initiate a plan, execute it and evaluate the reasonableness of the solution.
T2 (T53) Articulate how mathematical concepts relate to one another in the context of a problem or in the theoretical sense.
T3 (T51) Examine alternate methods to accurately and efficiently solve problems.
T4 (T52) Use appropriate tools strategically to deepen understanding of mathematical concepts.
T5 (T23) Use functions or equations to model relationships among quantities.
T6 (T31) Represent, summarize, and interpret data to clarify and solve problems or to make informed decisions.

Meaning

to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.
CCSS.MATH.CONTENT.8.SP.A.2

- Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?
CCSS.MATH.CONTENT.8.SP.A.4

Mathematics: 9

- Determine an explicit expression, a recursive process, or steps for calculation from a context.
CCSS.MATH.CONTENT.HSF.BF.A.1.A
- 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.
CCSS.MATH.CONTENT.HSN.Q.A.1
- Combine standard function types using arithmetic operations.

Understandings	Essential Questions
U1 (U206) A function can represent how quantities in the real world relate to one another. **U2** (U207) Recognition of predictable mathematical patterns supports the analysis of functional relationships and the prediction of data. **U3** (U502) Effective problem solvers identify and apply an appropriate model, tool, or strategy. **U4** (U521) Evaluating arguments creates clarity about a problem, its model, and the viability of a solution. **U5** (U530) Every problem belongs to a category of problems that has a similar structure and set of characteristics; which means it can be solved using a similar model.	**Q1** (Q205) How can I represent this relationship as a function or equation? (Gr. 6-12) **Q2** (Q208) What function best models the data? How do its characteristics help me make predictions? (Gr. 8-12) **Q3** (Q305) What measurements are appropriate to describe the properties of the data set? **Q4** (Q306) How can I predict future values from a data set? **Q5** (Q502) What is important here? What is not important? **Q6** (Q503) What strategies/approaches are best for this problem? **Q7** (Q520) Does the argument/thought process/logic make sense? **Q8** (Q531) What values, numbers, quantities, and/or symbols can be used to solve a problem? **Q9** (Q533) How do I use the model to solve other problems?

Acquisition of Knowledge and Skill

Knowledge	Skills
	S1 measure central tendency (mean, median, mode) **S2** measure the spread of a data set (range and inter-quartile range) **S3** identify extreme data points (outliers)

CCSS.MATH.CONTENT.HSF.BF.A.1.B • Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. *CCSS.MATH.CONTENT.HSF.IF.C.7.B* • Informally assess the fit of a function by plotting and analyzing residuals. *CCSS.MATH.CONTENT.HSS.ID.B.6.B* • 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. *CCSS.MATH.CONTENT.HSS.ID.A.2* • Compose functions. *CCSS.MATH.CONTENT.HSF.BF.A.1.C* • Fit a linear function for a scatter plot that suggests a linear association. *CCSS.MATH.CONTENT.HSS.ID.B.6.C* • Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). *CCSS.MATH.CONTENT.HSS.ID.A.3* • Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. *CCSS.MATH.CONTENT.HSA.CED.A.3* • For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *CCSS.MATH.CONTENT.HSF.IF.B.4* • Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *CCSS.MATH.CONTENT.HSF.IF.B.5*		**S4** construct and interpret a scatterplot (identify positive, negative, and no correlation) **S5** extrapolate and interpolate data to make predictions **S6** generate a line of best fit and a linear regression line **S7** graph and interpret piece-wise functions **S8** model, solve, and interpret problems using linear equations (using a graph/word problem/data) **S9** use a graphical device to verify results **S10** understand which measure of central tendency is appropriate **S11** understand constraints in equations or inequalities **S12** understand the correlation coefficient **S13**

• 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. *CCSS.MATH.CONTENT.HSF.IF.B.6* • Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. *CCSS.MATH.CONTENT.HSS.ID.C.7* • Compute (using technology) and interpret the correlation coefficient of a linear fit. *CCSS.MATH.CONTENT.HSS.ID.C.8* • Construct viable arguments and critique the reasoning of others. *CCSS.MATH.MP.3* • Make sense of problems and persevere in solving them. *CCSS.MATH.MP.1* • Model with mathematics. *CCSS.MATH.MP.4*		understand appropriate units as they apply to the graph and solution

Stage 2: Assessment Evidence

Performance Task(s)

Coding	Code	Description
	PT1	**Untitled** **Due** Jan. 31, 2015 **Performance Task** Unit 4 Summative Assessment - Honors.docx **Resources** RES1 Unit 4 Summative Assessment - Honors.docx Download File

Stage 3: Learning Plan		
Coding	**Code**	**Description of Learning Activity**