MP1c-Linear Functions

Content Area: **Math**
Course(s): **Algebra 1 Accelerated**
Time Period: **Marking Period 1**
Length: **enVision Chapter 3, 15 days**
Status: **Published**

Essential Questions

- How can linear functions be used to model situations and solve problems?

Big Ideas

Relationships between variables.

- Determine whether a relation is a function.
- Use function notation.
- Use trend lines on scatter plots to make predictions.
- Arithmetic sequences.
- Transform linear functions.
- Determine the line of best fit.

CSDT Technology Integration

8.2.8.ED.1 Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer.

Activity:

Have students make an input output program to determine if its a relation or a function

Diversity Integration

Objective:

The activities in these projects use all five of the NCTM process standards. The context is a real-world connection in a problem-solving format. Analysis involves reasoning with multiple representations of data and

communication of conclusions.

Project III. How is poverty related to School Achievement? Students collect online data for poverty level and achievement level for a random sample of school districts in their state. They construct a scatterplot and a regression equation, and describe this relationship. (Algebra I, Algebra II, Statistics)

Project IV. What Can Be Done? Students are given a number of sources to learn more about poverty. (All)

Activity:

Project III. How is poverty related to School Achievement? Students collect online data for poverty level and achievement level for a random sample of school districts in their state. They construct a scatterplot and a regression equation, and describe this relationship.

Project IV. What Can Be Done? Students are given a number of sources to learn more about poverty.

Enduring Understandings

Functions

8.FA.A.1 Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.

8.FA.A.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 table of values and an algebraic expression, determine which function has the greater rate of change.

8.FA.A.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 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.

8.FA.B.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.FA.B.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.

8.SP.A.1 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.

8.SP.A.2 Know that straight lines are widely used 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 (e.g. line of best fit) by judging the closeness of the data points.

8.SP.A.3 Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.

Interpreting Functions

F.LE.A1a Linear, quadratic, and exponential models. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

F.LE.A1b Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.

- Relations and Functions

F.IF.A2 Use function notation, evaluate functions for inputs in their domains, and interprets statements that use function notation in terms of a context.

- Writing Functions

F.IF.A3 [M] Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by $f(0) = f(1) = 1$, $f(n+1) = f(n) + f(n-1)$ for $n \geq 1$.

- Arithmetic Sequences

F.IF.B4 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.

- Graphing Relationships

F.IF.B5[M] 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 a factory, then the positive integers would be an appropriate domain for the function.

- Graphing Functions

Functions

8.F.A1 [M] Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.

8.F.A2 [M] Compare properties (e.g. rate of change, intercepts, domain and range) 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.A3 [M] 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 $A = s^2$ giving the area of a square as a function of 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.*

8.F.B4 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.B5 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.

Interpreting Categorical and Quantitative Data

S.ID.B6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

- Scatter-Plots and Trend Lines

Mathematical Practices Focus

1. Make sense of problems and persevere in solving them. Pages 89, 118, 126

2. Reason abstractly and quantitatively. Pages 89, 110, 118

3. Construct viable arguments and critique the reasoning of others. Pages 102, 118

4. Model with mathematics. Pages 95, 109

5. Use appropriate tools strategically. Pages 126

6. Attend to precision. Pages 95, 110

7. Look for and make use of structure. Pages 89, 95, 102, 110

8. Look for and express regularity in repeated reasoning. Page 102