



Unit 3: Functions

Subject Area: Mathematics	Course: 8th Grade Math		
Unit Title: Functions	Grade(s): 8	Start: March	End: June
Unit Summary: Define, evaluate, and compare functions; 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; Use functions to model relationships between quantities; Describe and analyze qualitative graphs.			

Stage 1: Desired Results

Massachusetts Learning Standards

Expressions and Equations 8.EE

- B. Understand the connections between proportional relationships, lines, and linear equations.
 - 5. Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.
 - 6. Use similar triangles to explain why the slope m is the same between any two distinct points on a nonvertical line in the coordinate plane. Derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b .
- C. Analyze and solve linear equations and pairs of simultaneous linear equations.
 - 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. Analyze and solve pairs of simultaneous linear equations.



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- 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 (using substitution and elimination strategies), and estimate solutions by graphing the equations. Solve simple cases by inspection.
- c. Solve real-world and mathematical problems leading to two linear equations in two variables.

Functions 8.F

A. Define, evaluate, and compare functions.

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.
2. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
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.

B. Use functions to model relationships between quantities.

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.
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.

Statistics and Probability 8.SP

A. Investigate patterns of association in bivariate data.

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.



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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 by judging the closeness of the data points to the line.
3. Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.
4. 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.

Mathematics Practice

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.

Transfer (Authentic, relevant application of learning to new situations)

Students will be able to independently use their learning to...

Apply functions in order to calculate interest in a real world situation.

Meaning



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Enduring Understandings

Students will understand that...

- Functions can be represented in a variety of ways.
- Different representations can give different information at a glance, serving a different purpose.
- Being able to interpret various representations and analyze the relationships can assist in understanding the independent or dependent values within the relationship and whether there is cause and effect.
- Numbers have meaning. It is important to attach the meaning to values given in the equation and the resulting ordered pairs.
- Many real world functional relationships can be represented by equations. Equations can be used to find the solution of given realworld problems.

Essential Questions

Students will consider...

How can you...

- Use similar triangles to explain why the slope is the same between any two points on a line.
- Graph proportional relationships, interpreting the unit rate as the slope.
- Compare proportional relationships represented in different ways.
- Derive $y = mx$ and $y = mx + b$.
- Show that a linear equation in one variable has one solution, infinitely many solutions, or no solution by transforming the equation into simpler forms.
- Solve multi-step equations.
- Understand that the solution of a system of two linear equations in two variables corresponds to the point of intersection of their graphs.
- Solve systems of two linear equations in two variables graphically and algebraically.
- Solve real-world mathematical problems leading to systems of two linear equations in two variables.
- Understand the definition of a function.
- Compare and write functions represented in different ways (words, tables, graphs).
- Understand that $y = mx + b$ is a linear function and recognize nonlinear functions.
- Interpret the rate of change and initial value of a function.

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Acquisition	
Knowledge Students will know... • Graphing points & 4-Quadrants • Graphing Techniques • Definition of a Function • Understand the 4-ways to represent functions with words, tables, graphing, and rules • Finding ROC from graphs, tables, and graphs. • Introductions to positive, negative, and zero slopes • Launch to graphing an equation using a point and slope. • Goal: to start looking at y-intercept as a starting point for graphing. • Graphing equations using a point and slope for parallel lines. • Graph lines using point and slope. • Graph Parallel Lines • Graph Perpendicular Lines • Graphing from y-intercept • Comparing Linear Graphs • How to write and graph equations written in Standard Form • Writing linear equations from graphs	Skills Students will be skilled at... • Identifying functions using various methods. • Vertical Line Test (Graph) • X cannot repeat with different Ys (Table, Mapping) • Evaluating functions given the input. • Stating domain and range of a relation using inequalities or lists. • Attributing meaning to values in an equation given a situation. • Identifying Independent and Dependent Variables • Represent and describe functions



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| <ul style="list-style-type: none">• Writing equations from two points on a graph and two points in a table• Writing, graphing, and solving linear systems through graphing.• Writing, graphing, and solving linear systems through substitution.• Writing, graphing, and solving linear systems through elimination. | |
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