

SAU 50
Grade 8
Mathematics
Linear Equations, Systems, and Functions

Linear Equations: analyze and solve linear equations.

Functions: an [expression](#) with one or more [variables](#) that relates inputs to outputs.

SAU 50 District Competency:

Students will independently use their learning to make use of structure (mathematical concepts, ideas, and patterns) to describe and compare relationships.

Essential Questions

- How can mathematics be used to model relationships between two quantities?

Acquisition

Students will demonstrate the following to meet the standards.

- I can solve linear equations with rational number coefficients.
- I can solve equations whose solutions require expanding expressions using the distributive property and/or collecting like terms.
- I can give examples of linear equations in one variable with one solution, no solution, or infinitely many solutions.
- I can transform equations into simpler forms until an equivalent equation of the form $x=a$, $a=a$, or $a=b$ where a and b are different numbers.
- I can transform linear equations in two or more variables to express one variable in terms of the others.
- I can solve real world problems leading to two linear equations in two variables.
- I can determine if a system of linear equations is consistent, inconsistent, or dependent.
- I can identify functions using a mapping diagram or the vertical line test.
- I can describe the properties (linear/nonlinear and increasing/decreasing) of functions that are represented algebraically, graphically, numerically in tables, or by verbal descriptions.
- I can compare the properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
- I can give examples of functions that are not linear.
- I can construct a function (graph, table, equation, verbal description) to model a linear relationship between two quantities.

- I can determine the initial value of a function from a description, a graph.
- I can determine the rate of change of a function from a description, a table, or a graph.
- I can write the equation $y = mx + b$ given two points, including those in a table.
- I can interpret the rate of change and the initial value in context when given the situation, a graph or a table.
- Sketch a graph that exhibits the qualitative features of a function given a verbal description.
- I can graph proportional relationships.
- I can calculate the slope of a line from a graph or given two points.
- I can represent linear relationships with a verbal description, table, equation ($y = mx$ and $y = mx + b$) and graph.
- I can compare linear relationships with a verbal description, table, equation ($y = mx$ and $y = mx + b$) and graph.
- I can use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane.
- I can derive an equation of the form $y = mx$ for a line through the origin.
- I can derive an equation of the form $y = mx + b$ for a line intercepting the vertical axis at b (the y-intercept).

Standards

NH College and Career Ready Standards

Key to Standard Notation:

8.EE.1: 8 (grade level) **EE** (domain: Expressions and Equations) and **F** (Functions) **1** (number of the standard)

Expressions and Equations

Understand the connections between proportional relationships, lines, and linear equations.

8.EE.5: Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.

8.EE.6: Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical 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 .

Analyze and solve linear equations and pairs of simultaneous linear equations.

8.EE.7: Solve linear equations in one variable.

8.EE.7.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).

8.EE.7.b: Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

8.EE.8: Analyze and solve pairs of simultaneous linear equations.

8.EE.8.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.

8.EE.8.B Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection.

8.EE.8.c Solve real-world and mathematical problems leading to two linear equations in two variables.

Functions

Define, evaluate, and compare functions.

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

8.F.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.

Use functions to model relationships between quantities.

8.F.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.F.5: Describe qualitatively the functional relationship between two quantities by analyzing a graph (where the function is increasing or decreasing, linear or nonlinear).

[New Hampshire College and Career Ready Standards](#)

References:

National Governors Association Center for Best Practices, Council of Chief State School Officers. (2010). *Common Core Standards for Mathematics* (United States, National Governors Association Center for Best Practices, Council of Chief State School Officers). Retrieved August 10, 2016, from http://www.corestandards.org/assets/CCSSI_Math%20Standards.pdf

Math is fun/definitions. (n.d.). Retrieved April 17, 2017, from <http://www.mathisfun.com/definitions>