

Functions

Students who study functions are learning to answer the questions

In what ways can functional relationships be represented?

What types of situations can be modeled with a quadratic function?

What types of situations can be modeled with an exponential function?

This unit of study addresses Indiana College & Career Ready Standards as follows:

8.AF.3: Understand that a function assigns to each x -value (independent variable) exactly one y -value (dependent variable), and that the graph of a function is the set of ordered pairs (x,y) .

8.AF.4: Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear, has a maximum or minimum value). Sketch a graph that exhibits the qualitative features of a function that has been verbally described.

8.AF.7: Compare properties of two linear functions given in different forms, such as a table of values, equation, verbal description, and graph (e.g., compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed).

AI.F.1: Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. Understand that if f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x . Understand the graph of f is the graph of the equation $y = f(x)$.

AI.F.2: Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear, has a maximum or minimum value). Sketch a graph that exhibits the qualitative features of a function that has been verbally described. Identify independent and dependent variables and make predictions about the relationship.

AI.F.3: Identify the domain and range of relations represented in tables, graphs, verbal descriptions, and equations.

AI.L.10: Graph absolute value linear equations in two variables.

AI.QE.1: Distinguish between situations that can be modeled with linear functions and with exponential functions. Understand that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. Compare linear functions and exponential functions that model real-world situations using tables, graphs, and equations.

AI.QE.2: Represent real-world and other mathematical problems that can be modeled with exponential functions using tables, graphs, and equations of the form $y = ab^x$ (for integer values of $x > 1$, rational values of $b > 0$ and $b \neq 1$); translate fluently among these representations and interpret the values of a and b .

A1.QE.3: Graph exponential and quadratic equations in two variables with and without technology.

Gaining skills in this unit will enable students to do everyday tasks like calculating bank interest, power washing a tall wall, or analyzing distance, rate, and time for a car trip. The specific skills in this unit of study include

- defining functions
- understanding graphs of functions
- graphing absolute value functions
- graphing rational functions
- graphing quadratic functions
- writing quadratic functions in vertex form
- graphing cubic functions
- graphing exponential functions
- graphing piecewise and step functions
- writing inverse functions
- investigating new functions