

Points of Emphasis in M201

Whereas a typical instructional unit on functions might begin with a focus on students visualizing relations and functions, in M201, students should:

- collaboratively explore the graphs of functions (linear, quadratic, exponential, logarithmic, square root, cube root, polynomial, and piecewise-defined functions, including step functions and absolute value functions) with opportunities to discuss and gain deep understanding of the key features of each of the graphs (LP 2).
- communicate their understanding of functions and the relationship between domain and range (LP 3).
- examine the structure of equivalent forms of an expression representing a function to gain insights about the different properties of functions (LP 3).
- regularly encounter real-world tasks involving functions (LP 1) that require them to make sense of multiple representations and how they relate to each other—verbal, algebraic, numerical, graphical (LP 3).
- be able to choose tasks that are organized around different scientific, social, or other topics, allowing students to have agency in their learning (LP 4).
- frequently collaborate, share their solution methods, and make their thinking visible (LP 2).
- regularly engage with tasks that focus on understanding and reasoning about different representations—verbal, algebraic, numerical, graphical. As examples, students should engage with the following:
 - Analyze and explain the relationship between parameters in a function and the features of its graph to graph a function (LP 3).
 - Reason about and recognize that sequences are functions (LP3).
 - Reason about and explain the real-world meaning of key features of a graph.
 - Make connections between the different representations of a situation.
 - Compare properties of two functions each given in a different representation (LP 3).
- use open-ended tasks to interpret data, analyze graphs, and reason about the context (LP 3).
- have opportunities to use reasoning to relate the algebraic form of a function to its graph and key features (LP 3).
- have opportunities to share their reasoning with partners or in groups, allowing for practice sharing, critiquing, and revising their arguments and including social interaction as part of the learning process (LP 2).

Students should also be given opportunities to understand and reflect on the ways that functions can authentically involve real-world situations (LP 6).

Often, coursework with functions is focused on performing computations by hand. Instead, students should be given frequent opportunities to:

- use spreadsheets and graphing software to allow for focus on understanding the effect on the graph when replacing $f(x)$ by $f(x) + k$, $k f(x)$, and $f(x + k)$ for specific values of k , seeing patterns, forming generalizations, and testing conclusions (LP 7).