Mini-Map for M.EE.HS.F.IF.4-6

Subject: Mathematics
Functions—Interpreting Functions (F.IF)
Grade: 11

Learning Outcome

DLM Essential Element	Grade-Level Standard
M.EE.HS.F.IF.4-6 Construct graphs that represent linear functions with different rates of change and interpret which is faster/slower, higher/lower, etc.	**M.F.IF.4** 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. **M.F.IF.5** 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. **M.F.IF.6** Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.

Linkage Level Descriptions

Initial Precursor	Distal Precursor	Proximal Precursor	Target	Successor
Arrange objects in a specific order (e.g., smallest to largest). Form a pair by putting together two objects (e.g., putting together a pencil and a ruler).	Communicate understanding that a coordinate pair (ordered pair) is a set of numbers used to show a position on a graph. The first number, "*x*," or	Recognize covariation as the pattern in which two variables or quantities change together. Recognize the direction in which two variables change	Communicate whether a linear function graph has an increasing, decreasing, or constant rate of change. Compare two functions with different rates of	Solve real-world problems by interpreting linear function graphs. Compare rates of change, *x*- and *y*-intercepts, direction of

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	the x-coordinate in the coordinate pair (*x*, *y*), represents *x* units left or right on the *x*-axis. The second number, "*y*," or the *y*-coordinate, represents *y* units up or down on the *y*-axis [e.g., (4, 8) represents 4 units right on the *x*-axis and 8 units up on the *y*-axis].	together (e.g., as *x* increases, *y* decreases). Describe the rate of change in a function graph by quantifying covariation between two variables (e.g., as *x* increases by 2 units, *y* decreases by 3 units).	change to communicate which function is faster or slower, higher or lower.	change (covariation), or overall shape of two linear functions represented graphically.

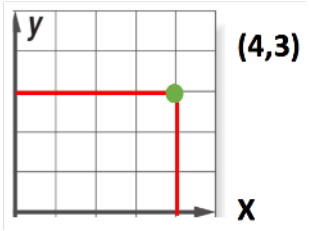
Initial Precursor and Distal Precursor Linkage Level Relationships to the Target

How is the Initial Precursor related to the Target?

In order to construct graphs that represent a linear function, students begin by learning to notice what is new. The educator draws the students' attention to new objects or stimuli, labels them (e.g., “this set has all red objects; this set has all blue”, “these fidgets are big; these fidgets are small”), and the student observes, feels, or otherwise interacts with them. Educators encourage students to begin placing like objects together, drawing attention to the characteristics that make an item the same or different. Educators provide sorting activities that allow learners to isolate specific attributes while recognizing likenesses and differences among objects. Educators also provide activities that reinforce the skill of ordering (e.g., arrangement of objects from largest to smallest, sequencing daily events, and counting).

How is the Distal Precursor related to the Target?

As students' attention to objects and details develops, educators can extend their attention by providing experience with finding and creating simple patterns using objects and moving to symbols (e.g., numerals). Educators should take care to start with simple patterns (e.g., 1-2-1-2) and take advantage of the symbols that are already being used in the classroom. Educators should demonstrate how students can create and identify the pattern/rule (e.g., using colored cubes, the student creates a line of 5 cubes; the educator then creates a matching set and explains what to do to follow the student's pattern. Then, the student generates a third matching set. If the order is not followed, it is a good teaching opportunity to talk about why it doesn't fit the pattern). Learning to identify the rule of patterns will help students extend their thinking across patterns. As students are working on identifying pattern rules, educators can also begin to demonstrate how rules can be used with ordered pairs. Provide students lots of opportunities to apply rules to create their own examples of ordered pairs. Educators should demonstrate how students can use their counting skills to figure out where to mark the point by counting how far along and how far up the *x*- and *y*-axes.



Instructional Resources

Released Testlets
See the Guide to Practice Activities and Released Testlets.
Using Untested (UN) Nodes
See the document Using Mini-Maps to Plan Instruction.

Link to Text-Only Map

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