Content Area: Math Grade Level: HS Algebra

Reporting Measure: Combining Functions

Level	Description
Above & Beyond (4.0)	The student will: • Use combinations of functions to model and solve real-world problems and identify any mathematical or real-world constraints on the model (for example, given that the current output of a copper mine is $10,000$ pounds of copper per year and is growing at a rate of $\sqrt[3]{t}$ in which t is the number of years from the present, and given that the current price for copper of \$3 per pound is expected to grow at a rate of $10\% - 20\%$ per year, create a graph that can be used to find the projected income of the mine for any given year in the future).
3.5	In addition to score 3.0 performance, partial success at score 4.0 content
Proficient (3.0)	The student will: **CBF1—Evaluate the outputs of combined functions** (for example, for two given functions $f(x)$ and $g(x)$, calculate the value of $(f + g)(x)$, $(f \cdot g)(x)$, and $(f \circ g)(x)$ for given values of x). **CBF2—Use the graphs of functions to find solutions to systems of equations and inequalities** (for example, for a given system of inequalities, identify the solution to the system by graphing the functions that correspond to the inequalities, shading the appropriate areas of the graph, and identifying the regions in which the shaded areas overlap).
2.5	No major errors or omissions regarding score 2.0 content, and partial success at score 3.0 content
Getting There (2.0)	**CBF1—**The student will recognize or recall specific vocabulary (for example, *composition of functions*, *function definition*) and perform basic processes such as: • Calculate the output value of a function for a given input value. • Interpret combined function notation. For example, $(f + g)(x) = f(x) + g(x)$, $(f - g)(x) = f(x) - g(x)$, $(f \cdot g)(x) = f(x) \cdot g(x)$, and $\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}$. • Explain that $\left(\frac{f}{g}\right)(x)$ is undefined for values of x for which $g(x) = 0$. • Explain that in a composition of functions, the output of a function serves as the input of a separate function. **CBF2—**The student will recognize or recall specific vocabulary (for example, *system of equations*, *system of inequalities*) and perform basic processes such as: • Explain that the point (x, y) at which the graphs of two functions intersect represents a specific input x for which both functions produce the same output y. • Explain that the input value x for which two given functions $f(x)$ and $g(x)$ both produce the same output is the solution to the equation $f(x) = g(x)$. • Use the graphs of two given intersecting functions $f(x)$ and $g(x)$ to identify the values of the input for which $f(x) = g(x)$. • Explain that an inequality can be graphed by graphing the function that corresponds to the inequality and shading the appropriate areas of the graph. For example, the inequality $y \leq x$ can be graphed by graphing the corresponding function $f(x) = x$ and shading both the graph of the function and the area below it.

	• Explain that a system of equations or inequalities can be solved by graphing the functions that correspond to each equation or inequality and identifying their point(s) of intersection. For example, the system that includes the equations $y = 2x + 2$ and $y = x - 1$ can be solved by graphing the corresponding functions $f(x) = 2x + 2$ and $g(x) = x - 1$ and identifying that the graphs of the functions intersect at the point at which $x = -3$ and $y = -4$.
1.5	Partial success at score 2.0 content, and major errors or omissions regarding score 3.0 content
Beginning (1.0)	With help, partial success at score 2.0 content and score 3.0 content