Algebra 2

ELG HS.F.1: **Understand the concept of a function and use function notation.**

Vertical Progression:

8th Grade	**8.F.A Define, evaluate, and compare functions** o **8.F.A.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.
Algebra 1	**ELG.MA.HS.F.1 Understand the concept of a function and use function notation.** o **F-IF.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. 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. The graph of f is the graph of the equation y = f(x). o **F-IF.2** Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. o **F-IF.3** Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, the Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1) for n ≥ 1.* Note: Functions may include linear, quadratic, exponential, polynomial (quadratic or cubic), square root, cube root, and piecewise-defined functions (including step and absolute value).
Algebra 2	**ELG.MA.HS.F.1 Understand the concept of a function and use function notation.** o **F-IF.3** Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, the Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1) for n ≥ 1.* Note: Functions may include linear, quadratic, exponential, polynomial, square root, cube root, and piecewise defined (including step and absolute value).

Students will demonstrate command of the ELG by:

- Writing sequences as functions.
- Explaining that a recursive formula tells how a sequence starts and explaining how to use the previous value(s) to generate the next element of the sequence.
- Explaining that an explicit formula allows them to find any element of a sequence without knowing the element before it.
- Distinguishing between explicit and recursive formulas for sequences.

Note: Functions may include linear, quadratic, exponential, polynomial, square root, cube root, and piecewise defined (including step and absolute value).

Vocabulary:

- domain
- function
- recursively
- sequence

Sample Instructional/Assessment Tasks:

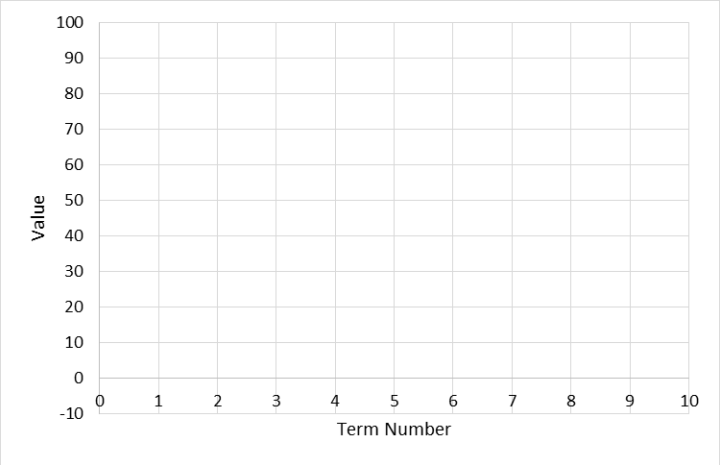
1) **Standard(s): F-IF.4**

Source: Jonathan Mattes-Ritz

Item Prompt:

Given the sequence: -2 , 1 , 6 , 13 , 22 , 33 , 46 , 61 , 78 , 97 …

a. Plot the sequence on the grid below.
b. Sketch a line or curve of fit for the sequence.
c. Write a function, f(n), for your line or curve.
d. Verify that your function produces the sequence.
e. Use your function to find the 20th term, f(20).

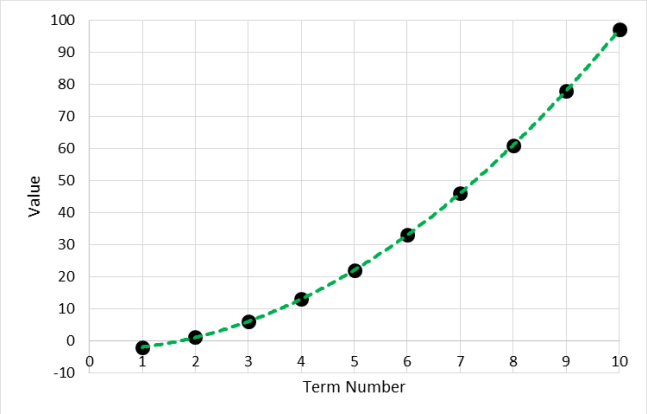


Correct Answers:

a. See picture below
b. See picture below
c. $f(n) = n^2 - 3$
d. Students should check at least 2 values with their function.
e. $f(n) = n^2 - 3$
$f(20) = (20)^2 - 3$

$f(20) = 400 - 3$

$f(20) = 397$



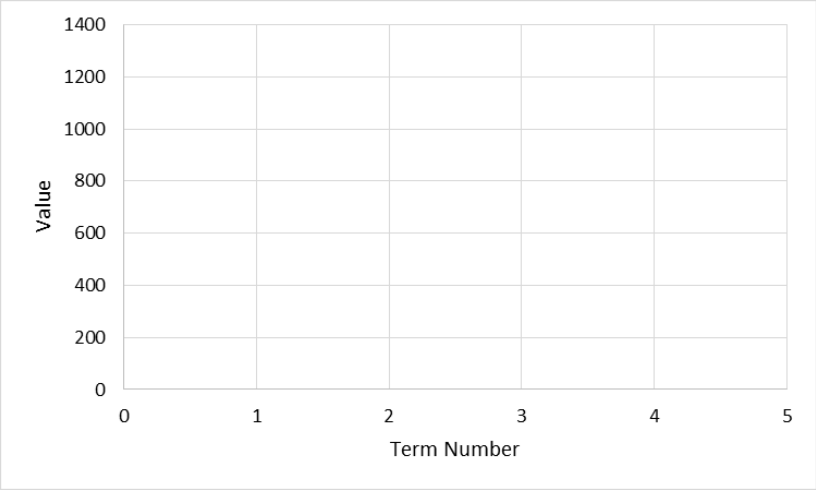
2) Standard(s): F-IF.4

Source: Jonathan Mattes-Ritz

Item Prompt:

Given the recursive formula: $\begin{cases} g_1 = 5 \\ g_n = g_{n-1} \cdot 4, n > 1 \end{cases}$

a. Write the first 5 terms of the sequence.
b. Plot the first 5 terms on the grid below.
c. Sketch a line or curve of fit for the sequence.
d. Write a function, g(n), for your line or curve.
e. Verify that your function produces the sequence.
f. Use your function to find the 10th term, g(10).



Correct Answer:

a. 5 , 20 , 80 , 320 , 1280 …
b. See picture below.
c. See picture below.
d. $g(n) = 5 \cdot 4^{(n-1)}$
e. Students should check at least 2 values with their function.
f. $g(n) = 5 \cdot 4^{(n-1)}$

$g(n) = 5 \cdot 4^{((10)-1)}$

$g(n) = 5 \cdot 4^{(9)}$

$g(n) = 5 \cdot 262144$

$g(n) = 1310720$