LESSON MAKER PRO

Sequence Signal

Use rules, terms, and domains to read sequences as functions.

HIGH SCHOOL · HSF-IF.A.3

CCSS.Math.Content.HSF-IF.A.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."

NAME _____ DATE _____

THE BIG IDEA

A sequence is a function that gives exactly one output for each allowed integer input, often called a term number. Its domain may start at 0, 1, or another integer, and it may stop after a set number of terms. In a recursive rule, use the starting value or values and the rule to generate the next terms in order.

WORKED EXAMPLE

The sequence r is defined by r(20) = 101 and r(n + 1) = r(n) + 17 for n >= 20. Find r(23).

1. Start with r(20) = 101.
2. r(21) = 101 + 17 = 118.
3. r(22) = 118 + 17 = 135.
4. r(23) = 135 + 17 = 152.

Answer: r(23) = 152

PRACTICE 6 problems

1 The sequence a is defined by a(0) = 3 and a(n + 1) = a(n) + 4 for n >= 0. List the first five terms, from a(0) through a(4).

ANSWER _____

2 The sequence b is defined by b(1) = 2 and b(n) = 3b(n - 1) for n >= 2. List b(1), b(2), b(3), and b(4).

ANSWER _____

3 The rule $c(n) = n^2 + 1$ has domain {-2, -1, 0, 1, 2}. Is c a function? Why?

ANSWER _____

4 The sequence d is defined by d(n) = 5n - 1, where n is a nonnegative integer. Find d(4).

ANSWER _____

5 A sequence is shown by p(3) = 8, p(4) = 6, p(5) = 4, and p(6) = 2. State the domain and range.

ANSWER _____

6 The sequence q is defined by q(0) = 1, q(1) = 1, and q(n + 2) = q(n + 1) + q(n) for n >= 0. Find q(5).

ANSWER _____

APPLY IT Show your work

1 A student posts a short video for a 6-day school spirit challenge. It gets 12 views on day 1, and the number of views is 6 more each day. Let v(n) be the views on day n. Write a recursive rule, find v(6), and state the domain for this situation.

WORK SPACE

ANSWER

2 In a gaming tournament, a player earns 4 points in round 1. The points earned in each new round are double the points earned in the previous round. Let s(n) be the points earned in round n. Write a recursive rule and list the points earned in the first five rounds.

WORK SPACE

ANSWER

CHALLENGE One step up

The sequence w is defined by $w(-2) = 7$ and $w(n + 1) = w(n) - 3$ for integers $n \geq -2$. Does this stated definition specify an output for every integer? Explain; distinguish the given definition from a possible extension.

WORK SPACE AND ANSWER

Sequence Signal

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	The sequence a is defined by a(0) = 3 and a(n + 1) = a(n) + 4 for n >= 0. List the first five terms, from a(0) through a(4).	**3, 7, 11, 15, 19**
2	The sequence b is defined by b(1) = 2 and b(n) = 3b(n - 1) for n >= 2. List b(1), b(2), b(3), and b(4).	**2, 6, 18, 54**
3	The rule c(n) = n^2 + 1 has domain {-2, -1, 0, 1, 2}. Is c a function? Why?	**Yes. Each input in the domain has exactly one output.**
4	The sequence d is defined by d(n) = 5n - 1, where n is a nonnegative integer. Find d(4).	**19**
5	A sequence is shown by p(3) = 8, p(4) = 6, p(5) = 4, and p(6) = 2. State the domain and range.	**Domain: {3, 4, 5, 6}; range: {2, 4, 6, 8}**
6	The sequence q is defined by q(0) = 1, q(1) = 1, and q(n + 2) = q(n + 1) + q(n) for n >= 0. Find q(5).	**8**

PART 2 · APPLY IT

1. **v(1) = 12, v(n + 1) = v(n) + 6 for n >= 1; v(6) = 42; domain: {1, 2, 3, 4, 5, 6}** Begin with 12 and add 6 for each new day. The situation includes only the six whole-number day inputs from 1 through 6.
2. **s(1) = 4, s(n + 1) = 2s(n) for n >= 1; 4, 8, 16, 32, 64** Start with 4 points and multiply by 2 to get each next term. The first five round numbers form the domain {1, 2, 3, 4, 5}.

CHALLENGE

No. The stated definition specifies inputs -2, -1, 0, 1, … only. It does not specify values below -2. One could extend the rule backward, but that would add to the given definition.

Accept equivalent recursive notation that clearly gives the same starting term and update rule. For domain and range answers, accept set notation or correctly listed integer inputs and outputs.