LESSON MAKER PRO

Sequence Builders

Turn changing quantities into sequence functions.

HIGH SCHOOL · MA.912.AR.10.5

MA.912.AR.10.5 "Given a mathematical or real-world context, write a sequence using function notation, defined explicitly or recursively, to represent relationships between quantities from a written description."

NAME _____ DATE _____

WRITE THE RULE

Let f(n) represent the value at term number n. For a constant add or subtract change, use an explicit rule with the common difference. For a constant multiply change, use a recursive rule that connects each term to the term before it.

WORKED EXAMPLE

A plant is 7 cm tall in week 1 and grows 5 cm each week. Write an explicit function for its height h(n).

1. The first value is 7, so h(1) = 7.
2. The height increases by 5 each week.
3. Use first value + change times the number of changes.
4. h(n) = 7 + 5(n - 1), for n >= 1.

Answer: h(n) = 7 + 5(n - 1), for n >= 1

PRACTICE 6 problems

1 The first term of a sequence is 14. Each new term is 3 less than the term before it. Write an explicit function f(n).

ANSWER _____

2 A player earns 9 tokens at level 1. At each new level, the number of tokens doubles. Write a recursive function f(n).

ANSWER _____

3 A sequence begins with 18 at term 1. Each term is 4 less than the previous term. Write a recursive function g(n).

ANSWER _____

4 On day 1, a student reads 12 pages. Each day, the student reads 6 more pages than the day before. Write an explicit function p(n) for pages read on day n.

ANSWER _____

5 A sequence starts at 64. Each term is one-half of the previous term. Write a recursive function q(n).

ANSWER _____

6 A game score is 81 points in round 1. In each later round, the score is one-third of the previous round's score. Write an explicit function s(n).

ANSWER _____

APPLY IT Show your work

1 On the first Friday of a month, Jordan has saved $30 for headphones. Each following Friday, Jordan adds $8 to the savings. Let S(n) be the total saved on Friday n. Write an explicit function for S(n).

WORK SPACE

ANSWER _____

2 A student posts a video that receives 6 views in its first hour. The number of views received in each later hour is 3 times the number received in the hour before. Let V(n) be the views received in hour n. Write a recursive function for V(n).

WORK SPACE

ANSWER _____

CHALLENGE One step up

A gaming club has 24 members in month 1. Each month, 6 new members join. Every member pays $4 in monthly dues. Let R(n) be the club's total dues collected in month n. Write both an explicit and a recursive function for R(n). Then explain why the recursive rule increases by 24 rather than by 6.

WORK SPACE AND ANSWER

ANSWER KEY # Sequence Builders

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	The first term of a sequence is 14. Each new term is 3 less than the term before it. Write an explicit function f(n).	**f(n) = 14 - 3(n - 1), for n >= 1**
2	A player earns 9 tokens at level 1. At each new level, the number of tokens doubles. Write a recursive function f(n).	**f(1) = 9; f(n) = 2*f(n - 1), for n >= 2**
3	A sequence begins with 18 at term 1. Each term is 4 less than the previous term. Write a recursive function g(n).	**g(1) = 18; g(n) = g(n - 1) - 4, for n >= 2**
4	On day 1, a student reads 12 pages. Each day, the student reads 6 more pages than the day before. Write an explicit function p(n) for pages read on day n.	**p(n) = 12 + 6(n - 1), for n >= 1**
5	A sequence starts at 64. Each term is one-half of the previous term. Write a recursive function q(n).	**q(1) = 64; q(n) = (1/2)*q(n - 1), for n >= 2**
6	A game score is 81 points in round 1. In each later round, the score is one-third of the previous round's score. Write an explicit function s(n).	**$s(n) = 81*(1/3)^{(n - 1)}$, for n >= 1**

PART 2 · APPLY IT

1. **S(n) = 30 + 8(n - 1), for n >= 1** The savings begin at 30 and increase by 8 each Friday. Use the arithmetic-sequence form first value + difference(n - 1).
2. **V(1) = 6; V(n) = 3*V(n - 1), for n >= 2** The first-hour value is 6. Since each hour's views are triple the prior hour's views, multiply the previous term by 3.

CHALLENGE

Explicit: R(n) = 96 + 24(n - 1), for n >= 1. Recursive: R(1) = 96; R(n) = R(n - 1) + 24, for n >= 2. The club gains 6 members, and each pays $4, so monthly dues increase by 6*4 = 24 dollars.

Accept equivalent explicit forms, such as f(n) = 17 - 3n for the first problem. Recursive rules must include a correct initial value and a valid domain.