

Recursive Rule Run

Build terms, apply rules, and solve a challenge.

HIGH SCHOOL • MA.912.LT.1.2

MA.912.LT.1.2 "Solve problems involving recurrence relations."

NAME _____

DATE _____

BUILD ONE TERM AT A TIME

A recurrence relation gives each term from an earlier term. Begin with the initial value, then use the rule in order to generate the terms you need.

WORKED EXAMPLE

Given $t_0=11$ and $t_n=4t_{(n-1)}+5$ for $n \geq 1$, find t_3 .

1. $t_1=4(11)+5=49$

2. $t_2=4(49)+5=201$

3. $t_3=4(201)+5=809$

Answer: $t_3=809$

PRACTICE 6 problems

- 1** Given $a_1=9$ and $a_n=a_{(n-1)}+7$ for $n \geq 2$, find a_5 .

ANSWER _____

- 2** Given $b_1=81$ and $b_n=b_{(n-1)}/3$ for $n \geq 2$, find b_4 .

ANSWER _____

- 3** Given $c_1=-4$ and $c_n=c_{(n-1)}+6$ for $n \geq 2$, find c_5 .

ANSWER _____

- 4** Given $d_1=5$ and $d_n=3d_{(n-1)}$ for $n \geq 2$, find d_4 .

ANSWER _____

- 5** Given $e_1=48$ and $e_n=e_{(n-1)}/2$ for $n \geq 2$, find e_5 .

ANSWER _____

- 6** Given $f_1=2$ and $f_n=f_{(n-1)}+3n$ for $n \geq 2$, find f_4 .

ANSWER _____

APPLY IT Show your work

- 1** A student has \$18 in a festival fund. At the end of each week, they add \$12. Let $F_0=18$ and $F_n=F_{(n-1)}+12$. How much money is in the fund after 7 weeks?

WORK SPACE

ANSWER _____

- 2** A player begins an online game with 10 points. After each completed round, the player's points double and then 3 bonus points are added. Let $P_0=10$ and $P_n=2P_{(n-1)}+3$. How many points does the player have after 4 rounds?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

For $u_1=2$ and $u_n=3u_{(n-1)}+2$ for $n \geq 2$, find u_6 without listing u_2 through u_5 . Explain your reasoning.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Given $a_1=9$ and $a_n=a_{(n-1)}+7$ for $n \geq 2$, find a_5 .	$a_5=37$
2	Given $b_1=81$ and $b_n=b_{(n-1)}/3$ for $n \geq 2$, find b_4 .	$b_4=3$
3	Given $c_1=-4$ and $c_n=c_{(n-1)}+6$ for $n \geq 2$, find c_5 .	$c_5=20$
4	Given $d_1=5$ and $d_n=3d_{(n-1)}$ for $n \geq 2$, find d_4 .	$d_4=135$
5	Given $e_1=48$ and $e_n=e_{(n-1)}/2$ for $n \geq 2$, find e_5 .	$e_5=3$
6	Given $f_1=2$ and $f_n=f_{(n-1)}+3n$ for $n \geq 2$, find f_4 .	$f_4=29$

PART 2 • APPLY IT

1. **\$102** Apply the rule for 7 weeks. $F_7=18+7(12)=102$.
2. **205 points** Generate the values in order: $P_1=23$, $P_2=49$, $P_3=101$, and $P_4=205$.

CHALLENGE

$u_6=728$. Let $v_n=u_n+1$. Then $v_n=3v_{(n-1)}$ and $v_1=3$, so $v_6=3^6=729$. Therefore, $u_6=728$.

Accept correctly generated intermediate terms and equivalent numerical forms. For the challenge, accept any valid explanation that shows the transformation u_n+1 or an equivalent method.