F.LE.A.2: Sequences 2b

1. In 2014, the cost to mail a letter was 49¢ for up to one ounce. Every additional ounce cost 21¢. Which recursive function could be used to determine the cost of a 3-ounce letter, in cents?

2. A sunflower is 3 inches tall at week 0 and grows 2 inches each week. Which function(s) shown below can be used to determine the height, \( f(n) \), of the sunflower in \( n \) weeks?
   I. \( f(n) = 2n + 3 \)
   II. \( f(n) = 2n + 3(n - 1) \)
   III. \( f(n) = f(n - 1) + 2 \) where \( f(0) = 3 \)

3. Which recursively defined function has a first term equal to 10 and a common difference of 4?

4. After Roger’s surgery, his doctor administered pain medication in the following amounts in milligrams over four days.

<table>
<thead>
<tr>
<th>Day (n)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dosage (m)</td>
<td>2000</td>
<td>1680</td>
<td>1411.2</td>
<td>1185.4</td>
</tr>
</tbody>
</table>

How can this sequence best be modeled recursively?

5. If the pattern below continues, which equation(s) is a recursive formula that represents the number of squares in this sequence?

6. A pattern of blocks is shown below.

If the pattern of blocks continues, which formula(s) could be used to determine the number of blocks in the \( n \)th term?

<table>
<thead>
<tr>
<th>I</th>
<th>II</th>
<th>III</th>
</tr>
</thead>
<tbody>
<tr>
<td>( a_n = n + 4 )</td>
<td>( a_1 = 2 )</td>
<td>( a_n = 4n - 2 )</td>
</tr>
<tr>
<td>( a_n = a_{n-1} + 4 )</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
7 The sequence \( a_1 = 6, a_n = 3a_{n-1} \) can also be written as

8 Which function could be used to represent the sequence 8, 20, 50, 125, 312.5, …, given that \( a_1 = 8? \)

9 A recursive formula for the sequence 18, 9, 4.5, … is

10 Write an explicit formula for \( a_n \), the \( n \)th term of the recursively defined sequence below.

\[
\begin{align*}
    a_1 &= x + 1 \\
    a_n &= x(a_{n-1})
\end{align*}
\]

For what values of \( x \) would \( a_n = 0 \) when \( n > 1? \)

11 Which recursively defined function represents the sequence 3, 7, 15, 31, …?

12 Write a recursive formula, \( a_n \), to describe the sequence graphed below.

13 While experimenting with her calculator, Candy creates the sequence 4, 9, 19, 39, 79, … Write a recursive formula for Candy’s sequence. Determine the eighth term in Candy’s sequence.
F.L.E.A.2: Sequences 2b
Answer Section

1 ANS:
\[ a_1 = 49; \quad a_n = a_{n-1} + 21 \]
REF: 011708ai

2 ANS:
I and III
REF: 061421ai

3 ANS:
\[ f(1) = 10 \]
\[ f(x) = f(x - 1) + 4 \]
REF: 081514ai

4 ANS:
\[ m_1 = 2000 \]
\[ m_n = (0.84)m_{n-1} \]
REF: 081909aii

5 ANS:
\[ a_1 = 3 \]
\[ a_n = a_{n-1} + 2 \]
REF: 011818ai

6 ANS:
II and III
REF: 061522ai

7 ANS:
\[ a_n = 2 \cdot 3^n \]
REF: 081618aii

8 ANS:
\[ a_n = 2.5\left(a_{n-1}\right) \]
REF: 011919ai
9 ANS:
\[ g_1 = 18 \]
\[ g_n = \frac{1}{2} g_{n-1} \]

(2) is not recursive

REF: 081608aii

10 ANS:
\[ a_n = x^{n-1}(x+1) \]
\[ x^{n-1} = 0 \quad x + 1 = 0 \]
\[ x = 0 \quad x = -1 \]

REF: spr1511aii

11 ANS:
\[ f(1) = 3, \quad f(n+1) = 2f(n) + 1 \]

REF: 011618ai

12 ANS:
\[ a_1 = 4 \]
\[ a_n = 3a_{n-1} \]

REF: 081931aii

13 ANS:
\[ a_1 = 4 \quad a_8 = 639 \]
\[ a_n = 2a_{n-1} + 1 \]

REF: 081729aii