Advanced Algebra

CHAPTER 2

LINEAR EQUATIONS AND FUNCTIONS

Name ______________________________

Period ______ Date ____________________

Arithmetic Sequences: Recursive Formulas

In 1–4, find the next three terms of each arithmetic sequence. Then write its recursive formula.

1. 3, 10, 17, 24, …

2. 11, 8, 5, 2, …

3. 31, 19, 7, −5, …

4. −17, −11, −5, 1, …

In 5–8, find the first four terms of each arithmetic sequence.

5. $\begin{cases} f(n) = f(n-1) + 5 \\ f(1) = -2 \end{cases}$

6. $\begin{cases} f(n) = f(n-1) - 1.5 \\ f(1) = 10 \end{cases}$

7. $\begin{cases} f(n) = f(n-1) - 11 \\ f(1) = 27 \end{cases}$

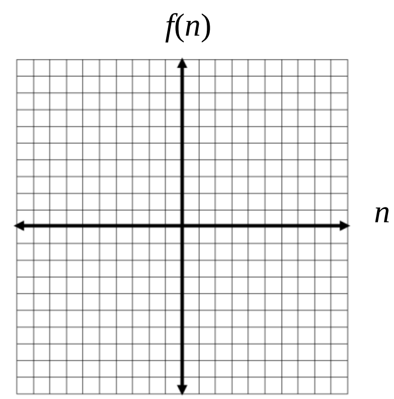
8. $\begin{cases} f(n) = f(n-1) + \frac{1}{2} \\ f(1) = 3 \end{cases}$

9. Given the **recursive** formula $\begin{cases} f(n) = f(n-1) + 3 \\ f(1) = -5 \end{cases}$

   a) Find the first four terms of the sequence.

   b) Rewrite those four terms as order pairs and graph the sequence.

   c) Find an **explicit** formula for the sequence.



   d) Find the value of the 30th term of the sequence. Which formula is more efficient for this question, the recursive formula or the explicit formula? Explain your answer.

SEE OTHER SIDE

In 10 and 11, use the recursive formula to find the first four terms of the sequence. ***(Note: these sequences are NOT arithmetic.)***

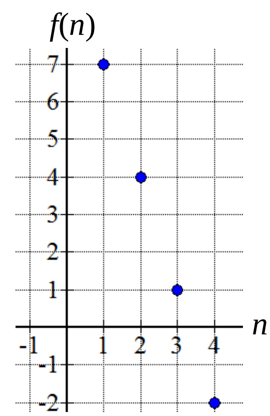
10. $\begin{cases} f(n) = 3f(n-1) - 4 \\ f(1) = 5 \end{cases}$

11. $\begin{cases} f(n) = 5 - 2f(n-1) \\ f(1) = -1 \end{cases}$

12. The first term of a sequence equals 5. Each term in the sequence can be obtained by subtracting 3 from twice the value of the prior term.
   a) List the first four terms of the sequence.

   b) Write the **recursive** formula for the sequence.

   c) Is this an arithmetic sequence? Explain.



13. The graph of an arithmetic sequence is shown to the right.
   a) List the first four terms of the sequence.

   b) Write the **recursive** formula for the sequence.

   c) Find an **explicit** formula for the sequence.

In 14 and 15, find an explicit formula for the arithmetic sequence given. Then use your formula to find the indicated term.

14. Find $f(40)$ for 11, 2, −7, −16,…
   $f(n)$ =

   $f(20)$ =

15. Find $f(57)$ when $f(11) = 4$ and $d = 2$
   $f(n)$ =

   $f(57)$ =

In 16–17, complete the statement for each arithmetic sequence.

16. −235 is the _____th term of 5, 1, −3, …

17. 267 is the _____th term of 14, 25, 36, …

ANSWERS

Arithmetic Sequences: Recursive Formulas

In 1–4, find the next three terms of each arithmetic sequence. Then write its recursive formula.

1. 3, 10, 17, 24, …

   31, 38, 45

   $\begin{cases} f(n) = f(n-1) + 7 \\ f(1) = 3 \end{cases}$

2. 11, 8, 5, 2, …

   −1, −4, −7

   $\begin{cases} f(n) = f(n-1) - 3 \\ f(1) = 11 \end{cases}$

3. 31, 19, 7, −5, …

   $-17, -29, -41$

   $\begin{cases} f(n) = f(n-1) - 12 \\ f(1) = 31 \end{cases}$

4. −17, −11, −5, 1, …

   17, 23, 29

   $\begin{cases} f(n) = f(n-1) + 6 \\ f(1) = -17 \end{cases}$

In 5–8, find the first four terms of each arithmetic sequence.

5. $\begin{cases} f(n) = f(n-1) + 5 \\ f(1) = -2 \end{cases}$

   $-2, 3, 8, 13$

6. $\begin{cases} f(n) = f(n-1) - 1.5 \\ f(1) = 10 \end{cases}$

   $10, 8.5, 7, 5.5$

7. $\begin{cases} f(n) = f(n-1) - 11 \\ f(1) = 27 \end{cases}$

   $27, 16, 5, -6$

8. $\begin{cases} f(n) = f(n-1) + \frac{1}{2} \\ f(1) = 3 \end{cases}$

   $3, 3\frac{1}{2}, 4, 4\frac{1}{2}$ or $3, 3.5, 4, 4.5$

9. Given the **recursive** formula $\begin{cases} f(n) = f(n-1) + 3 \\ f(1) = -5 \end{cases}$

   a) Find the first four terms of the sequence.

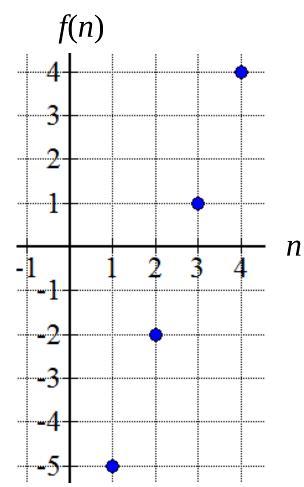
   $-5, -2, 1, 4$

   b) Rewrite those four terms as order pairs and graph the sequence.

   $(1, -5)$ $(2, -2)$ $(3, 1)$ $(4, 4)$

   c) Find an **explicit** formula for the sequence.

   $f(n) = 3n - 8$



   d) Find the value of the 30th term of the sequence. Which formula is more efficient for this question, the recursive formula or the explicit formula? Explain your answer.

   $f(30) = 82$

   The explicit formula is more efficient because it allows us to find the value of the 30th term directly, without having to list all 30 terms.

In 10 and 11, use the recursive formula to find the first four terms of the sequence. ***(Note: these sequences are NOT arithmetic.)***

10. $\begin{cases} f(n) = 3f(n-1) - 4 \\ f(1) = 5 \end{cases}$

$5, 11, 29, 83$

11. $\begin{cases} f(n) = 5 - 2f(n-1) \\ f(1) = -1 \end{cases}$

$-1, 7, -9, 23$

12. The first term of a sequence equals 5. Each term in the sequence can be obtained by subtracting 3 from twice the value of the prior term.

a) List the first four terms of the sequence.

$5, 7, 11, 19$

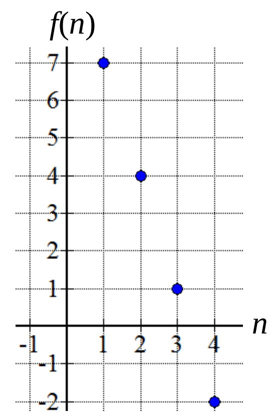
b) Write the **recursive** formula for the sequence.

$\begin{cases} f(n) = 2f(n-1) - 3 \\ f(1) = 5 \end{cases}$

c) Is this an arithmetic sequence? Explain.

The sequence is NOT arithmetic because there is no common difference among its terms.

13. The graph of an arithmetic sequence is shown to the right.



a) List the first four terms of the sequence.

$7, 4, 1, -2$

b) Write the **recursive** formula for the sequence.

$\begin{cases} f(n) = f(n-1) - 3 \\ f(1) = 7 \end{cases}$

c) Find an **explicit** formula for the sequence.

$f(n) = -3n + 10$

In 14 and 15, find an explicit formula for the arithmetic sequence given. Then use your formula to find the indicated term.

14. Find $f(40)$ for 11, 2, −7, −16,...

$f(n) = -9n + 20$

$f(40) = -340$

15. Find $f(57)$ when $f(11) = 4$ and $d = 2$

$f(n) = 2n - 18$

$f(57) = 96$

In 16–17, complete the statement for each arithmetic sequence.

16. −235 is the _____th term of 5, 1, −3, ...

$f(n) = -4n + 9$

-235 is the 61^{st} term

17. 267 is the _____th term of 14, 25, 36, ...

$f(n) = 11n + 3$

267 is the 24^{th} term