1.   If $f(1) = 5$ and $f(n) = -3f(n - 1)$, then $f(4) =$

[a]   -15   [b]   20   [c]   45   [d]   -135

2.   If a sequence is defined recursively by $f(0) = 6$ and $f(n + 1) = -3f(n) + 4$ for all $n \geq 0$, then $f(2)$ is equal to

[a]   22   [b]   -27   [c]   46   [d]   -14

3.   In a sequence, the first term is 3 and the common difference is 4. The fifth term of this sequence is

[a]   -11   [b]   -8   [c]   16   [d]   19

4.   If $f(1) = 3$ and $f(n) = -2f(n - 1) + 1$, then $f(5) =$

[a]   -5   [b]   11   [c]   21   [d]   43

5.   If a sequence is defined recursively by $f(0) = 2$ and $f(n + 1) = -2f(n) + 3$ for all $n \geq 0$, then $f(2)$ is equal to

[a]   1   [b]   -11   [c]   5   [d]   17

6.   In a sequence, the first term is 4 and the common difference is 3. The fifth term of this sequence is

[a]   -11   [b]   -8   [c]   16   [d]   19
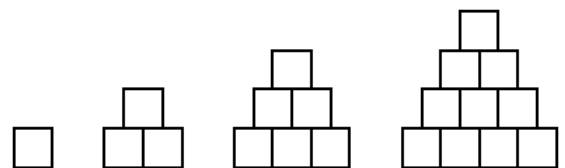
7.   Given the function(n) defined by the following: $f(1) = 2$
                                                                $f(n) = -5f(n - 1) + 2$

      Which set could represent the range of the function?

[a]   {2, 4, 6, 8, …}   [b]   {2, -8, 42, -208, …}   [c]   {-8, -42, -208, 1042, …}   [d]   {-10, 50, -250, 1250, …}

8.   A sequence of blocks is shown in the diagram. This sequence can be defined by the recursive function $a_1 = 1$ and $a_n = a_{n-1} + n$. Assuming the pattern continues, how many blocks will there be when $n = 7$?
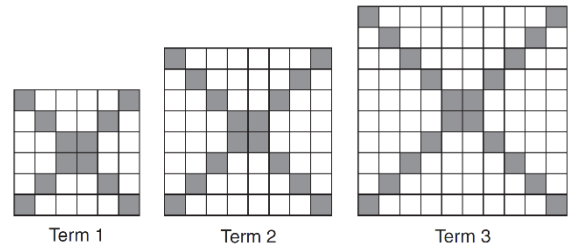

[a]   13
[b]   21
[c]   28
[d]   36

9. Determine and state whether the sequence 1, 3, 9, 27, … displays exponential behavior. Explain how you arrived at your decision.

10. 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 $f(0) = 3$
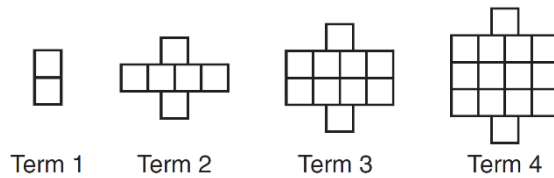
   [a] I and II
   [b] II, only
   [c] III, only
   [d] I and III

11. The diagrams represent the first three terms of a sequence. Assuming the pattern continues, which formula determines a_n, the number of shaded squares in the nth term?

   [a] $a_n = 4n + 12$
   [b] $a_n = 4n + 8$
   [c] $a_n = 4n + 4$
   [d] $a_n = 4n + 2$

Term 1   Term 2   Term 3

12. A pattern of blocks is shown.

Term 1   Term 2   Term 3   Term 4

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

I	II	III
$a_n = n + 4$	$a_1 = 2$ $a_n = a_{n-1} + 4$	$a_n = 4n - 2$

   [a] I and II   [b] I and III   [c] II and III   [d] III, only

13. The third term in an arithmetic sequence is 10 and the fifth term is 26. If the first term is a_1, which is an equation for the nth term of this sequence?

   [a] $a_n = 8n + 10$ [b] $a_n = 8n - 14$ [c] $a_n = 16n + 10$ [d] $a_n = 16n - 38$

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

   [a] $f(1) = 10$ [b] $f(1) = 4$ [c] $f(1) = 10$ [d] $f(1) = 4$
        $f(x) = f(x - 1) + 4$ $f(x) = f(x - 1) + 10$ $f(x) = 4 f(x - 1)$ $f(x) = 10 f(x - 1)$

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

[a] $f(1) = 3$
$f(n + 1) = 2^{f(n)} + 3$

[b] $f(1) = 3$
$f(n + 1) = 2^{f(n)} - 1$

[c] $f(1) = 3$
$f(n + 1) = 2f(n) + 1$

[d] $f(1) = 3$
$f(n + 1) = 3f(n) - 2$

16. Which function defines the sequence -6, -10, -14, -18, ..., where $f(6) = -26$?

[a] $f(x) = -4x - 2$

[b] $f(x) = 4x - 2$

[c] $f(x) = -x + 32$

[d] $f(x) = -x - 26$

17. 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?

[a] $a_1 = 49$
$a_n = a_{n-1} + 21$

[b] $a_1 = 0$
$a_n = 49 a_{n-1} + 21$

[c] $a_1 = 21$
$a_n = a_{n-1} + 49$

[d] $a_1 = 0$
$a_n = 21 a_{n-1} + 49$

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

Design 1   Design 2   Design 3   Design 4
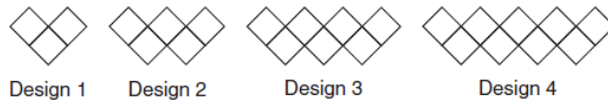
[a] $y = 2x + 1$

[b] $y = 2x + 3$

[c] $a_1 = 3$
$a_n = a_{n-1} + 2$

[d] $a_1 = 1$
$a_n = a_{n-1} + 2$

19. On the main floor of the Kodak Hall at the Eastman Theater, the number of seats per row increases at a constant rate. Steven counts 31 seats in row 3 and 37 seats in row 6. How many seats are there in row 20?
[a] 65   [b] 67   [c] 69   [d] 71

20. If $a_n = n(a_{n-1})$ and $a_1 = 1$, what is the value of a_5?

[a] 5   [b] 20   [c] 120   [d] 720

21. Which arithmetic sequence has a common difference of 4?

[a] {0, 4n, 8n, 12n, ...}   [b] {n, 4n, 16nm 64n, ...}   [c] {n+1, n+5, n+9, n+13, ...}   [d] {n+4, n+16, n+64, n+256, ...}

22. What is the common difference of the arithmetic sequence -7x, -4x, -x, 2x, 5x, ...?

[a] -3   [b] -3x   [c] 3   [d] 3x

23. Which of the following three sequences are arithmetic sequences?

I	II	III
2, 4, 6, 8, 10, ...	2, 4, 8, 16, 32, ...	a, a + 2, a + 4, a + 6, a + 8, ...

[a] I and II, only   [b] I and III, only   [c] II and III, only   [d] I, II, and III