Name ______________________ Date __________ Class __________

LESSON 12-1

Practice B

Introduction to Sequences

Find the first 5 terms of each sequence.

1. $a_1 = 1,\ a_n = 3(a_{n-1})$

2. $a_1 = 2,\ a_n = 2(a_{n-1} + 1) - 5$

3. $a_1 = -2,\ a_n = (a_{n-1})^2 - 1$

4. $a_1 = 1,\ a_n = 6 - 2(a_{n-1})$

5. $a_1 = -1,\ a_n = (a_{n-1} - 1)^2 - 3$

6. $a_1 = -2,\ a_n = \dfrac{2 - a_{n-1}}{2}$

7. $a_n = (n - 2)(n + 1)$

8. $a_n = n(2n - 1)$

9. $a_n = n^3 - n^2$

10. $a_n = \left(\dfrac{1}{2}\right)^{n-3}$

11. $a_n = (-2)^{n-1}$

12. $a_n = n^2 - 2n$

Write a possible explicit rule for the *n*th term of each sequence.

13. 8, 16, 24, 32, 40, …

14. 0.1, 0.4, 0.9, 1.6, 2.5, …

15. 3, 6, 11, 18, 27, …

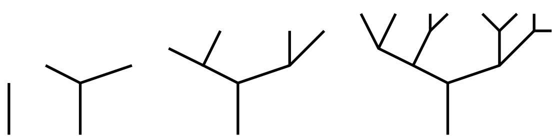
16. $\dfrac{3}{2}, \dfrac{3}{4}, \dfrac{3}{8}, \dfrac{3}{16}, \dfrac{3}{32}, \ldots$

17. −2, 1, 4, 7, 10, …

18. 5, 1, 0.2, 0.04, 0.008, …

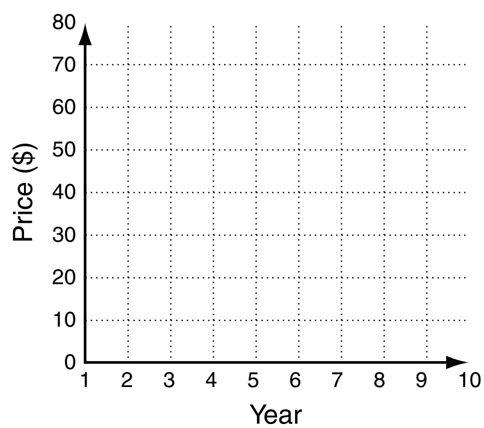
Solve.

19. Find the number of line segments in the next two iterations. ______________



20. Jim charges $50 per week for lawn mowing and weeding services. He plans to increase his prices by 4% each year.

a. Graph the sequence.



b. Describe the pattern.

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c. To the nearest dollar, how much will he charge per week in 5 years?

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LESSON 12-1

Practice A

Introduction to Sequences

Find the first 5 terms of each sequence.

1. $a_1 = 4$, $a_n = 2a_{n-1} - 3$

n	$2a_{n-1} - 3$	a_n
1		4
2	2(4) − 3	5
3	2(5) − 3	7
4	2(7) − 3	11
5	2(11) − 3	19

   a. The first term, a_1, is given. Make a table to record the terms. Substitute a_1 into the rule for a_n to find the second term. **5**

   b. Continue using each term to find the next term. Complete the table.

   c. Write the five terms. **4, 5, 7, 11, 19**

2. $a_1 = 2$, $a_n = (a_{n-1})^2$ — **2, 4, 16,256, 65,536**

3. $a_1 = 2$, $a_n = 1 - 2(a_{n-1})$ — **2, −3, 7, −13, 27**

4. $a_1 = 1$, $a_n = (a_{n-1})^2 + 1$ — **1, 2, 5, 26, 677**

5. $a_1 = 1$, $a_n = (a_{n-1})(a_{n-1} + 1)$ — **1, 2, 6, 42, 1806**

6. $a_1 = 5$, $a_n = 2(a_{n-1} - 2)$ — **5, 6, 8, 12, 20**

7. $a_1 = 243$, $a_n = \frac{a_{n-1}}{3}$ — **243, 81, 27, 9, 3**

8. $a_n = n - 2^n$

n	$n - 2^n$	a_n
1	$1 - 2^1$	−1
2	$2 - 2^2$	−2
3	$3 - 2^3$	−5
4	$4 - 2^4$	−12
5	$5 - 2^5$	−27

   a. Use the table. Substitute 1 for n and simplify to find the first term. **−1**

   b. Complete the table.

   c. Write the five terms. **−1, −2, −5, −12, −27**

9. $a_n = n(n + 1)$ — **2, 6, 12, 20, 30**

10. $a_n = n^2 - 2n$ — **−1, 0, 3, 8, 15**

11. $a_n = 2^{n-2}$ — **0.5, 1, 2, 4, 8**

12. $a_n = 2 - n$ — **1, 0, −1, −2, −3**

13. $a_n = (5 - n)(n + 5)$ — **24, 21, 16, 9, 0**

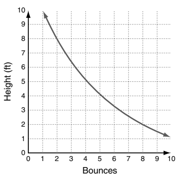
Solve.

14. A ball is dropped and bounces to a height of 10 feet. The ball rebounds to 80% of its previous height.

   a. Graph the sequence.

   b. Describe the pattern. **Exponential**

   c. To the nearest inch, find the height of the ball after its eighth bounce. **2 ft 1 in.**



LESSON 12-1

Practice B

Introduction to Sequences

Find the first 5 terms of each sequence.

1. $a_1 = 1$, $a_n = 3(a_{n-1})$ — **1, 3, 9, 27, 81**

2. $a_1 = 2$, $a_n = 2(a_{n-1} + 1) - 5$ — **2, 1, −1, −5, −13**

3. $a_1 = -2$, $a_n = (a_{n-1})^2 - 1$ — **−2, 3, 8, 63, 3968**

4. $a_1 = 1$, $a_n = 6 - 2(a_{n-1})$ — **1, 4, −2, 10, −14**

5. $a_1 = -1$, $a_n = (a_{n-1} - 1)^2 - 3$ — **−1, 1, −3, 13, 141**

6. $a_1 = -2$, $a_n = \frac{2 - a_{n-1}}{2}$ — **$-2, 2, 0, 1, \frac{1}{2}, \frac{3}{4}$**

7. $a_n = (n - 2)(n + 1)$ — **−2, 0, 4, 10, 18**

8. $a_n = n(2n - 1)$ — **1, 6, 15, 28, 45**

9. $a_n = n^3 - n^2$ — **0, 4, 18, 48, 100**

10. $a_n = \left(\frac{1}{2}\right)^{n-3}$ — **$4, 2, 1, \frac{1}{2}, \frac{1}{4}$**

11. $a_n = (-2)^{n-1}$ — **1, −2, 4, −8, 16**

12. $a_n = n^2 - 2n$ — **−1, 0, 3, 8, 15**

Write a possible explicit rule for the *n*th term of each sequence.

13. 8, 16, 24, 32, 40, … — **$a_n = 8n$**

14. 0.1, 0.4, 0.9, 1.6, 2.5, … — **$a_n = 0.1n^2$**

15. 3, 6, 11, 18, 27, … — **$a_n = n^2 + 2$**

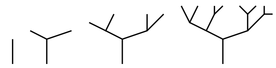
16. $\frac{3}{2}, \frac{3}{4}, \frac{3}{8}, \frac{3}{16}, \frac{3}{32}, \ldots$ — **$a_n = 3\left(\frac{1}{2}\right)^n$**

17. −2, 1, 4, 7, 10, … — **$a_n = 3n - 5$**

18. 5, 1, 0.2, 0.04, 0.008, … — **$a_n = 5(0.2)^{n-1}$**

Solve.

19. Find the number of line segments in the next two iterations. **31, 63**

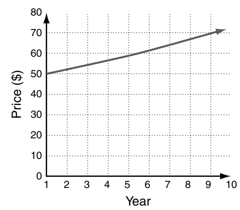


20. Jim charges $50 per week for lawn mowing and weeding services. He plans to increase his prices by 4% each year.

   a. Graph the sequence.

   b. Describe the pattern. **Exponential**

   c. To the nearest dollar, how much will he charge per week in 5 years? **$61 per week**



LESSON 12-1

Practice C

Introduction to Sequences

Find the first 5 terms of each sequence.

1. $a_1 = -3$, $a_n = (a_{n-1} + 2)^3$ — **−3; −1; 1; 27; 24,389**

2. $a_1 = 2$, $a_n = \frac{1 - a_{n-1}}{a_{n-1}}$ — **$2, -\frac{1}{2}, -3, -\frac{4}{3}, -\frac{7}{4}$**

3. $a_1 = 1$, $a_n = \frac{n}{a_{n-1} + 1}$ — **$1, 1, \frac{3}{2}, \frac{8}{5}, \frac{25}{13}$**

4. $a_n = n - 2^{n-3}$ — **$\frac{3}{4}, \frac{3}{2}, 2, 2, 1$**

5. $a_n = (n - 1)^n$ — **0, 1, 8, 81, 1024**

6. $a_n = n^2 - 2^n$ — **−1, 0, 1, 0, −7**

Write a possible explicit rule for the *n*th term of each sequence.

7. 1, 5, 9, 13, 17, … — **$a_n = 4n - 3$**

8. 0.8, 1.6, 3.2, 6.4, 12.8, … — **$a_n = 0.4(2)^n$**

9. 1.5, 3, 4.5, 6, 7.5, … — **$a_n = \frac{3}{2}n$**

10. 19.5, 18, 15.5, 12, 7.5, … — **$a_n = 20 - 0.5n^2$**

11. $2, \frac{10}{3}, \frac{14}{3}, 6, \frac{22}{3}, \ldots$ — **$a_n = \frac{4}{3}n + \frac{2}{3}$**

12. $\frac{25}{16}, \frac{5}{4}, 1, \frac{4}{5}, \frac{16}{25}, \ldots$ — **$a_n = \left(\frac{4}{5}\right)^{n-3}$**

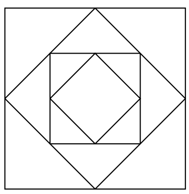
13. 10, 7, 2, −5, −14, … — **$a_n = 11 - n^2$**

14. 1, 0.2, 0.03, 0.004, … — **$a_n = n(0.1)^{n-1}$**

15. 0, 9, 24, 45, 72, … — **$a_n = 3n^2 - 3$**

Solve.

16. The vertex of each square is the midpoint of the next larger square. The area of the center square is 1 square unit.



   a. What are the areas of the next 4 squares? **2, 4, 8, 16**

   b. Write an explicit rule for the areas. **$a_n = 2^{n-1}$**

   c. What is the area of the eighth square? **128 square units**

17. A grocer stacks oranges in a square pyramid. Each orange sits on the 4 oranges below it. So, the top layer has 1 orange and the layer below it has 4 oranges. The layer below that has 9 oranges. The total number of oranges required for 1 layer is 1. The total number of oranges required for 2 layers is 5. The total number of oranges required for 3 layers is 14.

   a. Write a recursive formula for the sequence. **$a_n = n^2 + a_{n-1}$**

   b. How many oranges are required for 10 layers? **385 oranges**

LESSON 12-1

Reteach

Introduction to Sequences

A **sequence** is an ordered set of numbers. Each number is called a **term**.
A **recursive formula** is a rule that tells you how to write the terms of a sequence, using the preceding terms of the sequence.

Find the first five terms of the sequence with $a_1 = 4$ and $a_n = 3a_{n-1} - 2$.

a_{n-1} comes before a_n.

a_1 denotes the first term in the sequence.

a_n denotes the *n*th term in the sequence

Make a table to list the terms in the sequence.

Recursive formula

Term number

Term value

n	$a_n = 3a_{n-1} - 2$	a_n
1	Given: $a_1 = 4$	4
2	$a_2 = 3a_{2-1} - 2$ $= 3a_1 - 2$ $= 3(4) - 2 = 10$	10
3	$a_3 = 3a_2 - 2$ $= 3(10) - 2 = 28$	28
4	$a_4 = 3a_3 - 2$ $= 3(28) - 2 = 82$	82
5	$a_5 = 3a_4 - 2$ $= 3(82) - 2 = 244$	244

Notice how the previous term is used each time to compute the next term.

The first five terms are 4, 10, 28, 82, and 244.

Find the first five terms of each sequence.

1. $a_1 = -8$, $a_n = a_{n-1} + 3$

   $a_2 = a_1 + 3 = -8 + 3 =$ **−5**

   $a_3 = a_2 + 3 =$ **−2**

   $a_4 =$ **1**

   $a_5 =$ **4**

2. $a_1 = 2$, $a_n = -5a_{n-1}$

   $a_2 = -5a_1 = -5(2) =$ **−10**

   $a_3 = -5a_2 =$ **50**

   $a_4 =$ **−250**

   $a_5 =$ **1250**

3. $a_1 = 6$, $a_n = 2a_{n-1} - 1$

   $a_2 = 11$

   $a_3 = 21$

   $a_4 = 41$

   $a_5 = 81$

4. $a_1 = -1$, $a_n = 4a_{n-1}$

   $a_2 = -4$

   $a_3 = -16$

   $a_4 = -64$

   $a_5 = -256$