

Mr. Ward Answer Key

Sequences

A **sequence** is an ordered set of numbers. Example: {2, 4, 6, 8}

Sometimes a sequence can continue without ever stopping. This is what we would call an **infinite sequence**.

For now we will deal with **finite sequences** which are sequences that have a limited number of terms.

In your own words, write a definition for each of the three things mentioned above.

Sequence - ordered set of numbers

Infinite Sequence - set of numbers that continues forever

Finite Sequence - sequence with an ending point

One of the things you'll be asked to do is to find the terms of a sequence. To do this you'll be given an equation. Let's look at two different types of examples.

Finding Terms of a Sequence Using a Recursive Formula

What does recursive mean? Well a **recursive formula** is a formula in which one or more previous terms are used to generate the next term in the sequence.

Example #1

Find the first 5 terms of the sequence.

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

The first term is given, 5. Now use that first term to find the second term (a_2). The following table should help you figure out the first 5 terms. Some of the table has already been filled in. Use the information to fill in the rest.

n	$2a_{n-1} + 1$	a_n
1	Given	5
2	$2(5) + 1$	11
3	$2(11) + 1$	23
4	$2(23) + 1$	47
5	$2(47) + 1$	95

What are the first 5 terms of the sequence? 5, 11, 23, 47, 95

(Answer: 5, 11, 23, 47, 95)

Finding Terms of a Sequence Using an Explicit Formula

What does explicit mean? Well an **explicit formula** is a formula that defines the n^{th} term of a sequence as a function of n . Basically it's a formula where we don't need to know what any of the previous terms are to find the rest of the sequence.

Example #1

Find the first 5 terms of the sequence.

$$a_n = 3n - 5$$

Just as before, use the table to help you find the first 5 terms of the sequence.

n	$3n - 5$	a_n
1	$3(1) - 5$	-2
2	$3(2) - 5$	1
3	$3(3) - 5$	4
4	$3(4) - 5$	7
5	$3(5) - 5$	10

What are the first 5 terms of the sequence? -2, 1, 4, 7, 10

(Answer: -2, 1, 4, 7, 10)

You should now be able to say you can do the following things:

- I can tell the difference between an explicit and recursive formula. (A1)
- I can find several terms of a sequence using a recursive formula. (A2)
- I can find several terms of a sequence using an explicit definition. (A3)

Assignment: Worksheet + pg 865 #2-10, 16-21

LESSON **Practice A**
12-1 **Introduction to Sequences**

Find the first 5 terms of each sequence.

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

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

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

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. $a_n = n - 2^n$

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

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

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

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

-1, 0, 3, 8, 15

11. $a_n = 2^{n-2}$

1/2, 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.

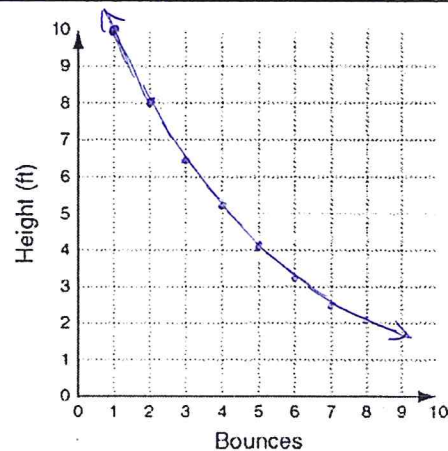
a. Graph the sequence.

b. Describe the pattern.

Exponential Decay

c. To the nearest inch, find the height of the ball after its eighth bounce.

2 ft 1 in



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2.

n	$4a_{n-1} - 1$	a_n
1	Given	1
2	$4(1) - 1$	3
3	$4(3) - 1$	11
4	$4(11) - 1$	43
5	$4(43) - 1$	171

1, 3, 11, 43, 171

3.

n	$a_{n-1} + 11$	a_n
1	Given	3
2	$3 + 11$	14
3	$14 + 11$	25
4	$25 + 11$	36
5	$36 + 11$	47

3, 14, 25, 36, 47

4. 500, 100, 20, 4, $\frac{4}{5}$

5. -12, 0, 12, 24, 36

6. 1, $-\frac{1}{2}$, $\frac{1}{4}$, $-\frac{1}{8}$, $\frac{1}{16}$

7. -3, -12, -27, -48, -75

8. 0, 2, 6, 12, 20

9. 1, 4, 16, 64, 256

10. 4, 9, 16, 25, 36

16. 7, 4, 1, -2, -5

17. 1, $\frac{1}{4}$, $\frac{1}{9}$, $\frac{1}{16}$, $\frac{1}{25}$

18. 4, 4, 4, 4, 4

19. 9, 10, 12, 16, 24

20. -10, -4, 6, 20, 38

21. -2, 5, -16, 47, -142