Unit 1 Honors Study Guide **Name:** Key

Matching: Classify each function on the left with its description on the right.

D 1. $a_n = \frac{5}{3}(8)^{(n-1)}$

B 2. $a_n = \frac{6}{5}n - 1$

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

a. Arithmetic, Recursive

b. Arithmetic, Explicit

c. Geometric, Recursive

d. Geometric, Explicit

Matching: Match each sequence on the left with a formula on the right.

C 4. $3, -5, -13, -21$

B 5. $4,\ 20,\ 100,\ 500$

D 6. $3,\ \frac{3}{8},\ \frac{3}{64},\ \frac{3}{512},$

a. $a_n = 3(8)^{n-1}$

b. $a_n = 5 \cdot a_{n-1}, a_1 = 4$

c. $a_n = -8n + 11$

d. $a_n = 3\left(\frac{1}{8}\right)^{(n-1)}$

For each table below, determine if the sequence is **arithmetic** or **geometric**. Then tell what the constant ratio or common difference is. Come up with the recursive and explicit functions for each as well.

7.

Term Number	Value	
7	4	+5
8	9	+5
9	14	+5
10	19	

Arithmetic $D = 5$

Rec
$A_n = A_{n-1} + 5$
$A_1 = -26$

Exp
$A_n = -26 + 5(n-1)$
$= -26 + 5n - 5$
$A_n = -31 + 5n$

8.

Term Number	Value	
2	1	×6
3	6	×6
4	36	×6
5	216	

Geometric $R = \times 6$

Rec
$A_1 = \frac{1}{6}$
$A_n = A_{n-1} \times 6$

Exp
$A_n = \frac{1}{6}(6)^{n-2}$
OR
$\frac{1}{6}(6)^{n-1}$

9. Below is an *arithmetic* sequence. Complete the table with the missing values.

x	1	2	3	4	5
f(x)	8	21	34	47	60

$\frac{60-8}{4} = \frac{52}{4} = 13$

$4 = A_1 + 5(7-1)$
$4 = A_1 + 30$ $A_1 = -26$
$-30 \quad -30$

10. Below is a *geometric* sequence. Complete the table with the missing values. Is that the only ratio that works? Why?

x	1	2	3	4	5
f(x)	8	-32	128	-512	2048

$\frac{-512}{8} = -64^{\wedge}\frac{1}{3}$ $\boxed{R=-4}$ only 1 b/c move odd # of times

11. The first term in a sequence is 8. The sequence decreases by 24% each term. What is the recursive equation that will represent this situation? $A_1=8$ $r=100-24=$ 76 → 0.76

$\boxed{A_1=8 \quad A_n=A_{n-1}\times 0.76}$

12. The end of a spring is pulled as far back as it will go and then released. On the first bounce back, it extends 54 cm. On its second bounce back, it extends 18 cm. On its third bounce back, it extends 6 cm.

x	y
1	54
2	18
3	6
⋮	⋮

$\times \frac{1}{3}$ $\times \frac{1}{3}$

a. How far does the spring extend on its 8th, 9th, and 10th bounce back?

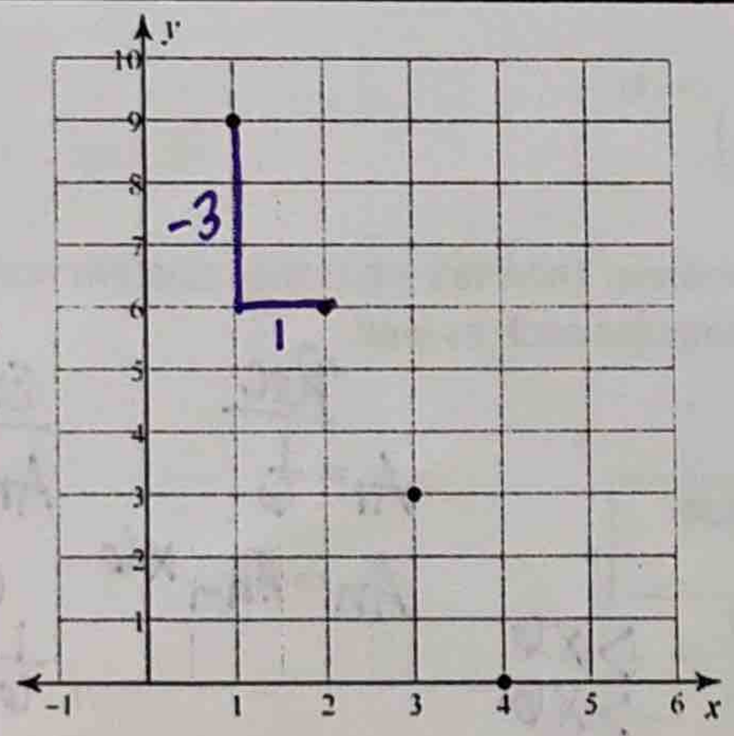
8th → $54(\frac{1}{3})^{8-1} = \frac{2}{81}$ 9th → $\boxed{\frac{2}{243}}$ 10th → $\boxed{\frac{2}{729}}$

b. Is this scenario Arithmetic or Geometric? How do you know?

Geometric b/c ratio $=\frac{1}{3}$

c. Can you write the recursive and explicit formulas?

Rec $A_1=54 \quad A_n=A_{n-1}\times\frac{1}{3}$ Exp $A_n=54(\frac{1}{3})^{n-1}$



14. Type of sequence: Arithmetic

15. Recursive: $A_1=9 \quad A_n=A_{n-1}-3$

16. Explicit: $A_n=9-3(n-1)$

$9-3n+3$

$\boxed{A_n=12-3n}$

Sequence: 1, 4, 16, 64, ...

17. Type of sequence: Geometric

18. Recursive: $A_1=1 \quad A_n=A_{n-1}\times 4$

19. Explicit: $A_n=1(4)^{n-1}$

20. **Error Analysis: Who is correct?**

Callie and Joseph are trying to find the common ratio, recursive formula, and explicit formula for the sequence $-5, -15, -45, -135, \ldots$ Their answers are provided. Is either one correct?

Callie's Work	Joseph's Work
Common ratio: $\frac{-15}{-5} = 3$ ✓	Common ratio: $\frac{-15}{-5} = 3$ ✓
Explicit Formula: $a_n = -5(3)^{(n-1)}$ ✓	Explicit Formula: $a_n = 3(-5)^{(n-1)}$ ✗
Recursive Formula: $a_n = 3 \cdot a_{n-1} \quad a_1 = -5$ ✓	Recursive Formula: $a_n = 3 \cdot a_{n-1} \quad a_1 = -5$ ✓

Explanation:

Joseph's reversed the first term and the ratio for the explicit. Both ratios are correct. Both Recursive formulas are correct. Callie is 100% correct.

21. The distance (in feet) that a free-falling object falls in each second, starting with the first second, is given by the arithmetic progression 19, 57, 95, 133,...Create the explicit and recursive function for this situation. Find the distance that the object falls on the 15th second. $d = 38$

Rec
$A_1 = 19$
$An = An-1 + 38$

Exp
$An = 19 + 38(n-1)$
$19 + 38n - 38$
$-19 + 38n$

15th
$-19 + 38(15) = \boxed{551 ft}$

22. My 12th term is 128 and my 15th term is 16. I have a constant ratio. Answer the following about me:

$\frac{16}{128}$ ^ $\frac{1}{3}$ $r = \frac{1}{2}$

a. Am I Arithmetic or Geometric?

b. Constant Ratio: $\frac{1}{2}$

c. Recursive formula: $A_1 = 262144 \quad An = An-1 \times \frac{1}{2}$

d. Explicit formula: $128(\frac{1}{2})^{n-12}$

e. First 5 terms are: 262144, 131072, 65536, 32768, 16384

23. A large nursery has 1400 lilies to sell. Every day, the number of lilies available decreases by 70. Write an explicit formula for the number of lilies available to sell, where n is the number of days after April 1st. Then, find the number of lilies that can be sold on April 8th, 9th, and 10th.

24.

Let's change back and forth between forms!

Given the recursive definition, write the explicit definition.	Given the explicit definition, write the recursive definition.
$a_1 = 4 \quad a_n = 3 \cdot a_{n-1}$	$a_n = 5(2)^n$
$a_1 = 5 \quad a_n = -2 \cdot a_{n-1}$	$a_n = 200\left(\frac{1}{2}\right)^n$

$An = 4(3)^{n-1}$ ←

$An = 5(-2)^{n-1}$ ←

$5(2)^1 = 2$

$A_1 = 10 \quad r = 2$
$An = An-1 \times 2$

$A_1 = 200(\frac{1}{2})^1$

$A_1 = 100$
$An = An-1 \times \frac{1}{2}$