Unit 1 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. $36, 18,\ 9, 4.5, \ldots$

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

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

~~c.~~ $a_n = -8n + 11$

~~d.~~ $a_n = 36\left(\frac{1}{2}\right)^{(n-1)}$

For each table below, determine if the sequence is **arithmetic** or **geometric**. Then tell what the **constant ratio** or **common difference** is. **Create** the **recursive** for each.

7.

Term Number	Value
0	4
1	9
2	14
3	19

Arithmetic

+5 = D

Rec

$A_1 = 9$

$A_n = A_{n-1} + 5$

8.

Geo

R = ×2

$A_1 = 8$

$A_n = A_{n-1} \times 2$

Term Number	Value
2	16
3	32
4	64
5	128

×2

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

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

10. Below is a *geometric* sequence. Complete the table with the missing values. Is that the only ratio that works? Why? Yes because you have an odd number of jumps

x	1	2	3	4	5
f(x)	8	24	72	216	648

$\frac{216}{8} = 27^{\frac{1}{3}} = 3 = R$

11. The first term in a sequence is 8. The sequence increases by 15 each time. What would be the recursive equation?

$A_1 = 8 \quad A_n = A_{n-1} + 15$

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 152 cm. On its second bounce back, it extends 76 cm. On its third bounce back, it extends 38 cm.

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

$r = \frac{1}{2}$

X	Y
1	152
2	76
3	38
4	19

$> \times \frac{1}{2}$ $> \times \frac{1}{2}$

b. Create the recursive and explicit formulas.

Rec $A_1 = 152 \quad A_n = A_{n-1} \times \frac{1}{2}$ Exp $A_n = 152(\frac{1}{2})^{n-1}$

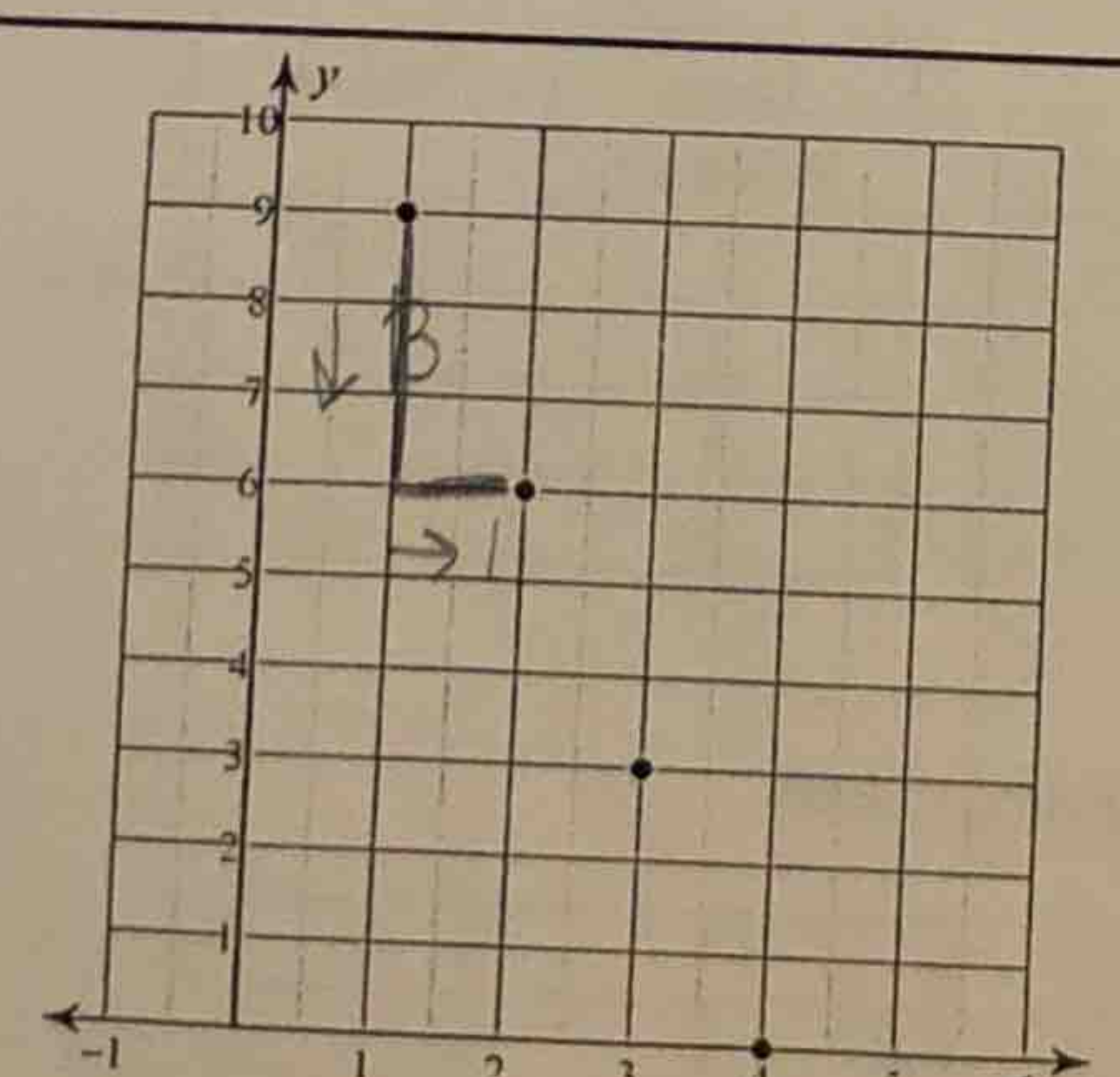
c. How far does the spring extend on its 5^{th}, 6^{th}, and 7^{th} bounce back?

$152(\frac{1}{2})^{5-1} = \frac{19}{2}$ or 9.5 $\quad 152(\frac{1}{2})^{6-1} = \frac{19}{4}$ or 4.75 $\quad 152(\frac{1}{2})^{7-1} = \frac{19}{8}$ or 2.375

13. 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 1^{st}. Then, find the number of lilies that can be sold on April 8^{th}, 9^{th}, and 10^{th}.

$1400 - 70(n-1) = 1400 - 70n + 70 = 1470 - 70n$

8th: $1470 - 70(8)$ = 910 $\quad$ 9th: $1470 - 70(9)$ = 840 $\quad$ 10th: $1470 - 70(10)$ = 770



14. Type of sequence: Arithmetic

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

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

$9 - 3n + 3 = 12 - 3n$

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: $a_n = 3(-5)^{(n-1)}$ X
Recursive Formula: $a_n = -3 \cdot a_{n-1}$ $a_1 = -5$ X	Recursive Formula: $a_n = 3 \cdot a_{n-1}$ $a_1 = -5$ ✓

Explanation:

The common ratios for both are correct. Callie has the correct Explicit formula. Joseph mixed up the 1st term and ratio placement for the explicit. Callie messed up the recursive by multiplying by -3 for the ratio. Joseph's recursive formula is correct.

21. The distance (in inches) that a free-falling object falls in each second, starting with the first second, is given by the geometric progression 0.5, 1.5, 4.5, 13.5,...Create the explicit and recursive function for this situation. Find the distance that the object falls on the 20th and 45th second.

X	Y
1	0.5
2	1.5
3	4.5
4	13.5

$>\times 3$ $>\times 3$

$R=3$

$A_1=0.5$

Rec

$A_1=0.5$

$A_n=A_{n-1}\times 3$

Exp

$A_n=0.5(3)^{n-1}$

$0.5(3)^{20-1} = 581130733.5$

$0.5(3)^{45-1} = 4.92\times 10^{20}$

22. **Let's change back and forth between forms!**

Given the recursive definition, write the explicit definition.	Given the explicit definition, write the recursive definition.
$a_1 = 4$ $a_n = 3 \cdot a_{n-1}$ $A_n = 4(3)^{n-1}$	$a_n = 5(2)^n$ $A_1 = 5(2)^1 = 10$ $A_1 = 10$ $A_n = A_{n-1}\times 2$
$a_1 = 5$ $a_n = -2 \cdot a_{n-1}$ $A_n = 5(-2)^{n-1}$	$a_n = 200\left(\frac{1}{2}\right)^n$ $A_1 = 200(\frac{1}{2})^1 = 100$ $A_1 = 100$ $A_n = A_{n-1}\times \frac{1}{2}$