

Warm Up: Just as Julian finished his homework, he went to feed his fish and accidentally dropped his homework in the fish tank. He was working on patterns of numbers and the last number in four of the patterns was washed away by the water in the fish tank. Julian needs help recreating his patterns. Describe the pattern and determine the next number in the list.

- 1, 3, 5, 7, .9.
 $\checkmark \checkmark \checkmark \checkmark$
 $+2 +2 +2 +2$
 Adding 2
- 7, 4, 1, -2, -5, ...
 $\checkmark \checkmark \checkmark \checkmark$
 $-3 -3 -3 -3$
 Subtracting 3
- 13, 18, 23, 28, ...
 $\checkmark \checkmark \checkmark \checkmark$
 $+5 +5 +5 +5$
 Add 5
 33
- 22, -15, -8, -1, ...
 $\checkmark \checkmark \checkmark \checkmark$
 $+7 +7 +7 +7$
 Add 7
 6

Recursive Formula Review: Write out the first four terms of the following sequences.

- $a_n = a_{n-1} + 4$; $a_0 = -3$
 $a_1 = a_{1-1} + 4 = a_0 + 4 = -3 + 4$
 $a_2 = a_{2-1} + 4 = a_1 + 4 = 1 + 4 = 5$
 $a_3 = 5 + 4 = 9$
 $a_4 = 9 + 4 = 13$
- $a_n = a_{n-1} - \frac{1}{2}$; $a_0 = 4$
 $a_1 = a_{1-1} - \frac{1}{2} = a_0 - \frac{1}{2} = 4 - \frac{1}{2} = 3.5$
 $a_2 = 3.5 - \frac{1}{2} = 3$
 $a_3 = 3 - \frac{1}{2} = 2.5$
 $a_4 = 2.5 - \frac{1}{2} = 2$

Reflection: Summarize what you know about sequences and recursive formulas.

Sequences Suck. A list of numbers that follow a specific pattern.
 Recursive. # The worst — They show the next number in the sequence.

Arithmetic Sequences:

Pattern is Adding/Subtracting each time (linear)

Explicit Formula:

$$f(n) = mn + b$$

Recursive Formula:

$$a_0 = b \quad a_n = a_{n-1} + m$$

Example 1: Are the following examples or non-examples of Arithmetic Sequences? How do you know?

- 4, 8, 16, 32, ...
 $\checkmark \checkmark \checkmark \checkmark$
 $\cdot 2 \cdot 2 \cdot 2 \cdot 2$
 NO
- 4, -2, 0, 2, ...
 $\checkmark \checkmark \checkmark \checkmark$
 $+2 +2 +2 +2$
 Remark
- $\frac{5}{8}, \frac{11}{16}, \frac{3}{4}, \frac{13}{16}, \dots$
 $\checkmark \checkmark \checkmark \checkmark$
 $\frac{10}{16}, \frac{11}{16}, \frac{12}{16}, \frac{13}{16}$
 YES

Notes 4-2

Sec 1 H

Arithmetic Sequences

Unit 4

Example 2:

- Find the common difference (Rate of Change) and the initial value of the following sequence.

a_0, a_1
 $-4, 3, 10, 17, 24, \dots$
 $\downarrow \downarrow \downarrow$
 $\times 7$

$RC = 7$ $IV = -4$
 $RC = M$ $IV = a_0 = b$

- Now write the explicit equation for the sequence.

~~$f(x) = mx + b$~~ $f(n) = mn + b$

$f(n) = 7n - 4$

Now write the recursive formula.

$a_n = a_{n-1} + D; a_0 = IV$
 Common Difference Initial Value

$a_n = a_{n-1} + 7$ $a_0 = -4$
 $a_1 = 3$ $a_2 = 10$ $a_3 = 17$ $a_4 = 24$

Now check your recursive formula by rewriting it.

$a_1 = a_{1-1} + 7 = a_0 + 7 = -4 + 7$
 $a_2 = a_{2-1} + 7 = a_1 + 7 = 3 + 7$

Notes 4-2

Sec 1 H

Arithmetic Sequences

Unit 4

Practice: First, determine if the sequence is arithmetic; if it is write the explicit and recursive formula for each.

$RC = \frac{10}{8} = \frac{5}{4}$ $IV = 5$
 $E = f(n) = \frac{5}{8}n + 5$
 $R = a_n = a_{n-1} + \frac{5}{8}$ $a_0 = 5$

3. $5, 10, 15, 20, \dots$

$RC = 5$ $IV = 0$
 $E = f(n) = 5n$
 $R = a_n = a_{n-1} + 5$ $a_0 = 0$

5. $100, 75, 50, 25, \dots$

$RC = -25$ $IV = 125$
 $E = f(n) = -25n + 125$
 $R = a_n = a_{n-1} - 25$ $a_0 = 125$

7. $\frac{2}{3}, \frac{1}{2}, \frac{2}{5}, \frac{1}{3}, \dots$

NO

$m = RC$ $b = IV$
 $E = f(n) = mn + b$
 $R = a_n = a_{n-1} + RC$

4. $2, 4, 8, 16, \dots$

NO

NO

6. $-20, -14, -8, -2, \dots$

$RC = 6$ $IV = -26$
 $E = f(n) = 6n - 26$
 $R = a_n = a_{n-1} + 6$ $a_0 = -26$

8. $2, 6, 18, 54, \dots$

NO

