<u>NOTES: SEQUENCES</u> DAY 3

Textbook Chapter 12.2

1. SEQUENCE TYPE: ____

You earn $5 on day one for walking a neighbor's dog. Each subsequent day you earn $2 more than the day before. How much money will you earn on day 19? Write a sequence and evaluate it to determine your answer.

a. Write a sequence that represents how much money you will earn each day.

b. Find out how much money you will earn on day 50.

c. How long will it take you to earn $85 on one day.

2. SEQUENCE TYPE: ____

You go to a concert with your Aunt in Seattle and see a newly formed band, "The Fours." When you get home the next day, you share the album with 5 friends. The day after that, those 5 friends then share the album with 5 more friends, etc.

d. Write a sequence that represents how many new people learn of the band each day.

e. Find out how many people in the northeast will know of the band after 6 days.

f. How long will it take 10,000,000 people to know the band on the east coast.

NOTES: ARITHMETIC SEQUENCES

Example 1:

<table>
<tr><td colspan="3">7, 10, 13, 16, 19, …</td><td>Pattern:</td></tr>
<tr><td colspan="3">$a_0 =$</td><td rowspan="2">Explicit: $a_n =$</td></tr>
<tr><td>$a_1 =$</td><td></td><td>n =</td></tr>
<tr><td>$a_2 =$</td><td></td><td>n =</td><td rowspan="4">Recursive: $a_1 =$
$a_n =$</td></tr>
<tr><td>$a_3 =$</td><td></td><td>n =</td></tr>
<tr><td>$a_4 =$</td><td></td><td>n =</td></tr>
<tr><td>$a_5 =$</td><td></td><td>n =</td></tr>
</table>

Example 2: Write the explicit and recursive formulas for each sequence.

a.

b.

ARITHMETIC SEQUENCES: $a_n = a_1 + d(n-1)$

a_1 = ______________________________

d = ______________________________

n = ______________________________

Example 3: Every morning a radio show has a contest with a prize of $150. Each day the prize is not awarded, they amount is increased by $75. Make a list of the prize amount from the week if no one is awarded the money.

_________,	_________,	_________,	_________,	_________,	_________,	_________
Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday

Write an Explicit Formula	
Write a Recursive Formula	
Evaluate a Sequence	Find out how much someone will be awarded on the 12th day.

Example 4: Write the first 5 terms of the sequence:

a) $a_n = 9 + 4(n - 1)$

b) $f(n) = (-3)^{n-1}$

c) $a_0 = 1;\ a_n = a_{n-1} + 4$

d) $a_1 = 2;\ a_n = 3 \bullet a_{n-1}$

Example 5: Write the explicit and recursive formulas for the sequence described:

a) $a_{19} = 48,\ d = 3$

b) $a_{12} = 10,\ d = -3$

<u>Arithmetic Sequences Practice</u>

1. Look for a common ________________________ between each term.

2. Find the ________________________ (   ).

3. Use the formula: __________________________________.

Write the explicit and recursive formulas for each of the sequences.

1) 15, 20, 25, 30, 35, … Explicit: ____________________ Recursive:	**2)** –2, 1, 4, 7, 10, … Explicit: ____________________ Recursive:
3) –3, 1, 5, 9, 13, … Explicit: ____________________ Recursive:	**4)** 6, 14, 22, 30, 38, … Explicit: ____________________ Recursive:

5. Write the recursive rule for the following sequences

(A) 3, 13, 23, 33, 43, ...

(B) 16, 40, 100, 250, 625, ...

(C) 1, 1, 2, 3, 5, 8, 13, ...

(D) 1, 1, 2, 6, 24, 120, ...

6. Find the number of terms in each finite sequence.

a) 8, 15, 22, 29, . . . 99	**b)** 15, 12, 9, 6, . . . – 36

NOTES: GEOMETRIC SEQUENCES DAY 3

EXAMPLE 1

<table>
<tr><td colspan="3">2, 6, 18, 54, 162, …</td><td>Pattern:</td></tr>
<tr><td>$a_1 =$</td><td></td><td>$n =$</td><td rowspan="2">Explicit: $a_n =$</td></tr>
<tr><td>$a_2 =$</td><td></td><td>$n =$</td></tr>
<tr><td>$a_3 =$</td><td></td><td>$n =$</td><td rowspan="3">Recursive: $a_1 =$
$a_n =$</td></tr>
<tr><td>$a_4 =$</td><td></td><td>$n =$</td></tr>
<tr><td>$a_5 =$</td><td></td><td>$n =$</td></tr>
</table>

Example 2: Write the explicit and recursive formulas for each sequence.

a.

b.

GEOMETRIC SEQUENCES: $a_n = a_1 \cdot r^{n-1}$

a_1 = ____________________

r = ____________________

n = ____________________

Example 3: A rival radio show has a contest with a prize on $10 which doubles each day. Make a list of the prize amount from if no one is awarded the money.

________,	________,	________,	________,	________,	________,	________
Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday

Write an Explicit Formula	
Write a Recursive Formula	
Evaluate a Sequence	Find out how much someone will be awarded on the 12th day.

Example 4: Write the first 5 terms of the sequence: $a_n = 3(4)^{n-1}$

______, ______, ______, ______, ______

Example 5: Write the explicit and recursive formulas for the sequence described:

a) $a_2 = 6$, $r = 3$

b) $a_4 = 12$, $r = 2$

Geometric Sequences Practice

For each sequence, write the explicit and recursive formula.
Which sequence(s) have a limit? ____________________.

1) 1, 2, 4, 8, 16, … Explicit: ____________________ Recursive:	**2)** –1, –3, –9, –27, –81, … Explicit: ____________________ Recursive:
3) 27, 9, 3, 1, 1/3, … Explicit: ____________________ Recursive:	**4)** –0.5, –.25, –0.125, –0.625, … Explicit: ____________________ Recursive:
5) 3, 9, 27, 81, 243, … Explicit: ____________________ Recursive:	**6)** –2, 4, –8, 16, –32, … Explicit: ____________________ Recursive:

7. An online music service initially has 50,000 members. Each month, it loses 20% of its current membership, then adds 5,000 new members.

(A) Write a recursive rule for the number of members, a_n, at the start of the nth year.

(B) Use your calculator to find the number of members at the start of the fifth year.

(C) What happens to the number of members each year?

PRACTICE OF ALL TYPES OF SEQUENCES

1. Determine if the sequence is arithmetic or geometric.
2. Write the explicit and recursive formula.
3. Which sequence(s) have a limit? _______________.

1) 11, 17, 23, 29, 35, … Explicit: ____________________ Recursive:	**2)** 3, 6, 12, 24, 48, … Explicit: ____________________ Recursive:
3) 10, 100, 1000, 10,000, … Explicit: ____________________ Recursive:	**4)** 0, 1, 2, 3, 4, … Explicit: ____________________ Recursive:
5) 3, -2, -7, -12, -17, … Explicit: ____________________ Recursive:	**6)** 8.32, 8.44, 8.56, 8.68, 8.80, … Explicit: ____________________ Recursive:
7) 30, 3, 0.3, 0.03, 0.003, … Explicit: ____________________ Recursive:	**8)** -3, 9, -27, 81, -243, … Explicit: ____________________ Recursive:
9) $\frac{1}{2}, \quad \frac{1}{4}, \quad \frac{1}{8}, \quad \frac{1}{16}, \quad \frac{1}{32}, \ldots$ Explicit: ____________________ Recursive:	**10)** $-1, \quad \frac{1}{2}, \quad -\frac{1}{3}, \quad \frac{1}{4}, \quad -\frac{1}{5}, \ldots$ Explicit: ____________________ Recursive:

PRACTICE: SEQUENCES   DAY 3

Tell whether the following sequences are arithmetic, geometric or neither.
If it is arithmetic, find the common difference, if it is geometric, find the common ratio.

	Sequence	Geometric or Arithmetic	Common Difference or Ratio
1	$5,\ 9,\ 13,\ 17,\ ...$		
2	$3,\ 6,\ 12,\ 24,\ ...$		
3	$40,\ 10,\ \frac{5}{2},\ \frac{5}{8},\ ...$		
4	4, 7, 12, 19, …		

Fill out the table.

	Sequence	Explicit Formula	Recursive Formula	10^{th} Term
5	$5,\ 11,\ 17,\ 23,\ ...$			
6	60, 52, 44, 36,…			
7	$40,\ 20,\ 10,\ 5,\ \frac{5}{2},\ ...$			
8	1.6, 3.2, 4.8, 6.4,…			
9	152, -76, 38, -19,…			
10	4, 20, 100, 500, …			
11	$2,\ \frac{5}{3},\ \frac{4}{3},\ 1,\ ...$			

12. Write the first 5 terms of each sequence:

a) $a_n = 2n + 5$	b) $a_1 = 1; \quad a_n = a_{n-1} + 4$	c) $a_1 = 2; \quad a_n = 3 \bullet a_{n-1}$
d) $a_n = n^3 + 2$	e) $a_n = \dfrac{n}{n+1}$	f). $a_n = 3^n - 2$

For the following ARITHMETIC sequences, write the explicit formula.

13. $a_{19} = 48, \; d = 3$	14. $a_{12} = -3; \quad d = -7$
15. $a_{10} = 30; \quad d = \dfrac{7}{2}$	16. $a_{12} = 10, \quad d = -3$

For the following GEOMETRIC sequences, write the explicit formula.

17. $1, -4, 16, -64, ...$	18. $4, 2, 1, 0.5, ...$
19. $a_1 = 5;\ r = 3$	20. $a_4 = 500;\ r = 5$

21. Write the recursive rule for the following sequences

(B) $3, 13, 23, 33, 43, ...$

(B) $1, 1, 2, 3, 5, 8, 13, ...$

24. The numbers 3 – x, x and 1 – 3x are the first three terms in an arithmetic sequence. Find the value of x and the next two terms in the sequence (hint: the difference between the 2nd term and the 1st term is equal to the difference between the 3rd term and the 2nd term).