

Warm-Up

1/24/18

1

Use the sequence below
to complete each task.

37, 35, 33, 31,

- Identify the common difference (d)
- Write the explicit formula
- Find the 26th term (a_{26})

$$d = -2$$

$$a_n = a_1 + (n-1)d$$

$$a_n = 37 + (n-1) \cdot (-2)$$

$$a_n = 37 - 2n + 2$$

$$a_n = 39 - 2n$$

$$\begin{aligned} a_{26} &= 39 - 2(26) \\ &= 39 - 52 \end{aligned}$$

$$a_{26} = -13$$

Standards: 1/24/18

MGSE9-12.F.BF.1a Determine an explicit expression and the recursive process (steps for calculation) from context.

MGSE9-12.F.BF.2 Write arithmetic sequences recursively and explicitly, use them to model situations, and translate between the two forms. Connect arithmetic sequences to linear functions.

Notes (INB)



A sequence is an ordered list of numbers that has a constant difference between each term.

- To find the n th term in a number series, use

$$a_n = a_1 + (n-1)d \text{ (explicit)}$$

a_n → nth term a_1 → 1st term $(n-1)$ → # of terms d → common difference

Example: 11, 8, 5, 2,

what would be the 21st term in
this sequence?

Recursive Definition is a formula for the next term, depending on the previous term.

$$a_n = a_{n-1} + d$$

previous term **common difference**

Guided Practice/Class Work 1/24/18

EXERCISES

Sequences

Name: _____

ARITHMETIC SEQUENCES. Find the next few terms in the sequence and then find the requested term.

1) 2, 4, 6, 8, 10, 12, 14

Find $a_{42} =$ 84

$$d = 2$$

$$a_{42} = 2(42) = 84$$

$$a_n = a_{n-1} + d$$

$$a_n = a_1 + (n-1)d$$

$$a_n = 2 + (n-1)2$$

$$a_n = 2 + 2n - 2$$

Determine the **RECURSIVE DEFINITION**:

$$a_n = a_{n-1} + 2$$

Determine the **EXPLICIT DEFINITION**:

$$a_n = 2n$$

2) 5, 8, 11, 14, _____, _____, _____,

Find $a_{33} =$ 101

$$d = 8 - 5 = 3$$

$$\begin{aligned} a_{33} &= 3(33) + 2 \\ &= 99 + 2 \end{aligned}$$

$$a_n = 5 + (n-1)3$$

$$a_n = 3 + 3n - 3$$

$$a_n = 3n + 2$$

Determine the RECURSIVE DEFINITION:

$$a_n = a_{n-1} + 3$$

Determine the EXPLICIT DEFINITION:

$$a_n = 3n + 2$$

3) 10, 7, 4, 1, _____, _____, _____,

 -3

$$d = -3$$

$$a_n = a_{n-1} - 3$$

Find $a_{29} =$ _____

$$a_n = a_1 + (n-1)d$$

$$a_{29} = 10 + (29-1)(-3)$$

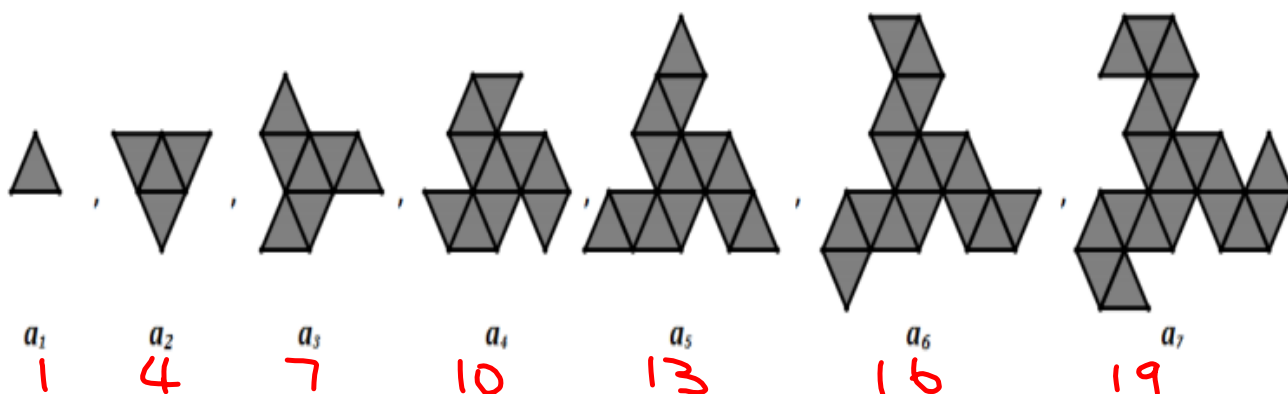
$$a_{29} = 10 + (28 \cdot -3)$$

$$a_{29} = 10 - 84$$

$$a_{29} = -74$$

Determine the RECURSIVE DEFINITION:Determine the EXPLICIT DEFINITION:

4) Josh was making a sequence pattern out of triangle pattern blocks.



If Josh continues this pattern, how many triangles will he need to make the 20th step of this pattern?

$$d = 3 \quad a_n = a_1 + (n-1)d \quad a_1 = 1$$

$$a_{20} = 1 + (19 \cdot 3)$$

$$a_{20} = 58$$

Functions can be used as explicit definitions for a sequence:

Consider the sequence: 4, 7, 10, 13, 16, 19, 22, 25,..... The function $f(x) = 4 + (x - 1)3$ could be used to define the sequence where x = the term number. The domain would be $\{1, 2, 3, 4, \dots\}$ and the range would be $\{4, 7, 10, 13, \dots\}$

5) Create a sequence based on the function: $f(x) = 4x - 1$ Domain: $\{1, 2, 3, 4, \dots\}$

$x=1$ $f(1) = 4(1) - 1 = 3$
 $x=2$ $f(2) = 4(2) - 1 = 7$
 $x=3$ $f(3) = 4(3) - 1 = 11$
 $x=4$ $f(4) = 4(4) - 1 = 15$

Range: $\{3, 7, 11, 15, \dots\}$

6) Describe the **domain** and **range** of a function that might describe the sequence of $\{14, 11, 8, 5, \dots\}$

Domain: $\{1, 2, 3, 4, \dots\}$

Range: $\{14, 11, 8, 5, \dots\}$

7) Determine the **common difference** of the sequence and write a function that could be used to describe the sequence: $\{14, 11, 8, 5, \dots\}$

$d = -3$

$a_n = a_1 + (n-1)d$

$a_n = 14 + (n-1)(-3)$

$a_n = 14 - 3n + 3$

$a_n = 17 - 3n$

$a_n = -3n + 17$

$f(x) = -3x + 17$

8) Write a recurrence relation and an explicit definition for the following table:

x	n	1	2	3	4	5	...	- domain
y	a_n	5	7	9	11	13	...	- range

$$d = 2 \quad a_1 = 5$$

$$\text{Recursive: } a_n = a_{n-1} + 2$$

$$\text{Explicit: } a_n = 5 + (n-1)2$$

$$a_n = 5 + 2n - 2$$

$$a_n = 2n + 3$$

RECURRENCE RELATION:

EXPLICIT DEFINITION:

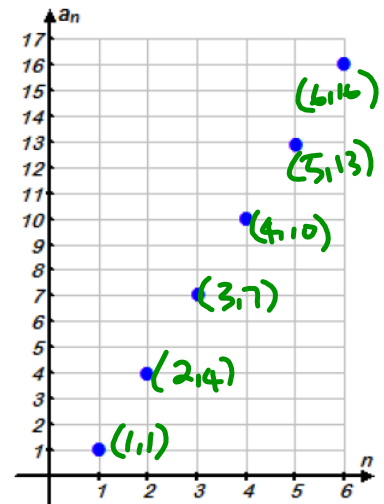
9) Write a **recurrence relation** and an **explicit definition** for the following graph:

$$\text{domain: } \{1, 2, 3, 4, 5, 6\}$$

$$\text{Range: } \{1, 4, 7, 10, 13, 16\}$$

$$a_1 = 1$$

$$d = 3$$



RECURRENCE RELATION:

$$a_n = a_{n-1} + 3$$

EXPLICIT DEFINITION:

$$a_n = 1 + (n-1)3$$

10) Given that a sequence is **arithmetic**, $a_1 = 5$, and the common difference is 4, find a_{37} .

$$a_{37} = 5 + (37-1)4$$

$$36 \cdot 4$$

$$144 + 5 = 149$$

11) Given that a sequence is **arithmetic**, $a_{52} = 161$, and the common difference is 3, find a_1 .

$$a_n = a_1 + (n-1)d$$

$$a_{52} = a_1 + (52-1)3$$

$$161 = a_1 + 153$$

$$\begin{array}{r} 161 = a_1 + 153 \\ -153 \\ \hline 8 = a_1 \end{array}$$

$$8 + 153 = 161$$

Class Work

1/24/18

Day 8 – Arithmetic Sequences
Practice Assignment

Name: _____

Date: _____ Block: _____

For problems 1-3, determine the first 4 terms of the sequence.

1.

$a_1 = 13$

$a_n = a_{n-1} + 12$

$a_2 = 13 + 12 = 25$

$a_3 = 25 + 12 = 37$

$a_4 = 37 + 12 = 49$

2.

$a_1 = 45$

$a_n = a_{n-1} - 10$

3.

$a_1 = -4$

$a_n = a_{n-1} + 12$

For problems 4 – 5, create a RECURSIVE rule for each sequence.

4. 10, 11, 12, 13, ...

$d = 1$

$a_n = a_{n-1} + 1$

5. -1, 3, 7, 11, ...

$a_n = a_{n-1} + d$

6. 14, 25, 36, 47...

Given the first term and the common difference of an arithmetic sequence determine the EXPLICIT formula and find the first five terms of the sequence.

7. $a_1 = 28; d = 10$ $a_n = 28 + (n-1)10$ 8. $a_1 = -38; d = -100$

$$a_n = 28 + 10n - 10 \quad a_5 = 68$$

$$a_n = 18 + 10n$$

$$a_2 = 18 + 10(2) = 38$$

$$a_3 = 18 + 10(3) = 48$$

$$a_4 = 18 + 10(4) = 58$$

9. A theater has 20 seats in the first row, 22 in the second row, 24 in the third row, and so on for 25 rows. How many seats will be in the 13th row?

$$20, 22, 24, \dots$$

$$d = 2 \quad a_1 = 20$$

$$a_{13} = 20 + (13-1)2$$

$$= 20 + 24$$

$$a_{13} = 44$$

10. Camden is collecting bugs for science class. The first day his sister helps him, and he finds 35 bugs. After day 2, he has 52 bugs. On day 3, he has 69 bugs. How many bugs will he have on the 15th day?



Fig 1



Fig 2

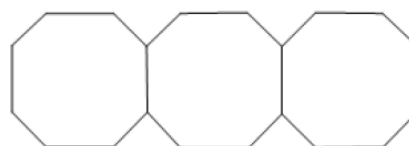


Fig 3

Complete the table below:

Fig #	0	1	2	3	4	5
# of lines						

a. Write the **CLOSED (EXPLICIT)** and **RECURSIVE** rule for the number of lines needed to generate each shape.

b. How many lines would be used to create figure #20?

12. After the first day at work, Annie realized that she sent 127 e-mails. Each day, Annie's e-mail count increased by 10. If she keeps this up, how many e-mails will she have sent after 3 weeks?

$$d = \underline{10}$$

3 wks = 21 days

$$a_1 = \underline{127}$$

Formula: $a_n = 10n + 117$

$$a_n = 127 + (n-1)10$$

$$a_n = 127 + 10n - 10$$

$$a_n = 117 + 10n$$

After 3 weeks: $\underline{327}$ emails

$$a_{21} = 127 + (21-1)10$$

$$a_{21} = 127 + 200$$

Student-Led Closing 1/24/18

MC Practice

1. In the sequence above, the first term is 4 and each term after the first is 7 more than the previous term. What is the 12th term of the sequence?

a. 77

c. 84

b. 81

d. 86

2. Find the 25th term of the sequence 7, 11, 15, 19, 23, ...

a. 103

c. 107

b. 104

d. 111

3. Which represents the n th term of this sequence? 31, 36, 41, 46, 51, ...

a. $51 + (n - 1)6$

c. $31 + (n - 1)6$

b. $51 + (n - 1)5$

d. $31 + (n - 1)5$

4. What is the 9th term in this sequence? 20, 14, 8, 2,...

a. 62

b. -4

c. -22

d. -28

5. What are the first four terms in the sequence whose n th term is $a_n = (-2)^n + 1$

a. 3, 4, 5, 6

b. -1, 1, -1, 1

c. -1, 5, -7, 17

d. -2, 4, -8, 16

6. The 8th term of an arithmetic sequence is 36. If the common difference is 2, what is the first term in the sequence?

a. 22

b. 24

c. 38

d. 6