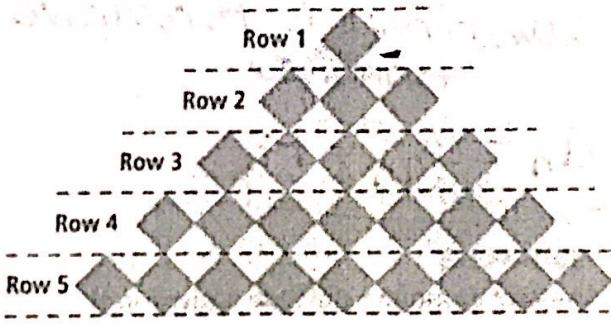
3.4 Arithmetic Sequences Guided Notes Day 1 Name _____

Goal: Identify and Describe Arithmetic Sequences, identify terms in an arithmetic sequence, and find common difference. Write arithmetic sequences in recursive and explicit formulas.

A. There are 5 shaded squares in row 3. The total number of shaded squares up to and including row 3 is 9. Fill in the table for the remaining rows.

Row Number	1	2	3	4	5	6	8	10
Number of Shaded Squares in the Row	1	3	5	7	9	11	15	19
Total Number of Shaded Squares	1	4	9	16	25	36	64	100

A fashion designer is designing a patterned fabric.



What number patterns do you see in the rows of the table?

each row: previous row +2

total shaded squares: (row #)^2

a_1 a_2 a_3 a_4 a_5

arithmetic sequence: a pattern of numbers that increases or decreases at a constant rate

EXAMPLE 1: Is the ordered list 26, 39, 52, 65, 78 an arithmetic sequence?

Yes! This is an arithmetic sequence with constant increase of 13. yes, +13

Identify the first term: $a_1 = 26$ notation of 1st term of a sequence "a sub 1"

Identify the last term: $a_5 = 78$ 5th term of sequence "a sub 5"

Find the common difference: common difference is "d" = +13 $d=13$

How are sequences related to functions? the common difference is like the slope. it's a constant rate

Represent the ~~sequence~~ sequence in subscript notation: **The Recursive Formula of an Arithmetic Sequence:**

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

a_n: the "nth" term of the sequence; a_{n-1}: previous term of sequence; d: common difference

i.e. $n=10$

$a_{10} = a_{10-1} + d$

$a_{10} = a_9 + d$

EXAMPLE 2

A. What is a recursive formula for the height above the ground of the n^{th} step of the pyramid shown?

$d=26$ $a_n = a_{n-1} + 26$ * start with "d"

B. Use the recursive formula $a_n = a_{n-1} + 26$, where $a_1 = 26$, to find the height above the ground of the 3rd step.

Identify what we know $a_1 = 26$

$a_3 =$

$a_2 = 26 + 26$

$a_2 = 52$cm

$a_3 = a_{3-1} + 26$

$a_3 = a_2 + 26$

$a_3 = 52 + 26$

$a_3 = 78$cm

The 3rd step is 78cm above ground

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

You try:

Given the arithmetic sequence
$-4, -12, -20, -28, \ldots$

-8 -8 -8

Write the recursive formula:

$a_n = a_{n-1} - 8$

You try: Given the arithmetic sequence
$-6, -1, 4, 9, 14, \ldots$

Write the recursive formula:

$d = +5$

$\therefore a_n = a_{n-1} + 5$

EXAMPLE 3

The cost of renting a bicycle is given in the table.

How can you represent the rental cost using an explicit formula?

Number of days rented (x)	1	2	3	4	5	10
Rental Cost (y)	26	38	50	62	74	134

$+12$ (common difference)

The cost for renting a bicycle for 10 days is $134.

The Explicit Formula

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

(n = term number, -1 = one)

a_n: nth term; a_1: 1st term

What is the cost of renting the bicycle for 10 days?

$a_n = 26 + (n-1)12$ $\quad n = 10$

PEMDAS

$a_{10} = 26 + (10-1)12$

$a_{10} = 26 + (9)12$

$a_{10} = 26 + 108$

$a_{10} = 134$

How is the explicit formula of an arithmetic sequence related to a linear function?

$a_n = 26 + 12n - 12 \Rightarrow a_n = 12n + 14$

$f(n) = 12n + 4$

$n = x$, $a_n = y$

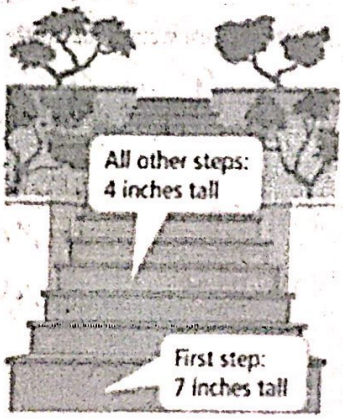
EXAMPLE 4

The recursive formula for the height above the ground of the n^{th} step of the stairs shown is $a_n = a_{n-1} + 4$ with $a_1 = 7$. What explicit formula finds the height above the ground of the nth step?

① identify what we know: $a_1 = 7$, $d = 4$

② "sub" in to explicit formula: $a_n = a_1 + (n-1)d$, $a_n = 7 + (n-1)4$

③ Simplify explicit formula: $a_n = 7 + 4n - 4$, $a_n = 4n + 3$



EXAMPLE 5 Using the explicit formula

Given $a_n = 10 - 3(n-1)$

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

Find the first 5 terms of the sequence:

$a_1 = 10$

$a_2 = 7$

$a_3 = 4$

$a_4 = 1$

$a_5 = -2$

$a_2 = 10 - 3(2-1)$, $a_2 = 10 - 3(1)$, $a_2 = 7$

$a_3 = 10 - 3(3-1)$, $a_3 = 10 - 3(2)$, $a_3 = 10 - 6$

$a_4 = 10 - 3(4-1)$, $a_4 = 10 - 3(3)$, $a_4 = 10 - 9$

$a_5 = 10 - 3(5-1)$, $a_5 = 10 - 3(4)$, $a_5 = 10 - 12$, $a_5 = -2$

You try:

Given $a_n = 11 - 4(n-1)$

Find the first 5 terms of the sequence:

$a_1 = 11$

$a_2 = 7$

$a_3 = 3$

$a_4 = -1$

$a_5 = -5$