Arithmetic Sequences, Lines Made of Dots

Arithmetic: add d each time. Recursive: the start and the next-from-before rule. Explicit: a sub n = a sub 1 + d(n - 1). Steps are one less than the term number.

Name _____ Date _____

Words we use

say the math word, then the plain English

WORD	PLAIN ENGLISH	WHAT YOU DO
Arithmetic sequence	A list that adds the same amount each time.	Its dots sit on a line.
Common difference, d	The amount added each time. It is the slope.	Subtract any term minus the one before. It can be negative.
Recursive rule	How to get the next term from the one before. The stairs.	a_1 = start, $a_n = a_{n-1} + d$.
Explicit rule	How to find any term from its term number. The elevator.	$a_n = a_1 + d(n - 1)$.
Zeroth term	The term one step before the first. It is the y-intercept.	$a_1 - d$. It sits at n = 0.
n – 1	The number of steps from the first term to the nth.	One less than the term number.

Part A Find d and write both rules

SEQUENCE	D	RECURSIVE RULE	EXPLICIT RULE
5, 9, 13, 17, ...			
60, 68, 76, 84, ...			
40, 37, 34, 31, ...			
2.5, 4, 5.5, 7, ...			

Part B Far terms

1. The 50th term of 5, 9, 13, 17, ... How many steps?

2. Row 20 of the theater (60, 68, 76, ...).

3. The 20th term of 40, 37, 34, 31, ...

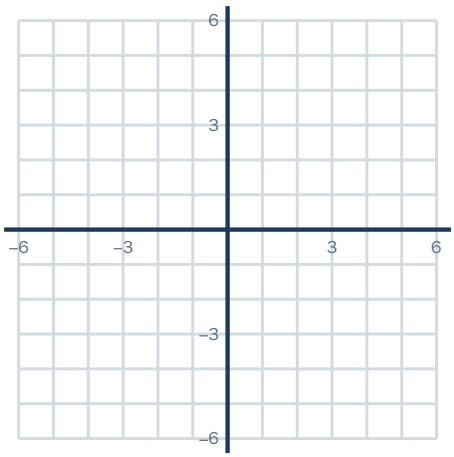
Part C It is a line

1. Simplify 60 + 8(n – 1) to slope-intercept form. Show the distribute step.

2. What is the slope? What is the y-intercept? What is the y-intercept called in sequence words?

3. For 7, 12, 17, 22, ... what is the y-intercept? Why is it not 7?

Plot the first five terms of 3, 5, 7, 9, 11 as dots. Draw the steps between them and mark the zeroth term on the y-axis.



Part D Which term?

1. A concert hall has 58, 62, 66, ... seats. Which row has 94 seats? Show the equation and each move.

2. In 7, 12, 17, 22, ... which term is 102?

Part E Exit ticket

1. 12, 19, 26, 33, ...: d, both rules, and the 30th term.

2. Why n – 1 and not n?

Answer key

Part A. d = 4; $a_1 = 5$, $a_n = a_{n-1} + 4$; $a_n = 5 + 4(n - 1)$. d = 8; $a_1 = 60, + 8$; $60 + 8(n - 1)$. d = –3; $a_1 = 40, - 3$; $40 - 3(n - 1)$. d = 1.5; $a_1 = 2.5, + 1.5$; $2.5 + 1.5(n - 1)$.

Part B. 1. 49 steps: $5 + 4 \times 49 = 201$. 2. $60 + 8 \times 19 = 212$. 3. $40 - 3 \times 19 = -17$.

Part C. 1. $60 + 8n - 8 = 8n + 52$. 2. Slope 8; y-intercept 52; the zeroth term. 3. 2: the first term 7 is at n = 1; one step back is 7 – 5 = 2. Plot: (1, 3), (2, 5), (3, 7), (4, 9), (5, 11); zeroth term at (0, 1).

Part D. 1. $58 + 4(n - 1) = 94$; $4(n - 1) = 36$; $n - 1 = 9$; $n = 10$. 2. $7 + 5(n - 1) = 102$; $n - 1 = 19$; $n = 20$.

Part E. 1. d = 7; $a_1 = 12$, $a_n = a_{n-1} + 7$; $a_n = 12 + 7(n - 1)$; $a_{30} = 215$. 2. The first term is already there: n – 1 steps reach the nth term.