NOTES: Linear Sequences (Arithmetic Sequences)

Arithmetic Sequence Formulas
Recursive: $a_n = a_{n-1} + d$
Explicit: $a_n = a_1 + (n-1)d$

Vocabulary:

Sequence means : A PATTERN OF NUMBERS

Arithmetic means : A (LINEAR) SEQUENCE. THE PATTERN CHANGES BY A CONSTANT AMOUNT THAT IS ADDED TO EACH TERM

Recursive means: A WAY (FORMULA) (MODEL) TO WRITE A SEQUENCE WHICH USES THE PREVIOUS TERM IN THE SEQUENCE

Explicit means: A WAY (FORMULA) (MODEL) TO WRITE A SEQUENCE WHICH USES THE TERM NUMBER AS AN INPUT

What are the variables?

USED IN BOTH:
a_n: THE OUTPUT VARIABLE

d: COMMON DIFFERENCE (WHAT IS ADDED TO EACH TERM)

USED IN RECURSIVE

a_{n-1}: THE PREVIOUS TERM

USED IN EXPLICIT

n: THE TERM IN THE SEQUENCE (FIRST, SECOND, THIRD....)

a_1: THE OUTPUT OF THE FIRST TERM

3, 9, 15, 21, 27.....

$a_1 =$ __3__ d = __6__

What is the 4th term? 21

9 represents which term? SECOND TERM

Examples

1) Write a <u>recursive</u> rule for the following sequence $\quad$ 2, 6, 10, 14, 18.....$\quad d=4$ $\boxed{a_n = a_{n-1} + 4}$ ← ↖ WRITE IT JUST LIKE THIS, ⟳◌←	**2)** Write a <u>recursive</u> rule for the following sequence $\quad$ 3, 7, 11, 15, 19..... $\boxed{a_n = a_{n-1} + 4}$ ✱SAME AS #1 it just had a different first term
3) Write an <u>explicit</u> rule for the following sequence $\quad$ 11, 20, 29, 38, 47 .... $a_1 = 11 \qquad d = 9$ $a_n = a_1 + (n-1)d$ $a_n = 11 + (n-1)9 \leftarrow$ PLUG IN a_1 AND d $a_n = 11 + 9n - 9 \leftarrow$ DISTRIBUTE (MULTIPLY) THE PARENTHESIS $\boxed{a_n = 9n + 2} \leftarrow$ COMBINE LIKE TERMS	**4)** Write an <u>explicit</u> rule for the following sequence $\quad$ 3, 7, 11, 15, 19..... $a_1 = 3 \qquad d = 4$ $a_n = 3 + (n-1)4$ $a_n = 3 + 4n - 4$ $\boxed{a_n = 4n - 1}$
5) What is the ⟨twentieth⟩ term of the sequence whose nth term is $a_n = -3n + 14$ $n = 20 \qquad a_n = -3(20) + 14$ MEANS THE 20th TERM IS -46 $\quad a_n = -46$ $\boxed{a_{20} = -46}$ ⟸	**6)** What is the ⟨~~twentieth~~⟩ SIXTIETH term of the sequence whose nth term is $a_n = -8n - 1$ $n = 60 \qquad a_n = -8(60) - 1$ $\qquad\qquad a_n = -481$ $\boxed{a_{60} = -481}$
7) Find the 36th term of the sequence $\quad$ 26, 24, 22, 20, 18, 16.....$\binom{\text{see}}{\#3}$ STEP 1: WRITE AN EXPLICIT FORMULA STEP 2: PLUG IN THE TERM (36) $a_1 = 26 \qquad d = -2$ $\qquad a_n = 26 + (n-1) \cdot -2$ $\qquad a_n = 26 - 2n + 2$ $\qquad a_n = -2n + 28 \leftarrow$ FORMULA $\qquad a_n = -2(36) + 28 \leftarrow$ PLUG IN $\qquad a_n = -44$ $\qquad\qquad \boxed{a_{36} = -44}$	**8)** Find the 28th term of the sequence $\quad$ 13, 27, 41, 55, 69... $a_1 = 13 \qquad d = 14$ $a_n = 13 + (n-1)14$ $a_n = 13 + 14n - 14$ $a_n = 14n - 1$ $\quad a_n = 14(28) - 1$ $\qquad a_n = 391$ $\qquad\qquad \boxed{a_{28} = 391}$