A34: Arithmetic Sequences Worksheet

19.1 Arithmetic Sequences

Sequence - An ordered list of terms; has a pattern.

Ex: 3, 6, 9, 12, 15 OR 4, 8, 16, 32, 64

Arithmetic Sequences - Always adds or subtracts the same number, called the common difference "d".

Ex #1 Determine the value of the common difference, d, and find the next 3 terms.

a) -16, -14, -12, -10, -8, -6 d = 2

b) -6, 2, 10, 18, 26, 34 d = 8

Sequence Notation - The way we write/represent a sequence using variables and expressions.

a_1 = 1st number in the sequence

a_2 = 2nd number in the sequence

a_3 = 3rd number in the sequence

⋮

a_{n-1} = $(n-1)^{th}$ number in the sequence

a_n = n^{th} number in the sequence

a_{n+1} = $(n+1)^{th}$ number in the sequence

the way you say these is "a sub #"

Ex #2 Identify a_6 in the sequence 1, 1, 2, 3, 5, 8, 13.

$a_6 = 8$ because 8 is the 6th term in the sequence.

Explicit Formula for an Arithmetic Sequence

Gives the value of any term by plugging into the formula

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

Ex #3 If the explicit formula is $a_n = 3 + (n-1)4$, what are a_1, a_{10}, and a_{200}?

$a_1 = 3 + (1-1)4 = 3 + (0)4 = 3 + 0 = 3$

$a_{10} = 3 + (10-1)4 = 3 + (9)4 = 3 + 36 = 39$

$a_{200} = 3 + (200-1)4 = 3 + (199)4 = 3 + 796 = 799$

$a_1 = 3$
$a_{10} = 39$
$a_{200} = 799$

Ex #4 Write the explicit formula for 4, 6, 8, 10, 12, 14, ...

$a_1 = 4$ and $d = 2$ so $a_n = 4 + (n-1)2$

Recursive Formula for an Arithmetic Sequence

MUCH more annoying to work with - Gives the value of the next term by using the term(s) before it

$a_n = a_{n-1} + d$ with $a_1 = \#$

Ex #5 Given the recursive formula is $a_n = a_{n-1} + 7$ with $a_1 = -14$, what are a_2, a_5, and a_{10}?

$a_2 = a_{2-1} + 7 = a_1 + 7 = -14 + 7 = -7$ → $\boxed{a_2 = -7}$

$a_5 = a_{5-1} + 7 = a_4 + 7$ → but we don't know a_4 :(

$a_4 = a_{4-1} + 7 = a_3 + 7$ → don't know a_3 :(

$a_3 = a_{3-1} + 7 = a_2 + 7 = -7 + 7 = 0$

Woohoo!! now go backwards

$a_4 = a_3 + 7 = 0 + 7 = 7$

$a_5 = a_4 + 7 = 7 + 7 = 14$ → $\boxed{a_5 = 14}$

$a_{10} = a_9 + 7 = 42 + 7 = 49$

$a_9 = a_8 + 7 = 35 + 7 = 42$

$a_8 = a_7 + 7 = 28 + 7 = 35$

$a_7 = a_6 + 7 = 21 + 7 = 28$

$a_6 = a_5 + 7 = 14 + 7 = 21$

$\boxed{a_{10} = 49}$

Ex #6 Write the recursive formula for $10, 6, 2, -2, -6, \ldots$

$a_1 = 10$ and $d = -4$ so $\boxed{a_n = a_{n-1} - 4 \text{ with } a_1 = 10}$

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