# HAT
# Recursive to Explicit, Explicit to Recursive!

3/8/18

For each sequence:

Write the first 4 terms.

If the formula is explicit, write the recursive formula.

If the formula is recursive, write the explicit formula.

Prove that the formulas are equivalent by starting with the explicit formula.

EX #1: $\begin{cases} t_1 = -23 \\ t_{n+1} = t_n + 8 \end{cases}$ Recursive

← Arithmetic

$-23, -15, -7, 1, 9, \ldots$

$t_n = -23 + 8(n-1)$

$t_n = -31 + 8n$

PROOF: 1) $t_1 = -31 + 8(1)$

$t_1 = -23$ ✓

2) $\boxed{t_n = -31 + 8n}$

$t_{n+1} = -31 + 8(n+1)$

$t_{n+1} = \underbrace{-31 + 8n}_{t_n} + 8$

$t_{n+1} = t_n + 8$ ✓

EX #2: $t_n = -4n + 7$ ← Arithmetic

EXPLICIT

$3, -1, -5, -9, -13, \ldots$

Recursive: $\begin{cases} t_1 = 3 \\ t_{n+1} = t_n - 4 \end{cases}$

Proof:

Start w/ explicit

1) $t_n = -4n + 7$

$t_1 = -4(1) + 7$

$t_1 = 3$ ✓

2) $t_n = -4n + 7$

$t_{n+1} = -4(n+1) + 7$

$t_{n+1} = -4n - 4 + 7$

$t_{n+1} = t_n - 4$ ✓

EX #3: $\begin{cases} t_1 = 3 \\ t_{n+1} = t_n \cdot 4 \end{cases}$ Geometric

3, 12, 48, 192, 768, ...

Explicit:

$t_n = 3(4)^{n-1}$

Proof: 1) $t_n = 3(4)^{n-1}$

$t_1 = 3(4)^{1-1}$

$t_1 = 3$ ✓

2) $t_n = 3(4)^{n-1}$

$t_{n+1} = 3(4)^{(n+1)-1}$

$t_{n+1} = 3(4)^{n-1+1}$

$t_{n+1} = 3(4)^{n-1} \cdot 4^1$

$t_{n+1} = t_n \cdot 4$ ✓

EX #4: $a_n = 2n^2 + 1$

**March 8, 2018**