☺ 3.1 – Linear Equations and Arithmetic Sequences ☺

Daily Objectives:

1. Given a recursive formula, find n for a given u_n
2. Graph an arithmetic sequence to locate the un-intercept and determine the slope
3. Recognize slope as the common difference of an arithmetic sequence
4. Use the un-intercept and slope to write a linear equation
5. Recognize that an arithmetic sequence is always linear
6. Introduce explicit formulas for sequences
7. Recognize connection between explicit and recursive formulas for arithmetic sequences.

Explicit Formula: GIVES A DIRECT RELATIONSHIP BETWEEN TWO DISCREET QUANTITIES

TERM VALUE = INITIAL VALUE + RATE × TERM NUMBER

$u_n = u_0 + \text{RATE} \times n$

↑ rule

Example 1: Given the recursive formula below, write the explicit formula:

$$u_0 = 2.27$$
$$u_n = u_{n-1} + 1.37$$

$u_n = 2.27 + 1.37n$

Example 2: Consider the recursively defined arithmetic sequence:

$$u_0 = 2$$
$$u_n = u_{n-1} + 6$$

a. Find an explicit formula for the sequence.

$u_n = 2 + 6n$

b. Use the explicit formula to find u_{22}.

$u_{22} = 2 + 6(22)$

$u_{22} = 134$

c. Find the value of n so that $u_n = 86$.

$86 = 2 + 6n$

$\frac{84}{6} = \frac{6n}{6}$

$14 = n$

Example 3: Consider the recursively defined arithmetic sequence.

$$u_0 = 13$$
$$u_n = u_{n-1} - 3$$

a. Find an explicit formula for the sequence.

$u_n = 13 - 3n$

b. Use the explicit formula to find u_{17}.

$u_{17} = 13 - 3(17)$

$u_{17} = 13 - 51$

$u_{17} = -38$

c. Find the value of n so that $u_n = -50$.

$-50 = 13 - 3n$

$-13 \quad -13$

$\frac{-63}{-3} = \frac{-3n}{-3}$

$21 = n$

Linear Equation:

$y = mx + b \quad y = a + bx \quad Ax + By = C$

Example 4: Matias wants to call his aunt in Chile on her birthday. He learned that placing the call costs $2.27 and that each minute he talks costs $1.37.

a. Write the recursive routine to represent the cost of Matias's phone call.

$u_0 = 2.27 \quad u_n = u_{n-1} + 1.37 \quad n \geq 1$

b. Write the explicit formula.

$u_n = 2.27 + 1.37n$

c. Write the linear equation for Matias's phone call.

$y = 2.27 + 1.37x$

Example 5: Rita typically spends $2 a day on lunch. She notices that she has $17 left after today's lunch.

a. Write a recursive routine that represents her daily cash balance.

$u_1 = 17 \quad u_n = u_{n-1} - 2 \quad n \geq 2$

b. Write the explicit formula for this recursive routine.

NEED TO HAVE u_0!

$u_n = 19 - 2n$

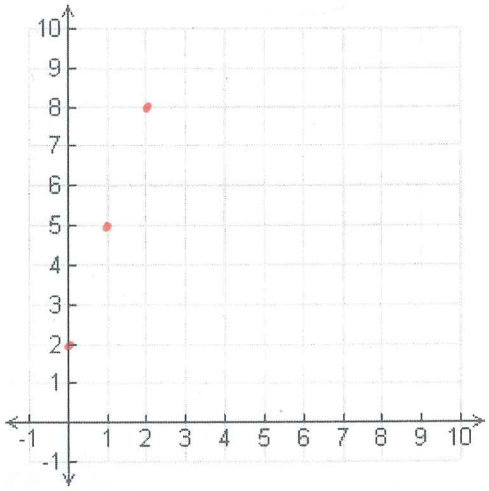
c. Write the linear equation for this situation.

$y = 19 - 2x$

Example 6:

Graph the explicit formula:

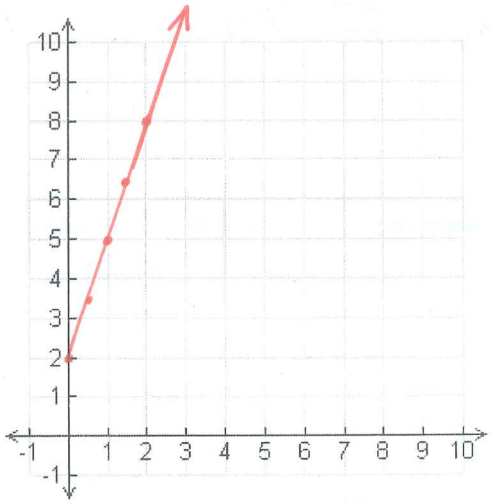
$u_n = 3n + 2$



Discrete: DATA CONSISTS OF INDIVIDUAL POINTS WITH GAPS AS VALUES OF N ARE WHOLE NUMBERS

Graph the linear equation:

$y = 2 + 3x$



Continuous: LINEAR EQUATIONS DO NOT CONTAIN GAPS, X CAN BE ANY VALUE