CS113/DISCRETE MATHEMATICS-SPRING 2024

Worksheet 17

Topic: Strong Induction

> Today, we will learn another powerful form of induction known as Strong Induction. Strong Induction, also known as Complete Induction or Course-of-Values Induction, is a variant of mathematical induction that allows us to establish the validity of statements about natural numbers or other well-ordered sets. Happy Learning!

Student's Name and ID: _____

Instructor's name: _____

1. Which amounts of money can be formed using just two dollar bills and five-dollar bills? Prove your answer using strong induction

2. Prove that every positive integer greater than 1 can be expressed as a product of prime numbers by using strong induction.

3. Given $n \in \mathbb{N}$, define a_n recursively as follows:

$$a_n = \begin{cases} 1, & \text{if } n = 0 \\ 3, & \text{if } n = 1 \\ 2a_{n-1} - a_{n-2}, & \text{if } n \geq 2 \end{cases}$$

Prove for all $n \geq 0$, $a_n = 2n + 1$.