MTH 225: Discrete Structures for Computer Science 1

Daily Preparation, Module 12A: Introduction to the concept of mathematical induction

Due by: 11:59pm ET, **Sunday, November 29**

Estimated time requirement: About 45-60 minutes for the whole assignment. *If you have worked on this assignment for 30 minutes and you're not at least halfway done*, *DON'T work any further* — instead, *stop and ask for help* on the `#dailyprep` channel on CampusWire. Remember these are graded just on completeness and effort — try to be right and understand everything, but don't get bogged down if you get stuck. Just give a good effort and move on, and ask a question.

Overview

Our final module of the course looks both backwards and forwards. We're going look *backwards* at concepts from our study of logic (specifically predicates and quantifiers), sets, and various recursively-defined objects from other Modules to take a very close look how we can draw conclusions about those objects. This sets us up for a closer look at the idea of *mathematical proof* introduced in Module 8, with a specific kind of proof called **mathematical induction**. It's a form of proof that is well suited for making conclusions about recursively-defined objects like sequences, sums, and other things. And expanding on the idea of induction is one of the first things you will do in MTH 325 (Discrete Structures 2).

What you will learn

Learning Targets addressed in this module:

- P.2 **(Core)**: Given a statement to be proven by (weak) induction, I can state and prove the base case, state the inductive hypothesis, and outline the proof.

BEFORE your class meeting, use the Resources for Learning (below) to learn how to do the following:

- (*Review*) Determine which values of a variable make a predicate true.
- Gather evidence and make a conjecture about a recursively-defined object's behavior.

DURING AND AFTER your class meeting, you will learn how to do the following:

- Explain the context in which a proof by mathematical induction is used.
- Given a statement that is to be proven by (weak) mathematical induction, state what would need to be proven in the base case, and then prove the base case.
- Given a statement that is to be proven by (weak) mathematical induction, state the inductive hypothesis.
- Given a statement that is to be proven by (weak) mathematical induction, explain what would need to be proven next.

Resources for Learning

There is no reading and no viewing for this Daily Prep. All of your preparatory work will consist in playing around with the Fibonacci number sequence, as explained in the exercises below.

Exercises

The exercises are on the following Google Form:
https://docs.google.com/forms/d/e/1FAIpQLSeLJb6bTfZFtHqmQ370Rl8We9NUZZSSKovfeN_YUGzpvgRsgQ/viewform

Submission, grading, and getting help

Submitting your work: Your work is to be done on Classkick using the link/code above. Classkick saves your work as you go, so there's nothing to submit – just do the work and you're good.

How this is graded: Daily Prep assignments are graded on the basis of *completeness and effort*: If your submission has **all parts completed** (no blank entries, even if left blank accidentally) and **a good-faith effort to provide a correct solution or explanation is given** (no responses of "I don't know" or "I didn't understand") and **the work is submitted on time**, it gets a "check". Otherwise it gets an "x". If you are stuck on an item, you're expected to ask questions and give your best effort.

Getting help on this assignment: *You may work with others on this assignment, but you may not copy each others' answers.* Evidence of copying will be treated as academic dishonesty. You may also ask questions on the #dailyprep channel on CampusWire, but you may not ask simply to be given the answers; giving and receiving answers on CampusWire will be treated as academic dishonesty.