MTH 225: Discrete Structures for Computer Science 1

Daily Preparation, Module 6A: Functions

Due by: 11:59pm ET, Sunday, October 11

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

Module 6 is all about **functions** which is a somewhat familiar idea for us. We're pretty familiar with the concept of functions through previous math work and through using Python functions – a function is just a way of taking objects in one set (the *domain* of the function) and changing them into objects in another set. The purpose of this module is to make this basic idea mathematically precise. You'll learn about the *domain*, *range*, and *codomain* of a function, different ways of representing functions (especially when they involve different data types), the special functions `floor` and `ceiling`, and what it means to *compose* two functions.

What you will learn

Learning Targets addressed in this module:

- **SF.3 (Core)**: I can determine whether or not a given relation is a function, determine the domain and codomain of a function, and find the image and preimage of a point using a function.
- **SF.4**: I can determine whether a function is injective, surjective, or bijective.

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

- State the definition of a function.
- Determine whether a relationship is a function, when stated as a diagram, formula, table of outputs, or visual image.
- Define and use the *floor* and *ceiling* functions.
- Find the image of an input using a function using correct function notation.

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

- State the domain, codomain, and range of a function.
- Find the composition of two functions.

Resources for Learning

For this module, I recommend you watch the videos first and THEN read in the text.

Video: These were made by me for MTH 210 (Communicating in Mathematics) but they work for MTH 225 as well.

- Functions: The big concepts (6:12) https://www.youtube.com/watch?v=PZFU3JC3Plo&list=PL2419488168AE7001&index=77
- Functions: Terminology (15:44) https://www.youtube.com/watch?v=3rpl_HGcUIs&list=PL2419488168AE7001&index=78
- Function example: Names to initials (7:57) https://www.youtube.com/watch?v=Aii47Dz7YF4&list=PL2419488168AE7001&index=79
- Function example: Counting primes (8:29) https://www.youtube.com/watch?v=fSdFpxzjrlw&list=PL2419488168AE7001&index=80
- Function example: Congruence functions (7:17) https://www.youtube.com/watch?v=k7AXRLFZ320&list=PL2419488168AE7001&index=81
- Non-examples of functions (6:41) https://www.youtube.com/watch?v=ufG5dCKszOs&list=PL2419488168AE7001&index=84

Text: Read the following from *Discrete Mathematics: An Open Introduction*:

- In Section 0.4, read up to (but not including) the section "Surjections, Injections, and Bijections".
- Pay particular attention to the "two line notation" used for functions. This doesn't appear in the videos.
- Also, take a few minutes to think about the idea of "closed formulas" versus *recursively defined functions*. We won't deal with recursively defined functions now, because we will be going into depth on those in Module 10. But make a note of this concept for when we get to Module 10.

You are free to search for and use other resources in addition to, or instead of the above, as long as you can work the exercises below.

Exercises

The exercises are on the following Google Form: https://bit.ly/34h8V7r

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.