MTH 225: Discrete Structures for Computer Science 1

Daily Preparation, Module 5A: Sets and set relationships

Due by: 11:59pm ET, Sunday, October 4

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 5 introduces us to one of the original "discrete structures" — the concept of the **set**. Sets are basic to our understanding of mathematics, and they are the prototype for all data structures we use in computer science. In the A part of this module, you'll learn two different ways to view sets (**roster notation** versus **set builder notation**) as well as how sets relate to each other (through **equality** and **subset** relationships) and how individual objects relate to sets (by being **elements** of a set). As a side trip, you'll learn about Python **list comprehensions** and use these to boost your understanding of set builder notation.

What you will learn

Learning Targets addressed in this module:

- **SF.1 (Core)**: I can represent a set in roster notation and set-builder notation; determine if an object is an element of a set; and determine set relationships (equality, subset).
- **SF.2**: I can perform operations on sets (intersection, union, complement, Cartesian product) and determine the cardinality of a set.

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

- Identify the "special sets" by their notation: the empty set, the natural numbers, the integers, the rational numbers, and the real numbers.
- Given a set in roster notation, determine if an object is an element of the set or not, and express this using the "element of" symbol.
- State what it means for two sets to be equal.
- Given set A and B, determine if A is a subset of B or vice versa, and whether $A = B$.

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

- Given a set in set-builder notation, determine if an object is an element of the set or not; or rewrite the set in roster notation.
- Given a set in roster notation where the elements share a common condition, express the set in set-builder notation.
- Construct a Python list comprehension to generate a given list.

Resources for Learning

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

- [Section 0.3](#) up to and including Example 0.3.3 but nothing past this point yet.

Video: These were made by me for MTH 210 (Communicating in Mathematics) but they work for MTH 225 as well. Total running time is 12:32.

- Sets and set notation (5:35) https://www.youtube.com/watch?v=01OoCH-2UWc&list=PL2419488168AE7001&index=23
- Elements, subsets, and set equality (7:01) https://www.youtube.com/watch?v=kGyOrbblIEY&list=PL2419488168AE7001&index=25
- Set builder notation (9:25) https://www.youtube.com/watch?v=DEhWj-52rlw&list=PL2419488168AE7001&index=26

Additional material for Python: In this lesson, you'll be working with a new Python concept called a *list comprehension*. This is a method sometimes used in Python to efficiently create lists, based on pre-existing lists. To learn about list comprehensions:

- Watch this video (running time 7:27): https://www.youtube.com/watch?v=7G0jqG_kiig
- Read this web tutorial: https://www.digitalocean.com/community/tutorials/understanding-list-comprehensions-in-python-3

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 Classkick as "Module 5A Daily Prep". If you need a code, it's `HL8 WOL`.

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.