Chapter Summary — Sets

> *This document is a very rough summary of the the concepts and tasks that we covered in this chapter. The plan is to write a similar document at the end of each chapter, but time will tell (however it would be better if you did this yourself).*
> *I hope this document will be use to you when revising the chapter. However, please do not think that this comes with any guarantee of completeness — the probability of me overlooking something is large. Please ask if you think I have omitted anything.*
> — *kmurphy, 5 Oct, 2021*

Section A: Concepts

- □ **Set Definition**
  - □ As a list
    - □ Use of ellipses, how distinguish between finite and infinite lists.
  - □ Builder notation
    - □ $\{\text{pattern} \mid \text{rule/criteria}\}$
    - □ $\{\text{pattern} \mid \text{set to draw from}, \text{rule/criteria}\}$
    - □ Use of qualifiers
  - □ The empty set: $\emptyset$, $\{\}$ (in Python `set()`)
- □ **Relationship between sets**
  - □ subset and proper subset (in Python `a.issubset(b)`)
  - □ superset and proper superset (in Python `a.issuperset(b)`)
- □ **Properties of sets**
  - □ Cardinality (in Python `len(a)`)
  - □ Power Set
- □ **Operations**
  - □ Definition, representation using Venn diagrams, properties
  - □ Intersection (in Python `a.intersection(b)`)
    - □ Disjoint sets (in Python `a.isdisjoint(b)`)
  - □ Union (in Python `a.union(b)`)
  - □ Set difference (in Python `a.difference(b)`)
  - □ Symmetric difference (in Python `a.symmetric_difference(b)`)
  - □ Complement
    - □ Universal set
    - □ Expressing complement, $\overline{A}$, as a set difference with the universal, $\mathcal{U} \setminus A$
      (in python no complement operator ⇒ need to rewrite as set difference.)
    - □ Expressing set difference, $A \setminus B$, as a intersection with the complement set, $A \cap \overline{B}$
  - □ Cartesian product
- □ **Identities involving sets**
  - □ Correspondence between set operations and logical operations
    - □ Intersection ↔ AND ($\wedge$)
    - □ Union ↔ OR ($\vee$)
    - □ Complement ↔ NOT ($\neg$)
  - □ Proving identities using predicate logic arguments
  - □ Proving identities using membership tables

Section B: Tasks

- □ **Constructing sets**
  - □ Construct a set via builder notation in mathematics and in python.
- □ **Set operations**
  - □ Given sets apply set operations.
  - □ Given sets determine the truth value of an expression involving sets.
- □ **Prove identities (expressions) involving sets**
  - □ using predicate logic
  - □ using Venn diagram
  - □ using membership tables.
- □ **Construct a set given various criteria (e.g. given output of various set operations).**

Section C: Stuff not Covered (Yet)

(*You are probably asking "Why is this section here?". I have a number of reasons: 1) To highlight possible differences between this iteration of Discrete Mathematics and previous years. 2) To show those or you who are interested in more, where to go next. 3) To remind me of what I should do next, if miracles of miracles, we end up in week 11/12 with nothing to do but tell maths jokes . . .*)

- □ **Nothing here, at present, I think we have covered everything at this point.**