Chapter 1 outline:

- Introduction, sets and elements (this past Monday)
- Set operations; visual verification of set propositions (this past Wednesday)
- Introduction to SML; cardinality and Cartesian products (Today)
- Making types and functions in SML (next week Wednesday)
- More about functions in SML; introduction to lists [Chapter 2] (next week Friday)

Today (full agenda):

- [Programming] Introduction to the SML interpreter
- [Programming] Basic programming terminology
- [Programming] Types
- [Sets] Cardinality, disjointedness, partitions
- [Sets and Programming] Tuples and Cartesian products
- [Programming] Type analysis (“afterclass” video)
Which are valid ML types?

- int
- double
- char
- val
- string
- real
- int * int
- int * char
Compute the cardinality:

$$|\{1, 2, 3, 4, 5\} \cup \{3, 4, 5, 6\}|$$

$$|[0, \pi) \cap \mathbb{Z}|$$

$$|FacultyInThisRoom - StudentsInThisRoom|$$
Which are disjoint?

\[ \mathbb{Z} \text{ and } \mathbb{R} \]

\[ \mathbb{Z} \text{ and } \mathbb{R}^- \]

\([0, 5) \text{ and } [5, 10) \]

*Plants and Fungi*

*MathClasses and CSCIClasses*

*DeciduousTrees and ConiferousTrees*
1.8.1 What is the cardinality of \( \{0, 1, 2, \ldots n\} \)?

1.8.3 One might be tempted to think \( |A \cup B| = |A| + |B| \), but this is not true in general. Why not? (Assume \( A \) and \( B \) are finite.)

1.8.6 Describe three distinct partitions of the set \( \mathbb{Z} \).
1.9.5 Based on our description of the real number plane as a Cartesian product, explain how a line can be interpreted as a set.

1.9.6 Explain how \( \mathbb{C} \), the set of complex numbers, can be thought of as a Cartesian product.

1.9.7 Any rational number (an element of set \( \mathbb{Q} \)) has two integers as components. Why not rewrite fractions as ordered pairs (for example, \( \frac{1}{2} \) as \((1, 2)\) and \( \frac{3}{4} \) as \((3, 4)\)) and claim that \( \mathbb{Q} \) can be thought of as \( \mathbb{Z} \times \mathbb{Z} \)? Explain why these two sets cannot be thought of as two different ways to write the same set. (There are at least two reasons.)
#1(5, 4) + int(4.0 / 3.1)
(5 + 7, String.sub("hello", 2))
(((1, 2), 5.7, (#"A", #"x")), 8, "bye")
For next time:

Watch “afterclass” video about type analysis (pandemic-era)

Pg 26: 1.6.(1-5)
Pg 32: 1.8.(2, 4, 5)
Pg 36: 1.9.(3, 4, 8, 9, 10)

Note that the ML problems should be submitted on paper with the rest of the assignment. Submission to the automated grader starts with the assignment due Jan 24.

Skim 1.(10 & 11)