Chapter 1 outline:

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

\( \mathbb{Z} \) and \( \mathbb{R} \)

\( \mathbb{Z} \) and \( \mathbb{R}^- \)

\([0, 5) \) and \([5, 10) \)

\textit{Plants} and \textit{Fungi}

\textit{MathClasses} and \textit{CSCIClasses}

\textit{DeciduousTrees} and \textit{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 Sept 7.

Skim 1.(10 & 11)