Chapter 4 roadmap:

- Subset proofs (**Today**)
- Set equality and emptiness proofs (Friday)
- Conditional and biconditional proofs (next week Monday)
- Proofs about powersets (new week Wednesday)
- From theorems to algorithms (next week Friday)

Today:

- Transition point in course
- Game plan for Chapter 4
- Anatomy of a proof
- Proof examples
\[ \triangle A \cong \triangle B \]
\[
\angle 1 + \angle 2 = 90^\circ \\
\angle 1 + \angle 2' = 90^\circ \\
\angle 3 = 90^\circ \\
T \text{ is a square} \\
\text{Area of } T = c^2 \\
\text{Area of } S = (a + b)^2 \\
\text{Area of each } \triangle = \frac{ab}{2} \\
(a + b)^2 = c^2 + 4\frac{ab}{2} \\
a^2 + 2ab + b^2 = c^2 + 2ab \\
\therefore c^2 = a^2 + b^2
\]

SSS
\[
\triangle \text{ angles sum to } 180^\circ \\
\angle 2 \cong \angle 2' \\
\text{Supplementary } \angle s \\
\text{Equal sides, } 90^\circ \angle s \\
\text{Area of } \square \\
\text{Area of } \square \\
\text{Area of } \triangle \\
\text{Sum of areas} \\
\text{Algebra (FOIL, simplification)} \\
\text{Subtract } 2ab \text{ from both sides.}
sentences

propositions

non-propositions (questions, commands, nonsense, paradoxes)

false propositions

true propositions

false propositions

axioms

conjectures that happen to be true

theorems
General forms:

1. Facts \((p)\)
   Set forms
   1. Subset \(X \subseteq Y\)
   2. Set equality \(X = Y\)
   3. Set emptiness \(X = \emptyset\)

2. Conditionals \((p \rightarrow q)\)

3. Biconditionals \((p \leftrightarrow q)\)
\[ X \cup Y = \{ z | z \in X \lor z \in Y \} \]
\[ X - Y = \{ z | z \in X \land z \notin Y \} \]
\[ X \cap Y = \{ z | z \in X \land z \in Y \} \]
\[ X \times Y = \{ (x, y) | x \in X \land y \in Y \} \]
\[ \overline{X} = \{ z | z \notin X \} \]
For next time:

Pg 158: 4.2. (2–7)

Review 4. (1 & 2)
Read 4. (3 & 4)