Logical operators.
- conjunction, disjunction, biconditional
- implication: Recall that we can express $p \rightarrow q$ also as $p$ is sufficient for $q$, $q$ is necessary for $p$.

Tautologies and contradictions, truth tables.

Quantifiers.
- Checking the truth value. For example $P(x, y) = "x + y = 5"$, universe of discourse for $x$ and for $y$ is the set of real numbers. Check the truth values of $\forall_x \exists_y P(x, y)$, $\exists_y \forall_x P(x, y)$.
- Negations of quantifiers
- Translations(1): $F(x, y) = "x$ can fool $y"$. Translate statements of the form "Everybody can fool somebody", "Mary can fool exactly one person", "Mary can fool exactly two people."
- Translations(2): $B(x) = "x$ is a boy", $P(x, y) = "x$ knows $y"$. Universe of discourse is the set of all people. Translate statements like "Every boy knows Mary", "Some boy knows Mary".

Methods of proof.
- Direct and indirect proofs of implication. Examples like show that if $n^3 + 5$ is odd and $n$ is an integer then $n$ is even. Show that if two functions are continuous then their sum, product is a continuous function.
- Proof by contradiction. Show that $\sqrt{2}$ is irrational.

Mathematical induction
- Why does it work?
- Identities, inequalities, other statements that can be proved using induction.

Sets.
- It is important to understand notation well. For example let $A = \{a, \{a\}, \{a, b\}\}$. Is $\{a\} \subseteq A$? Is $\{a\} \in A$?
- Cardinality of sets.
- Power set, $P(S)$ is the set of all subsets of $S$. For a finite set $S$, we have $|(P(S))| = 2^{|S|}$.
- Operations on sets: union, intersection, complement, Cartesian product, and so on.
- Proving set identities. For example, $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$, $A - B = A - (A \cap B)$, $A \times (B \cap C) = (A \times B) \cap (A \times C)$.
- Generalized unions and intersections: $\bigcup A_i$, $\bigcap A_i$. 

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