1. Finite Automata:

   - DFA: Deterministic, one path for each input.

   - NFA: Non-deterministic, multiple paths.

   - epsilon-NFA: Includes epsilon (empty string) transitions.

2. Regular Languages:

   - Described using regular expressions.

   - Closed under union, concatenation, Kleene star.

3. Context-Free Grammar (CFG):

   - Produces context-free languages.

   - Used in programming language syntax.

4. Pushdown Automata (PDA):

   - Automaton with a stack.

   - Recognizes context-free languages.

5. Turing Machine:

   - Abstract model of computation.

   - Infinite tape, can simulate any algorithm.

6. Decidability:

   - Decidable problems have an algorithm.

   - Undecidable problems don't (e.g., Halting Problem).

7. Chomsky Hierarchy:

   - Type 0: Recursively enumerable (Turing Machines).

   - Type 1: Context-sensitive (Linear Bounded Automata).

   - Type 2: Context-free (PDA).

   - Type 3: Regular (Finite Automata).

8. Regular Expression Identities:

 - (a + b)* = All strings over {a, b}

 - a* = ε + a + aa + aaa + ...

  - Closure properties: Regular languages closed under:

   - Union, Intersection, Concatenation, Complement, Kleene Star

9. Pumping Lemma:

 - Used to prove a language is not regular.

 - If a string s ∈ L and |s| > p (pumping length), then s can be divided into xyz such that:

  - $|xy| \leq p$

  - $|y| > 0$

  - $xy^i z \in L$ for all $i \geq 0$