Errors Encountered in different phases

- **Lexical phase errors:**
  - Spelling errors.
  - Exceeding length of identifier or numeric constants
  - Appearance of illegal characters
- **Syntax analysis phase errors:**
  - Errors in structure
  - Missing operators
  - Unbalanced Parenthesis

Errors Encountered in different phases

- **Semantic errors:**

  - Incompatible types of operands

  - Undeclared variables

  - Not matching of actual arguments with formal arguments

  - Unreachable code

The Analysis-Synthesis Model of Compilation

- There are two parts to compilation:
  - *Analysis* determines the operations implied by the source program which are recorded in an Intermediate Representation.
  - *Synthesis* takes the Intermediate Representation and translates the operations into the target program

The Grouping of Phases

- Compiler *front* and *back ends*:
  - Front end: *analysis (machine independent)*
  - Back end: *synthesis (machine dependent)*
- Compiler *passes*:
  - A collection of phases is done only once (*single pass*) or multiple times (*multi pass*)
    - **Single pass**: usually requires everything to be defined before being used in source program
    - **Multi pass**: compiler have to keep entire program representation in memory

Compiler writing tools

- Systems to help with compiler writing process
  - Compiler-compilers, Compiler-generators, Translator writing.
- **SCANNER GENERATORS** produce lexical analyzers automatically.

- **PARSER GENERATORS** produce syntactic analyzers automatically.

- **SYNTAX DIRECTED TRANSLATION ENGINES** automated systems for generating intermediate code.

- **AUTOMATIC CODE GENERATORS** constructs a machine language for the target machine.