Debugging
Debugging is the activity of locating and correcting errors. It can start once a failure has been detected.

Techniques used for debugging:

- Brute Force
- Debugging by Induction
- Debugging by Deduction
- Debugging by Backtracking
- Debugging by Testing
Debugging By Brute Force

- Requires little thought
- Inefficient and generally unsuccessful.
- Can be partitioned into three categories:
  - Debugging with a storage dump
  - Debugging according to the common suggestion to “scatter print statements throughout the program”
  - Debugging with automated debugging tools
Thought Process
Start with the clues and look for the relationships among the clues

- Locate pertinent data
- Organize the data
- Study their relationship
- Devise a Hypothesis
- Prove the Hypothesis
- Fix the error

Hypothesis: giả thuyết
Pertinent: thích hợp
Debugging by Induction

- Locate the pertinent data: take account of all available data or symptom about the problem
- Enumerate all you know about the program
- Organize the data: induction implies processing from the particulars to generals
- Structure the pertinent data and search for the contradiction
- Devise a Hypothesis: Study clues and devise one or more hypothesis.
- If multiple theories are possible then select the most probable one first.
- Prove the hypothesis: Prove the reasonableness of the hypothesis.
- Hypothesis should completely explain the existence of clues.
Debugging By Deduction

- Start with set of suspects and use process of elimination and refinement.

- Steps:
  - Enumerate the possible causes or hypothesis
  - Use data to eliminate possible causes
  - Refine the remaining Hypothesis
  - Prove the remaining Hypothesis
Effective method for locating errors in small programs.

Backtrack the incorrect result through the logic of the program until you find the point where the logic went astray.
Debugging By Testing

- Test cases for debugging: purpose is to provide information useful in locating a suspected error.
- This method is used in conjunction with the induction method.