# COMPUTATIONAL PROBLEM SOLVING

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# The Process of Computational Problem Solving

#### **ANALYSIS** · Clearly understand the problem Analyze Know what constitutes a solution Problem DESIGN · Determine what type of data is needed Describe Determine how data is to be structured Data & Find and/or design appropriate algorithms Algorithms **IMPLEMENTATION** Implement · Represent data within programming language · Implement algorithms in programming language Program **TESTING** · Test the program on a selected set of Test and problem instances Debug Correct and understand the causes of any errors found

FIGURE 1-22 Process of Computational Problem Solving

# **Problem Analysis**

- Understanding the Problem
- Knowing What Constitutes a Solution
  - A solution
  - An approximate solution
  - A best solution
  - All solutions

### **Program Design**

- Describing the Data Needed
- man, cabbage, goat, and wolfman cabbage goat wolf

[W, E, W, E]

- Describing the Needed Algorithms
  - Algorithms that work well in general but are not guaranteed to give the correct result for each specific problem are called heuristic algorithms
- Design decisions provide general details of the data representation and the algorithmic approaches for solving a problem.

### **Program Implementation**

 specifying which programming language to use, or how to implement the program.

## **Program Testing**

- 1. Programming errors are pervasive, persistent, and inevitable.
- Software testing is an essential part of software development.
- Any changes made in correcting a programming error should be fully understood as to why the changes correct the detected error.

FIGURE 1-25 Truisms of Software Development