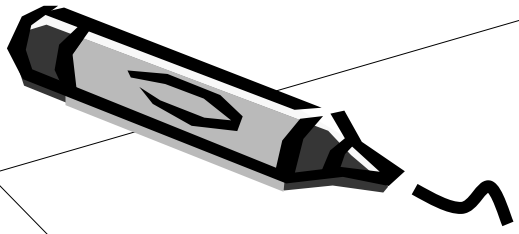

Solving Problems Using Flow Chart

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Reference: "Algorithm Development and Program Design Using C" by Gary J. Bronson, PWS.

Analyze the Problem

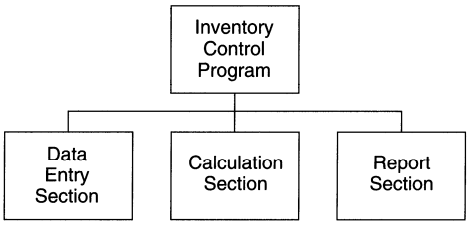
- Analyze and understand a program's requirements before coding
- Make clear
  - What the system or program ***must do***
  - What reports or ***outputs*** must be produced
  - What ***inputs*** are required to create the desired outputs

2

Structured Design

- Track the numbers of parts in inventory

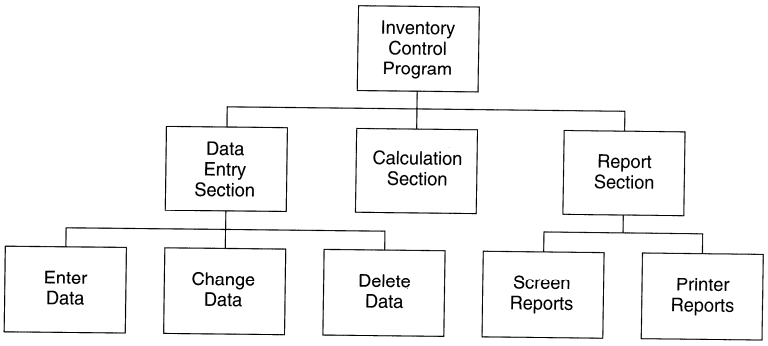
FIGURE 1.27 First-Level Structure Diagram



3

Detailed Refinement

FIGURE 1.28 Second-Level Refinement Structure Diagram



4

Algorithms

- The procedure, or solution, selected in the design step
- A step-by-step sequence of instructions
  - Describe how the data is to be processed to produce the desired outputs
- Programming is a translation
  - From a selected algorithm into a language that the computer can use

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Various Solving Methods

FIGURE 1.29 Summing the Numbers 1 Through 100

Method 1 — Columns: Arrange the numbers from 1 to 100 in a column and add them

$$\begin{array}{r} 1 \\ 2 \\ 3 \\ 4 \\ \bullet \\ \bullet \\ \bullet \\ 98 \\ 99 \\ +\ 100 \\ \hline 5050 \end{array}$$

Method 2 — Groups: Arrange the numbers in groups that sum to 100. Multiply the number of groups by 100 and add in any unused numbers.

$$\begin{array}{l} 1 + 100 = 100 \\ 2 + 99 = 100 \\ 3 + 98 = 100 \\ 4 + 97 = 100 \\ \quad\bullet \qquad\quad \bullet \\ \quad\bullet \qquad\quad \bullet \\ \quad\bullet \qquad\quad \bullet \\ 49 + 51 = 100 \\ 50 + 0 = 50 \end{array}$$

50 groups

$(50 \times 100) + 50 = 5050$

One unused number

Method 3 — Formula: Use the formula

$$\text{Sum } 5 = \frac{n(a+b)}{2}$$

where

n= number of terms to be added (100)
a= first number to be added (1)
b= last number to be added (100)

$$\text{Sum } 5 = \frac{100(1+100)}{2} = 5050$$

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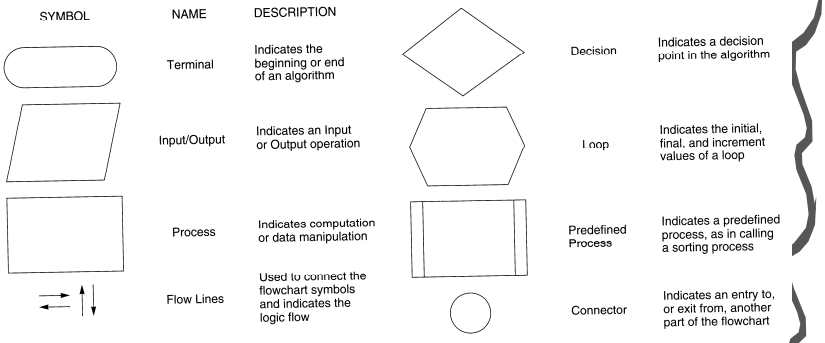
Flow Chart Symbols

FIGURE 1.30 Flowchart Symbols



SYMBOL	NAME	DESCRIPTION
	Terminal	Indicates the beginning or end of an algorithm
	Input/Output	Indicates an Input or Output operation
	Process	Indicates computation or data manipulation
	Flow Lines	Used to connect the flowchart symbols and indicates the logic flow
	Decision	Indicates a decision point in the algorithm
	Loop	Indicates the initial, final, and increment values of a loop
	Predefined Process	Indicates a predefined process, as in calling a sorting process
	Connector	Indicates an entry to, or exit from, another part of the flowchart

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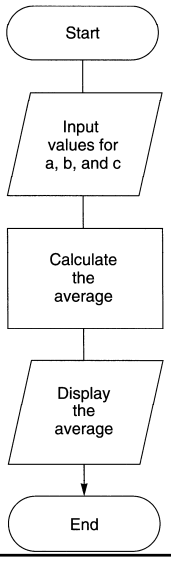
Flow Chart Example

FIGURE 1.31 Flowchart for Calculating the Average of Three Numbers



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