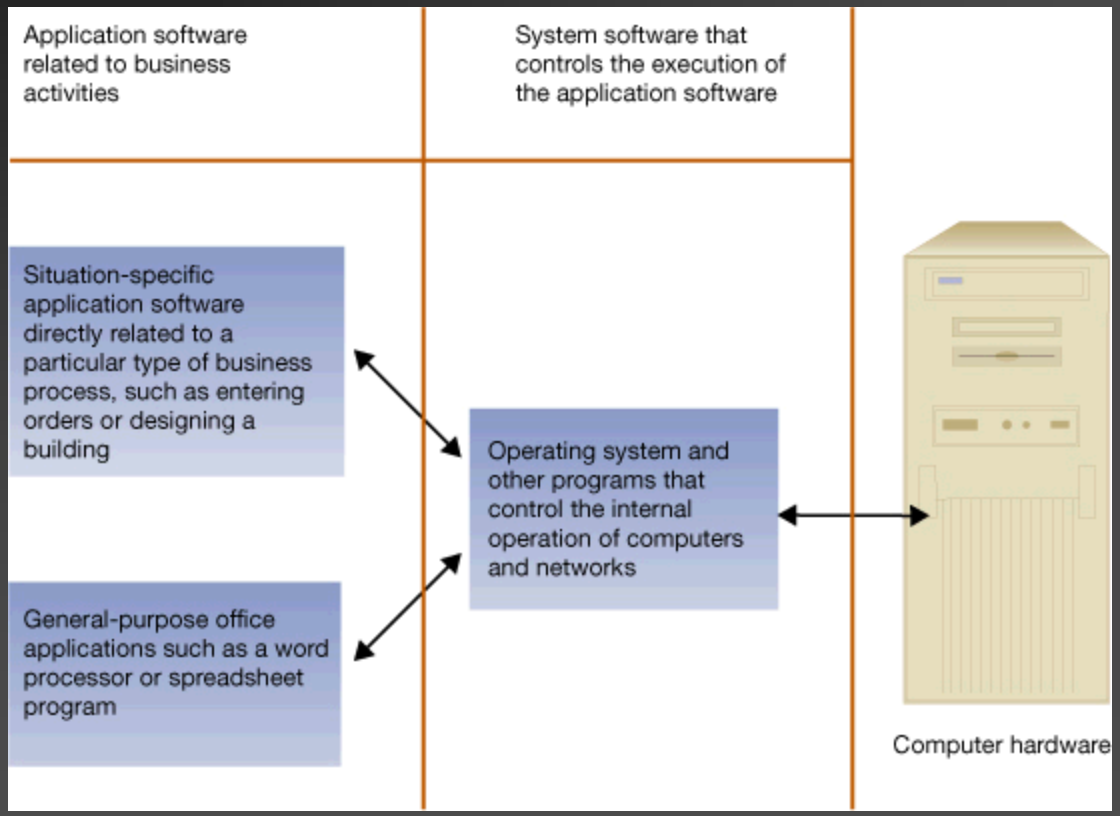
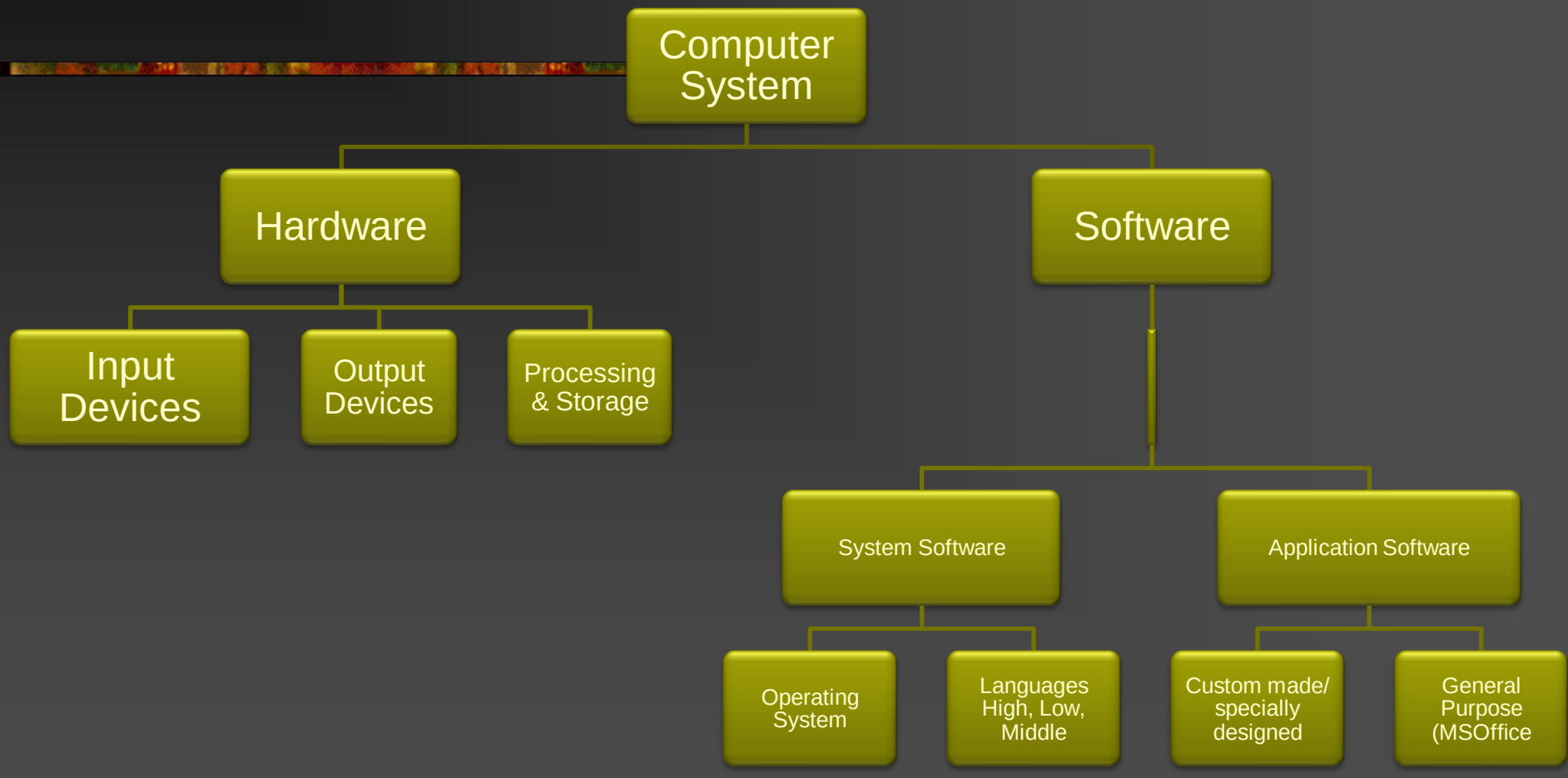
Global Chartered Accountants
www.gcaofficial.org

Software, Programmings

Chapter 9

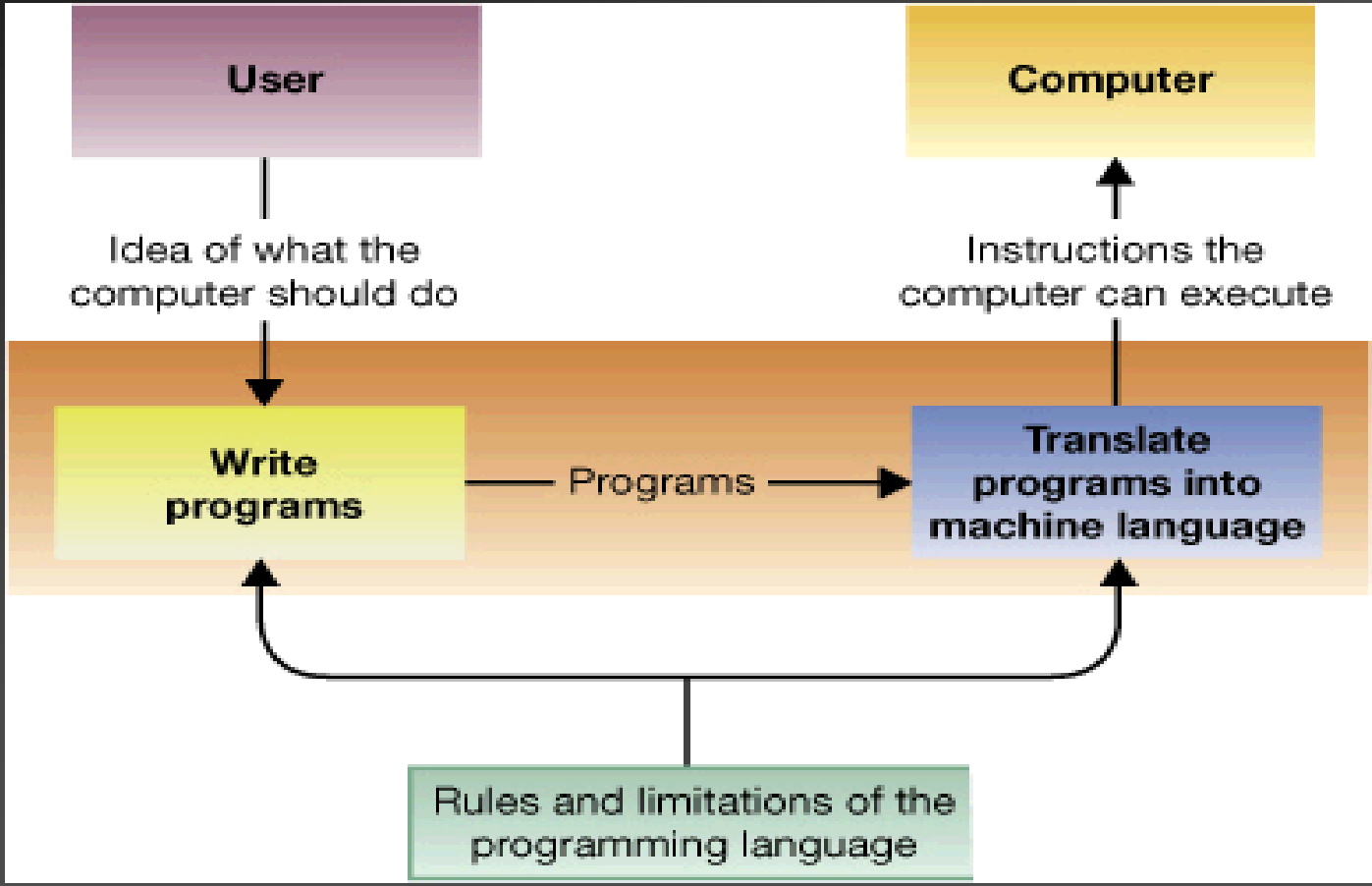
Types of Software Figure 9.1




Computer System
Hardware
Software
Input Devices
Output Devices
Processing & Storage
System Software
Application Software
Operating System
Languages High, Low, Middle
Custom made/ specially designed
General Purpose (MSOffice

Programming Viewed As a Business Process

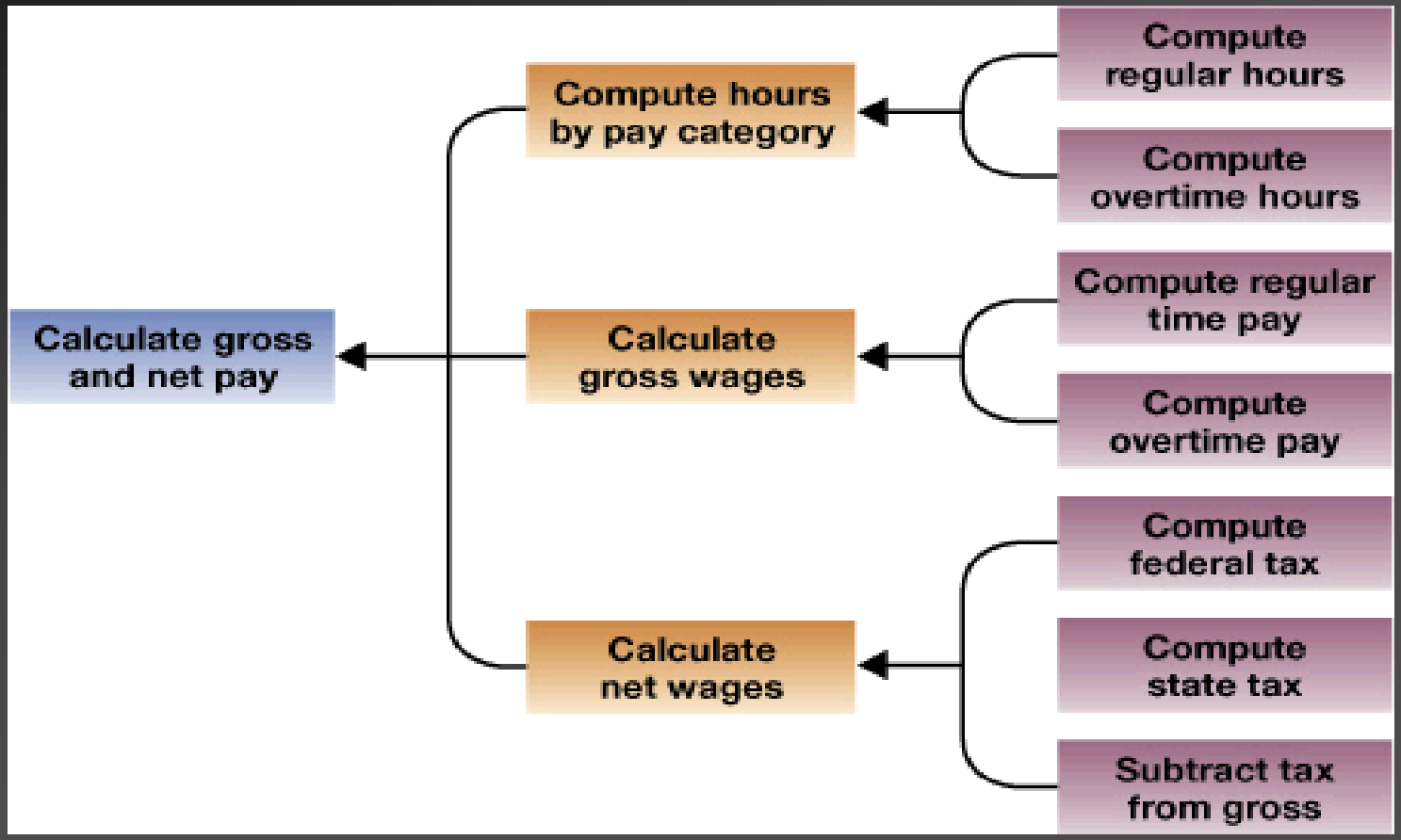
Programming As a Translation Process Figure 9.2



Organizing Ideas

- **Successive decomposition** (also known as **stepwise refinement**) – programs are divided into small subprograms called **modules**
  - Self-contained subsystems that produce predictable outputs from known inputs
- **Structured programming** – a disciplined style of programming based on successive decomposition

Figure 9.3


Calculate gross and net pay
Compute hours by pay category
Calculate gross wages
Calculate net wages
Compute regular hours
Compute overtime hours
Compute regular time pay
Compute overtime pay
Compute federal tax
Compute state tax
Subtract tax from gross

Testing Programs

- The process of determining whether a program or system operates in the desired manner
- ***Bug*** – a flaw in the program
- Syntax errors – incorrect use of the programming language
- Logic errors – bugs that cause a syntactically correct program to perform incorrect processing

The Changing Nature of Programming

- Greater nonprocedurality
  - Procedural program – a program that specifies how something should be done
  - Nonprocedural program – a program that specifies what should be accomplished
  - Nonprocedural programs are easier to develop

- Greater modularity and reusability
  - Reusability – using preexisting modules when developing new programs
- Greater machine and data independence
  - Machine independence – programs can be executed under different operating system and on machines from different vendors
  - Data independence – possible to change the way the data are physically stored without changing the program

The Trend Toward Object-Oriented Programming (OOP)

- Objects vs. classes
  - Objects are things about which data exist
  - The object is made up of both data and actions that can be performed with the data
  - A class is a general description of a related set of objects
  - Classes are organized in hierarchies
  - A class inherits both the data and the actions of the parent class

- All actions are controlled by <u>messages</u> passed between objects
- Object orientation is becoming increasingly popular
- Most popular object-oriented programming languages: C++ and Java

Four Generations of Programming Languages

Machine Languages

- The **internal programming language** for a particular chip
- The only language the processor can understand
- Very difficult for humans to use

Assembly Languages

- Are automatically translated into machine language by ***assembler*** programs
- Makes programs easier to write because it avoids the problem of physical references
- Still very laborious and error-prone

High Level Languages

- Also known as *third generation languages (3GLs)*
- The **source code** is translated into the **object code** (machine language) by a *COMPILER*
  - The translation can also be accomplished by an *INTERPRETER*, which translates and executes each line of code (no object code is created)

Fourth Generation Languages (4GLs)

- A loosely defined group of programming languages that permit nonprogrammers to do programming work
- Main categories:
  - Query languages
  - Report generators

Other Major Developments in Programming

- Special purpose languages
- Spreadsheets
- Computer aided software engineering systems (CASE)

Operating Systems

- Complex programs that control the operation of computers and networks
  - Control the execution of other programs
  - Control communication with peripherals
  - Control the use of computer resources, such as disk space

Operating Systems for Personal Computers

- Functions:
  - Controlling the user interface
  - Controlling tasks in progress
  - Controlling access to data
  - Allocating resources

Operating Systems for Multiuser Computer Systems

- Monitor the current status and decide when to start jobs
- Network operating system – establishes the links, monitors the operation, and controls recovery processes