

*Introduction to Software
and
Programming Languages*

An Overview of Software

❑ What is ‘Software’?

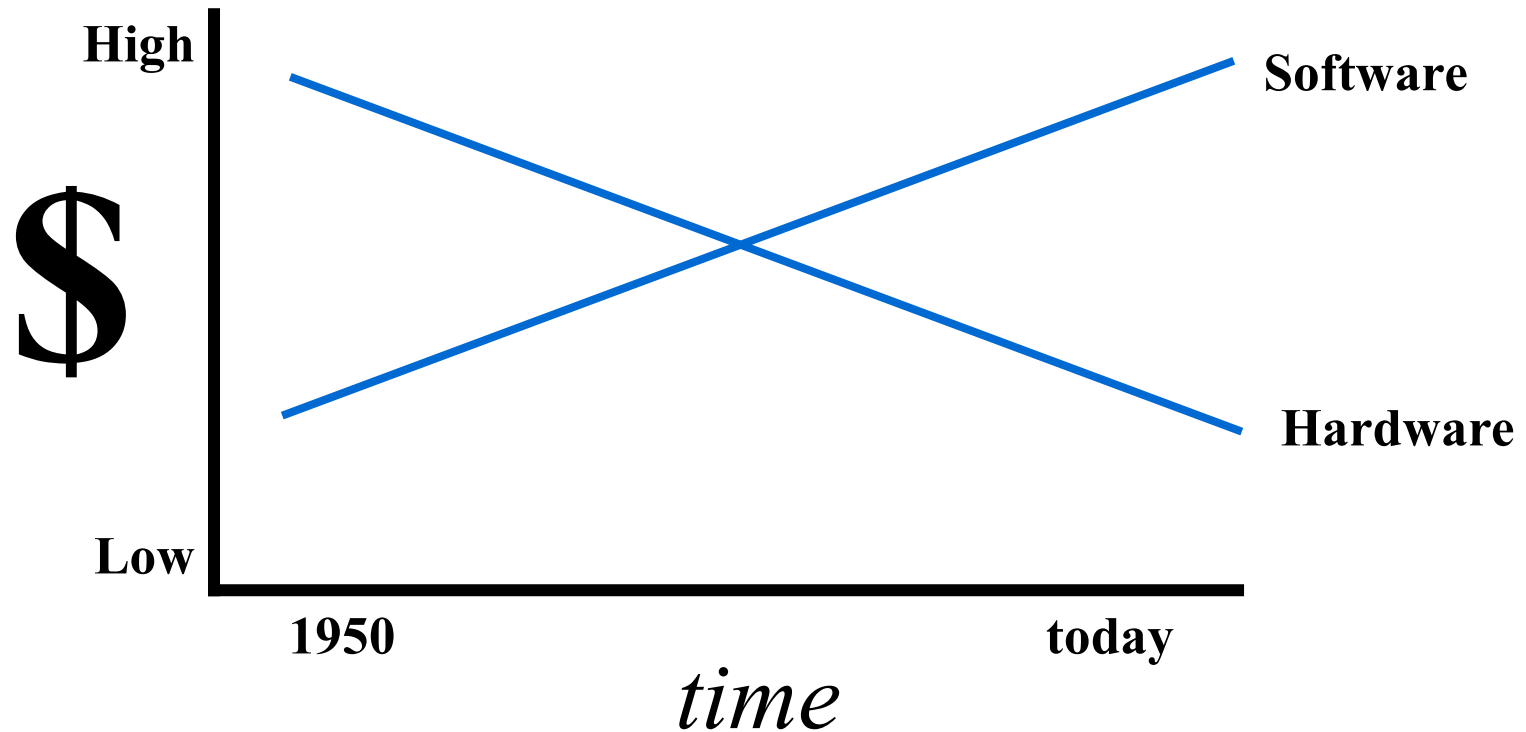
Software is a set of instructions, data or programs used to operate computers and execute specific tasks.

❑ How do we get Software ?

Software can be purchased at a retail computer store or online and come in a box containing all the disks (CD, DVD, or Blu-ray), manuals, warranty, and other documentation.

Software can also be downloaded to a computer over the Internet.

The Importance of Software



Classes of Software

- ❑ Systems software
 - Set of programs that coordinates activities and functions of the hardware and various other programs

- ❑ Application software
 - Programs that help users solve particular computing problems

Issues and Trends

- ❑ Software licensing
 - Protection by software vendors to prevent unauthorized use
- ❑ Software upgrades
 - A revised version of software that usually includes fixes of known problems, plus enhancements to existing capabilities
- ❑ Global software support
 - Software that is distributed around the globe may require unique support mechanisms due to local political and economic conditions

Ownership



- ☐ Freeware
- ☐ Shareware
- ☐ Public-domain software
- ☐ Open Source software

Freeware



Copyrighted software given away for free by the author. Although it is available for free, the author retains the copyright, which means that you cannot do anything with it that is not expressly allowed by the author. Usually, the author allows people to use the software, but not sell it.

Shareware



Software distributed on the basis of an honor system. Most shareware is delivered free of charge, but the author usually requests that you pay a small fee if you like the program and use it regularly. By sending the small fee, you become registered with the producer so that you can receive service assistance and updates.

Note that shareware differs from public-domain software in that shareware is copyrighted. This means that you cannot sell a shareware product as your own.

Public-domain Software

Refers to any program that is not copyrighted. Public-domain software is free and can be used without restrictions. The term public-domain software is often used incorrectly to include freeware, free software that is nevertheless copyrighted.

Open Source

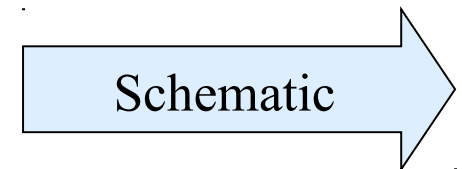
Open source software is software with source code that anyone can inspect, modify, and enhance.

Other software has source code that only the person, team, or organization who created it can modify. This kind of software is called "proprietary" or "closed source" software.



Role of Systems Software

- ❑ System software...
 - Is an interface or buffer between application software and hardware
 - Controls the computer hardware and acts as an interface with applications programs





Users



Application
software



Operating
and
systems
software



Hardware

Operating System Functions

- Perform common computer hardware functions
- Provide a user interface
- Provide a degree of hardware independence
- Manage system memory
- Manage processing tasks
- Provide networking capability
- Control access to system resources
- Manage files

User Interface

- ❑ User interface
 - A function of the operating system that allows individuals to access and command the computer
- ❑ Command-based user interface
 - A particular user interface that requires text commands be given to the computer to perform basic activities
 - E.g., unix, DOS
- ❑ Graphical user interface (GUI)
 - A user interface that uses icons and menus displayed on the screen to send commands to the computer system
 - E.g. Windows, MAC OS

Systems Software Concepts

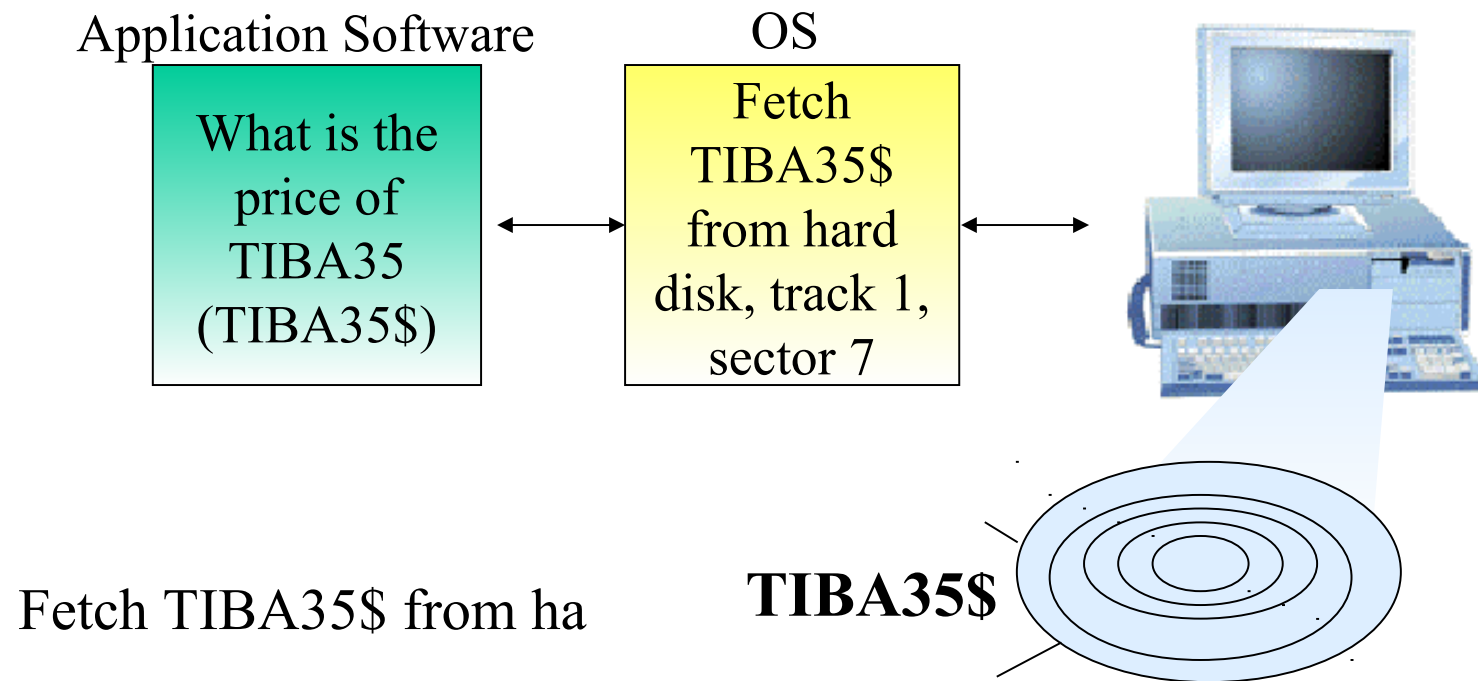
- ❑ Hardware independence
 - Operating system (OS) provides hardware independence for application software
 - Application software interfaces with the operating system which interfaces with the hardware
 - When the hardware is changed, the operating system is changed so that the application software is not required to be changed

Software Concepts

- ☐ Memory management
- ☐ Virtual memory & paging
- ☐ Multitasking
- ☐ Multithreading
- ☐ Timesharing

Memory Management

- ❑ Memory management...
 - Controls how memory is accessed and maximizes available memory and storage



Software Concepts

- ☐ Memory management
- ☐ Virtual memory & paging
- ☐ Multitasking
- ☐ Multithreading
- ☐ Timesharing

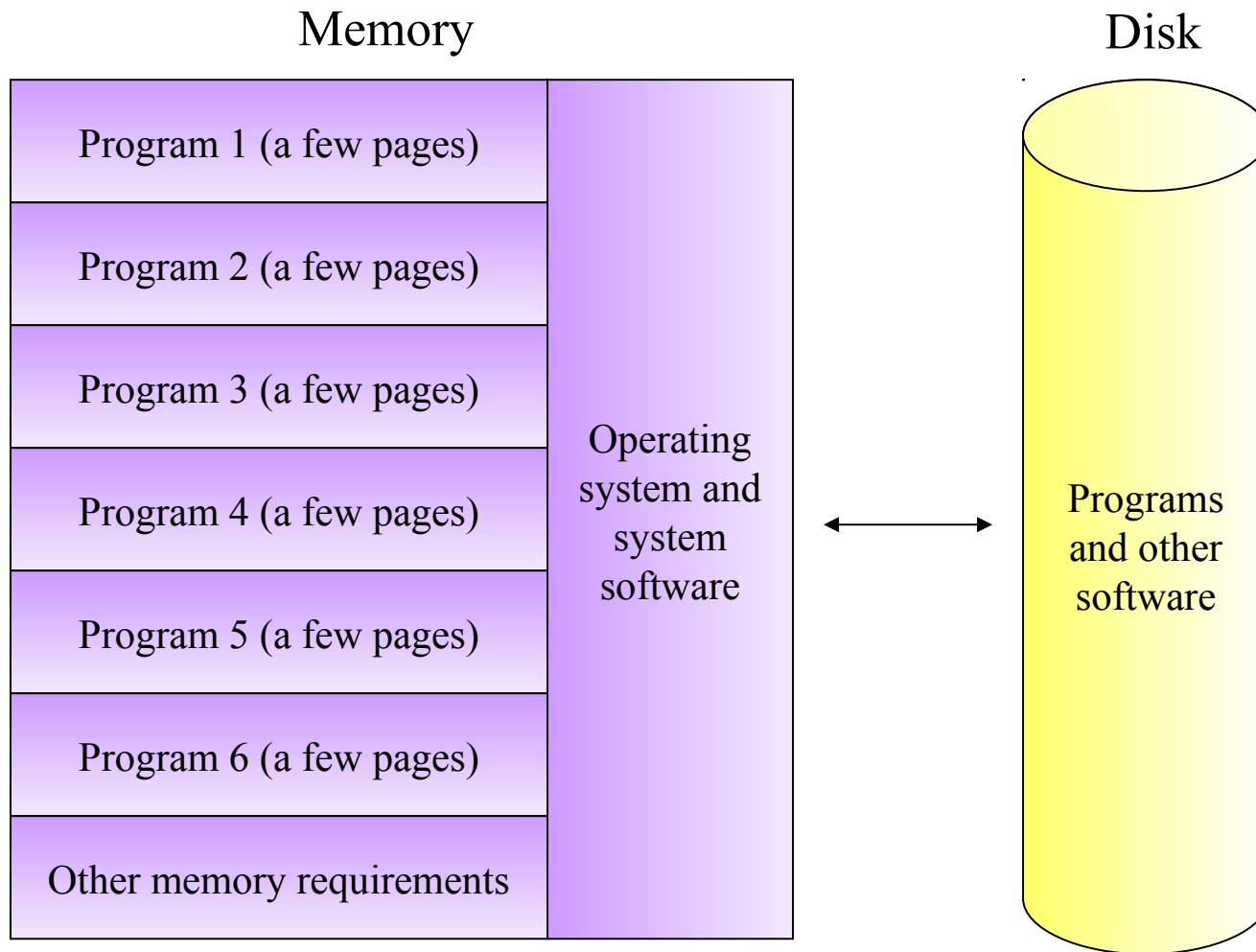
Virtual Memory & Paging

❑ Virtual memory

- Memory that allocates space in secondary storage to supplement the immediate, functional memory capacity of RAM
- Paging
 - A function of virtual memory allowing the computer to store currently needed pages in RAM while the rest of the pages wait in secondary storage



Schematic



Virtual Memory

An imaginary memory area supported by some operating systems (for example, *Windows*) in conjunction with the hardware. You can think of virtual memory as an alternate set of memory addresses. Programs use these virtual addresses rather than real addresses to store instructions and data. When the program is actually executed, the virtual addresses are converted into real memory addresses.

The purpose of virtual memory is to enlarge the address space, the set of addresses a program can utilize.

Virtual Memory



To facilitate copying virtual memory into real memory, the Operating system divides virtual memory into pages, each of which contains a fixed number of addresses. Each page is store on a disk until it is needed. When the page is needed, the operating system copies it from disk to main memory, translating the virtual addresses into real addresses.

The process of translating virtual addresses into real addresses is called **mapping**. The copying of virtual pages from disk to main memory is known as **paging** or **swapping**.

Software Concepts

- ☐ Memory management
- ☐ Virtual memory & paging
- ☐ Multitasking
- ☐ Multithreading
- ☐ Time-sharing

Multitasking, Multithreading, Time-sharing

❑ Multitasking

- A processing activity that allows a user to run more than one application at the same time

❑ Multithreading

- A processing activity that is basically multitasking within a single application

❑ Time-sharing

- A processing activity that allows more than one person to use a computer system at the same time

Software Concepts

- ❑ Network capability
 - Aids in connecting the computer to a network
- ❑ Access to system resources
 - Provides security for unauthorized access
- ❑ File management
 - Ensures that files in secondary storage are available when needed, and they are protected against unauthorized usage

Utility Programs

❑ Utility programs...

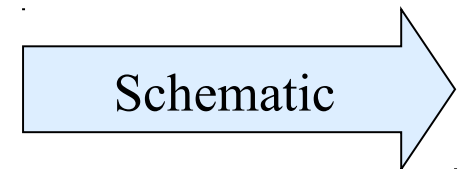
Programs used to merge and sort sets of data, keep track of computer jobs being run, compress files of data before they are stored or transmitted over a network, and perform other important tasks

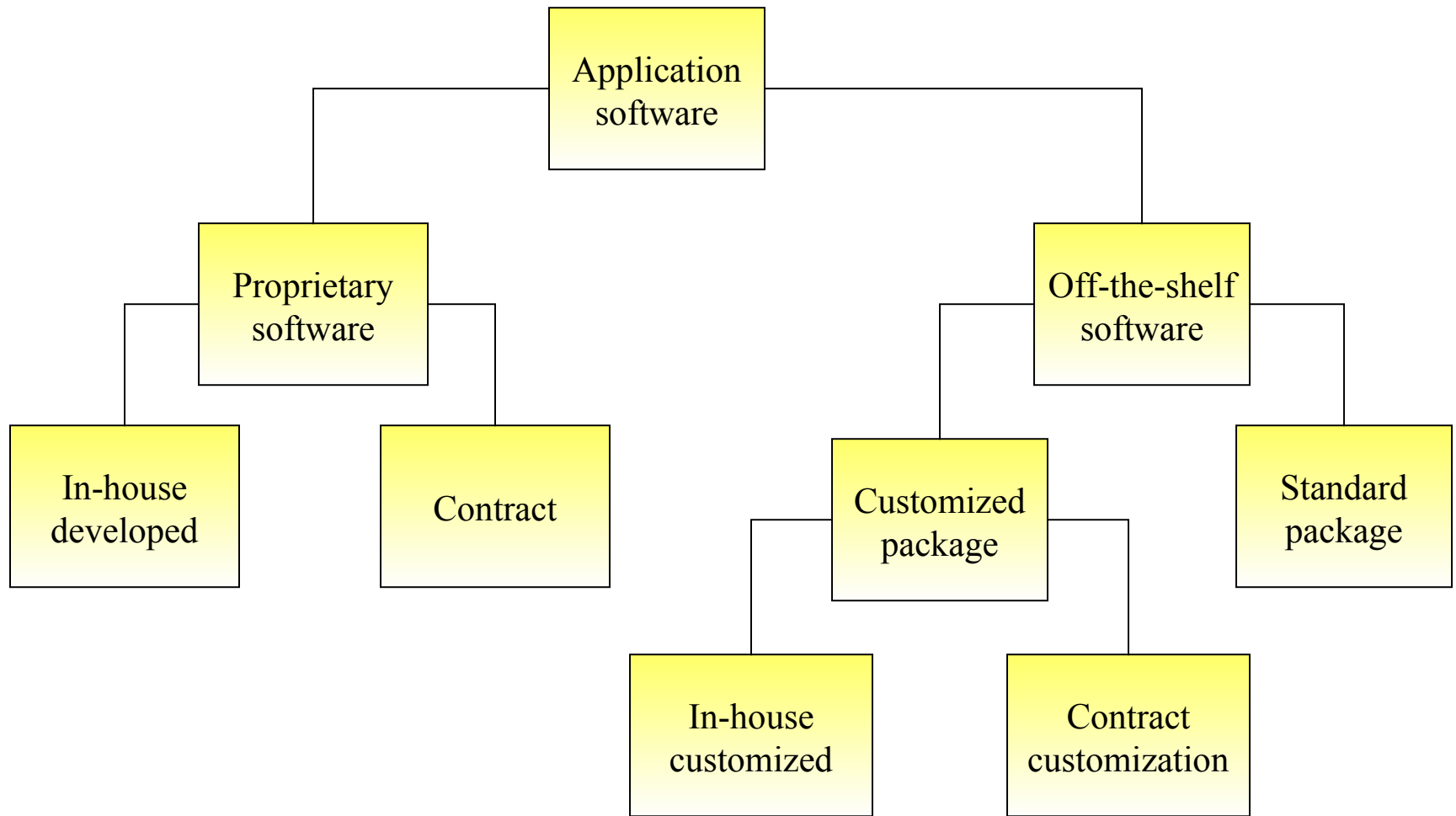
Types of Application Software

- ☐ Proprietary
 - Designed to solve a unique and specific problem
- ☐ In-house
 - Development of application software using the company's resources
- ☐ Contract
 - Developed for a particular company
- ☐ Off-the-shelf
 - An existing software program that can be used without considerable changes expected

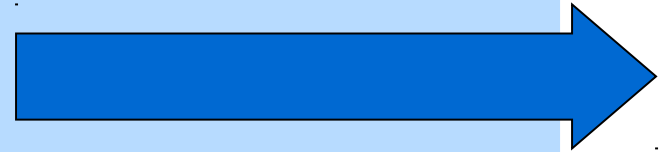
Sources of Software

- ❑ Customized package
 - Blend of external and internal software development
 - In-house customized
 - Contract customization





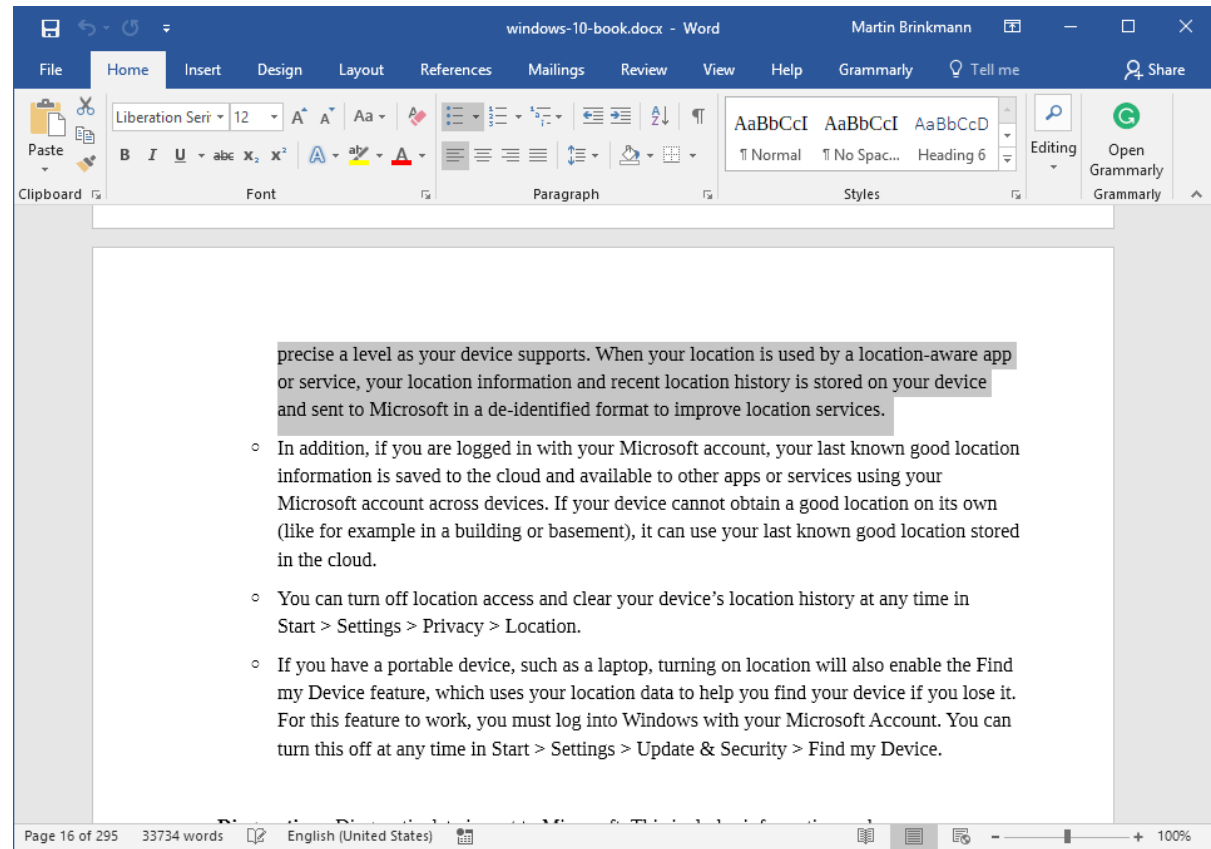
Examples



Word Processing

Word Processing

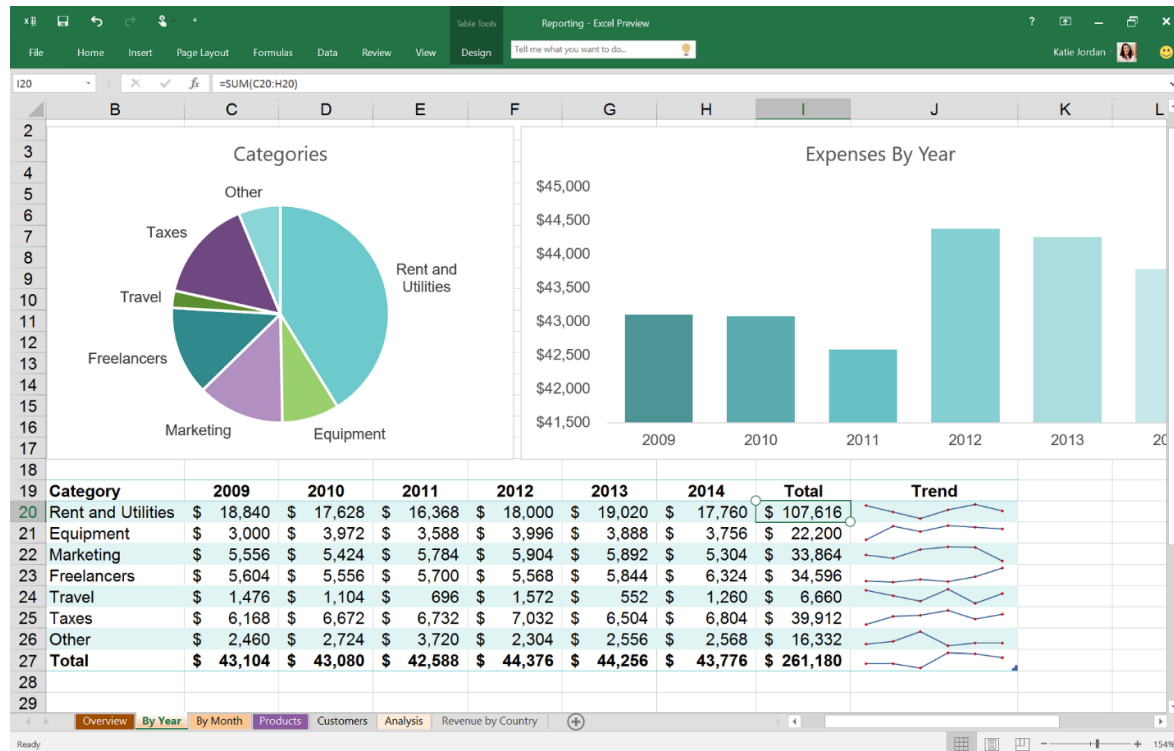
Provides assistance in formulating, formatting, and printing documents such as letters, memos, and papers.



Spreadsheet

Spreadsheet

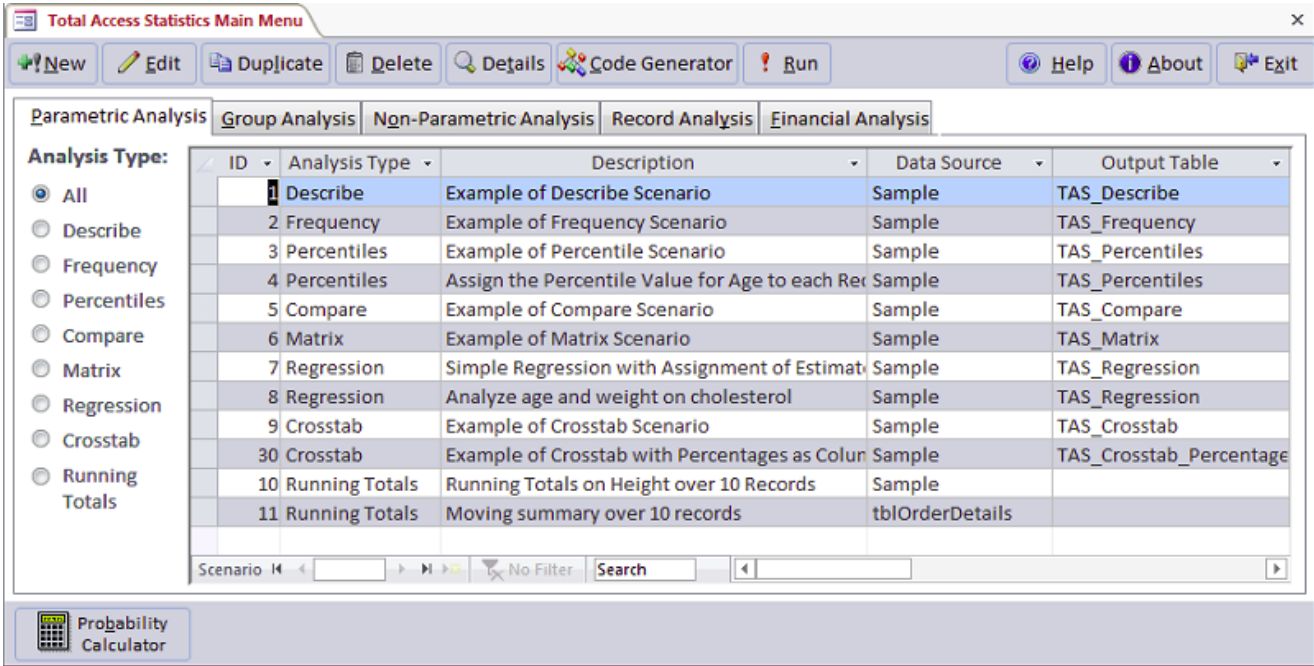
Provides a wide range of built-in functions for statistical, financial, logical, database, graphics, and data and time calculations.



Database

Database

Stores, manipulates, and retrieves data.

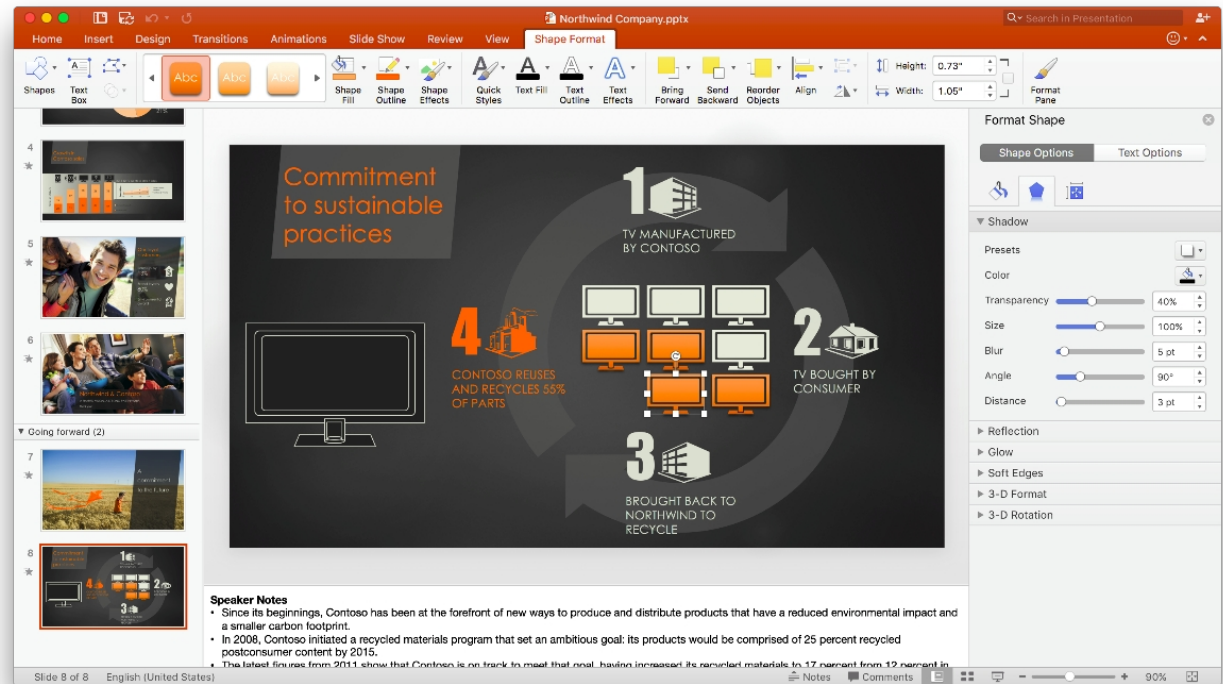


Graphics

Graphics Program

Helps make a presentation;
develops brochures,
illustrations, etc.

Usually called Presentation Graphics



On-Line Services

On-Line Services
Provide access
to various
information
resources.

Tell Us What You Think | Take the Page Tour | Make AOL Your Home Page | Get AOL Toolbar

AOL

Web Images Video News Local BETA More

with Google Search

Hot Searches: Amy Winehouse Nick Hogan 'Rock of Love' Two Moons More

Mail my AIM

Autos
Finance
Food
Games
Health & Diet
Microscopes
Jobs
Local
Love@AOL
MapQuest
Movies
Music
People
Pictures
Real Estate
Shopping
Sports | Fantasy
Television
Travel
Yellow Pages
Mgnet NEW!
More From AOL

In Marketplace

Farewell, Flip-Flops
This Fall, Printed Flats, Patent Leather And Booties Rock: 10 Biggest Trends

Even Worse Than Stilettos?
This Style Shoe Is More Dangerous

Put It Behind You
10 Secrets Happy People Know
Butt Cam(?) Promises a Good Fit

Next in Specials: IM From Your Inbox 4/5

Top News Aug 27, '07 as of 3:23 PM EDT

- Wildfires Kill More Than 60 in Greece
- Iraqi Leader Lashes Out at Clinton, Critics
- Is Another Elian Case Brewing in Miami?
- Hulk Hogan's Son Injured in Car Crash
- Two Network Anchors Join in Wristband Stunt
- Total Lunar Eclipse Takes Place Tonight
- \$100 Bill Getting 'High Security' Makeover

More: Top News | World | Sports

Markets

DJIA	13,342.54	-28.33
NASDAQ	2,585.72	-10.97
S&P 500	1,489.97	-8.40

Sponsored by: **Scottrade**

My Portfolios | Market News

Finance News

- Home Sales Hit Slowest Pace in 5 Years
- Debt, Not Terrorism, Top Economic Risk

Sign In

Get Free AOL® Mail

Mail Weather AOL Radio with XM Video

Download the Free AOL Toolbar Today

Hot Spots, Hotter Savings.
Book flight + hotel together and save

BOOK & SAVE
AOL travel

Ad Feedback

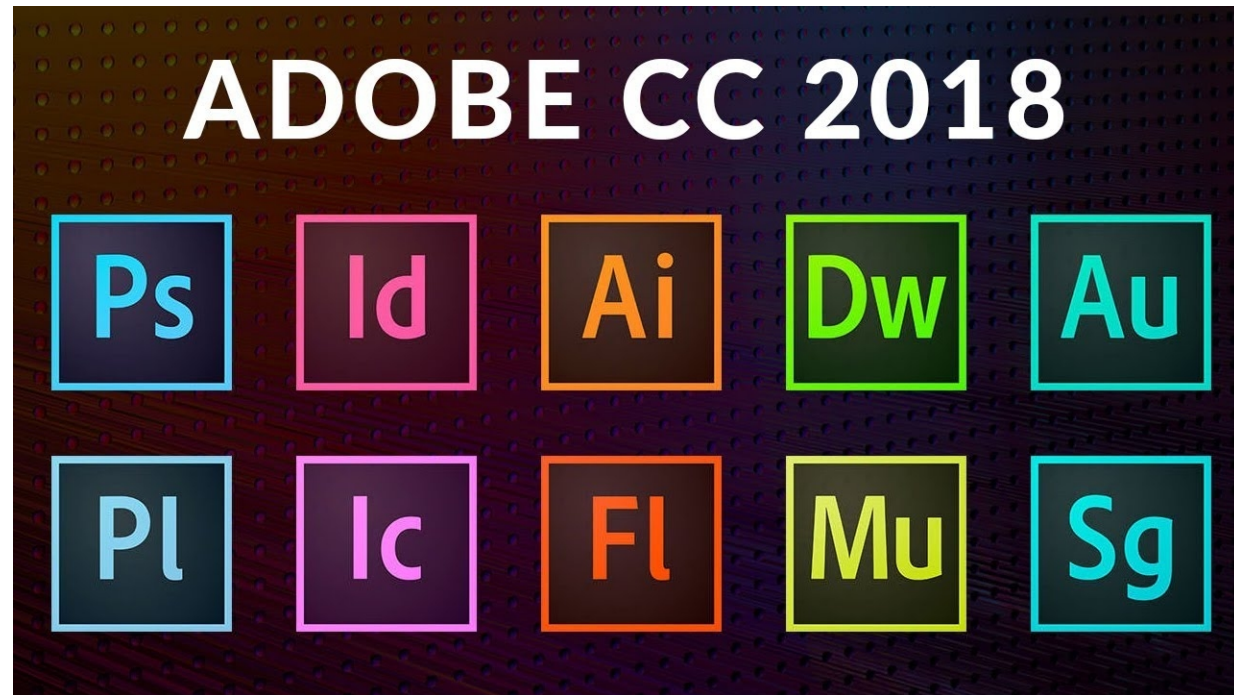
Featured Offers

A Prof Bot?
Test Your SAT Skills With the Prof Talk Now

Software Suite

Software Suite

Collection of personal productivity software such as drawing, designing, and editing.

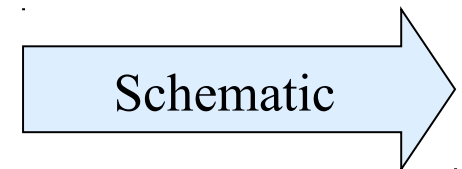


Software Concepts - OLE

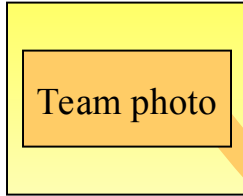
- ❑ OLE = Object Linking and Embedding
 - A software feature that allows you to copy text from one document to another or embed graphics from one program into another program or document
 - Server Application
 - The application that supplies objects you place into other applications
- ❑ Client application
 - The application that accepts objects from other applications

OLE Concepts

- ❑ Copy
 - Copy data from one application and place it in another
- ❑ Link
 - Changes made to the server object to automatically appear in all linked client objects
- ❑ Embed
 - An object to become part of the client document

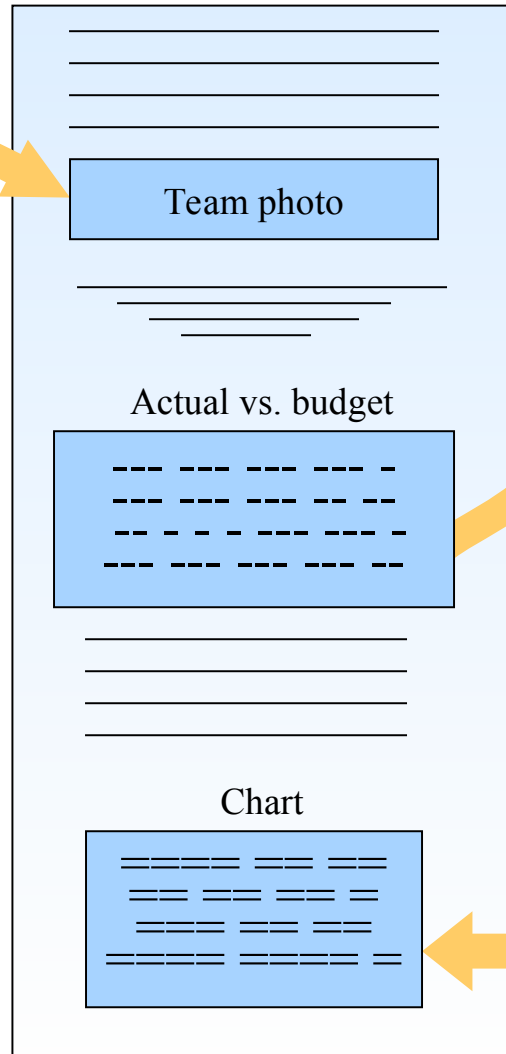


Graphics Program
Server Application

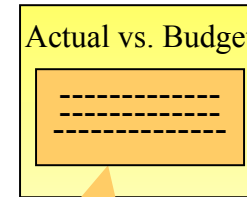


Copy

Client Application
Word Processing
Program

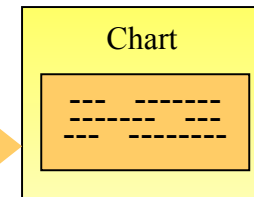


Spreadsheet Program
Server Application



Link

Project Management Program
Server Application



Embed

Workgroup Application Software

- ❑ Groupware
 - Software that helps groups of people work together more efficiently and effectively

- ❑ Collaborative computing software
 - Software that helps teams of people work together toward a common goal

Enterprise Application Software

- ❑ Enterprise application software...
 - Software that benefits the entire organization
 - Examples
 - Accounts receivable
 - Accounts payable
 - Cash-flow analysis
 - Manufacturing control
 - General Ledger
 - Sales ordering
 - Order entry
 - Check processing
 - Receiving
 - Retail Operations

Enterprise Resource Planning (ERP)

- ❑ Enterprise Resource Planning (ERP)...
 - A set of integrated programs that manage a company's vital business operations for an entire multi-site, global organization
 - Vendor examples

SAP	Baan
Oracle	SSA
PeopleSoft	Marcam
Dun & Bradstreet	QAD
JD Edwards	Ross Systems

Programming Languages

- Programming languages...
 - Coding schemes used to write both systems and application software

Categories of Programming Languages

❑ Machine Language

- 1st generation programming language
- Considered a low-level language because it involves basic coding using the binary symbols 1 and 0

❑ Assembly Language

- 2nd generation language
- Replaced binary digits with mnemonics (e.g., “ADD”) programmers could more easily understand

Categories of Programming Languages

- ❑ Third Generation Languages
 - Continued trend to more symbolic code (e.g. COBOL)
- ❑ Fourth Generation Languages (4GLs)
 - Languages that are less procedural and even more English-like than third-generation languages (e.g. FOCUS)

Categories of Programming Languages

- ❑ Query languages
 - Used to ask the computer questions in English-like sentences
 - Also known as database languages
- ❑ Structured query language (SQL)
 - A standardized language often used to perform database queries and manipulations

Object Oriented Languages

- ❑ Object-oriented languages (OOL)
 - Languages that allow interaction of programming objects, including data elements and the actions that will be performed on them
 - Note: OOP = object-oriented programming
- ❑ Encapsulation
 - The process of grouping items into an object
- ❑ Polymorphism
 - A process allowing the programmer to develop one routine or set of activities that will operate on multiple objects

Object Oriented Languages

❑ Inheritance

- Property used to describe objects in a group of objects taking on characteristics of other objects in the same group or class of objects

❑ Reusable code

- The instruction code within an object that can be reused in different programs for a variety of applications

❑ Examples

- Smalltalk, C++, Java

Visual Programming Languages

- ❑ Visual programming languages...
 - Languages that use a mouse, icons, or symbols on the screen and pull-down menus to develop programs
 - Examples
 - Visual Basic
 - Visual C++
 - PC COBOL

Fifth-Generation Languages

- ❑ 5th generation languages...
 - Combines rule-based code generation, component management, visual programming techniques, and reuse management
 - Knowledge-based management
 - An approach to the development of computer programs in which you do not tell a computer how to do a job, but what you want it to do

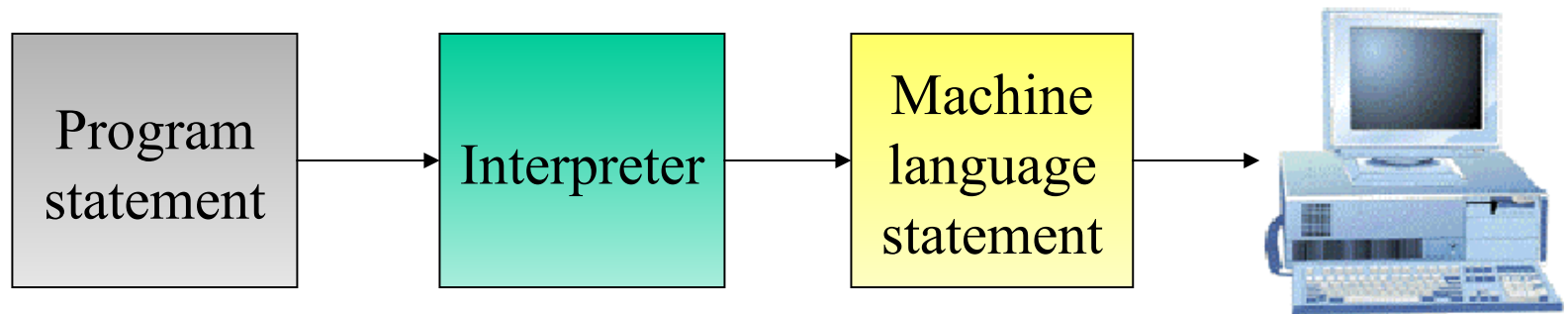
Programming Languages: Terminology

- ❑ Language translator
 - Systems software that converts a programmer's source code into its equivalent in machine language
- ❑ Source code
 - High-level program code written by the programmer
- ❑ Object code
 - Another name for machine language code

Programming Languages: Terminology

❑ Interpreter

- A language translator that translates one program statement at a time into machine code

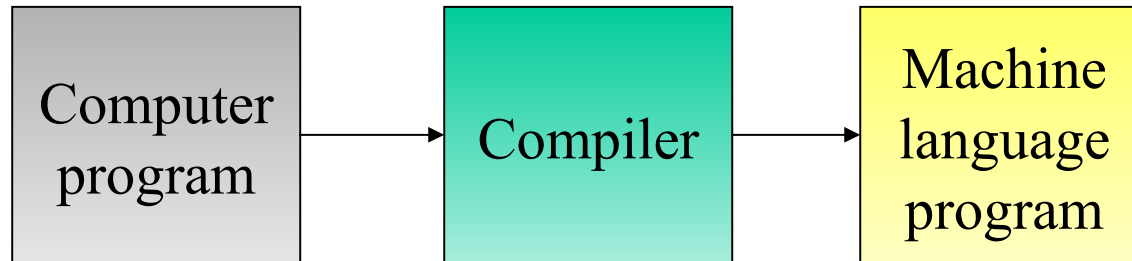


❑ Compiler

- A language translator that converts a complete program into machine language to produce a program that the computer can process in its entirety

Programming Languages: Terminology

Step 1: Translate program



Step 2: Execute program

