

# Fundamentals of Computers

Imagine that you are looking to purchase a new computer and have come across the systems advertised below:



**Free Shipping**  
on all Sb-Series Desktops

Plus **\$100 off** the Sb-4100-A  
Now Starting at **\$499** (after discount)

Monitor not included

Price discount on the Sb-4100-A is reflected in the list price. To receive Free Shipping, enter the following coupon code in your shopping cart: **NOSHIPD**

### Designed for Small Business

The Sb-4100 Series combines Intel® processing power, SMB network-ready configurations and office software applications in a stylish machine that fits your business and bottom line.

### Gateway® Sb-4100-A

- Intel® Pentium® 4 Processor 2.2GHz
- 128MB PC2700 DDR SDRAM
- 30GB Ultra ATA100 7200rpm hard drive
- 3.5" 1.44MB diskette drive
- 20x min./48x max. CD-ROM drive
- Microsoft® Windows® XP Home Edition
- 1 year parts, labor and on-site service, limited HW and SW tech support for as long as you own it! [\\_](#)

Base Price: ~~\$599~~ **\$499**  
3-Year Limited Warranty +\$119

[DETAILS](#)

Total: **\$618**  
(monitor not included)  
[Financing Options](#)  
shipping & handling extra

[CUSTOMIZE](#)

### Gateway® Sb-4100-B

- Intel® Pentium® 4 Processor 2.4GHz
- 256MB PC2700 DDR SDRAM
- 30GB Ultra ATA100 5400rpm hard drive
- 3.5" 1.44MB diskette drive
- 48x/24x/48x CD-RW
- Microsoft® Windows® XP Professional
- 1 year parts, labor and on-site service, limited HW and SW tech support for as long as you own it! [\\_](#)

Base Price: **\$649**  
3-Year Limited Warranty +\$119

[DETAILS](#)

Total: **\$768**  
(monitor not included)  
[Financing Options](#)  
shipping & handling extra

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In this unit, I will try to help you understand what the listed features mean. In addition, I will tell you about some features that are not shown and how those can add up to a lot more money.

First, we will discuss the processor. On this advertisement, both systems use an Intel Pentium 4 processor. The processor is actually the “computer” part of a computer system. A *computer* is an electronic device that accepts information, performs arithmetic and logical operations and produces results. The entire collection of stuff is a computer system. A computer system is composed of a computer and additional devices and

programs that make it useful. *Hardware* is the parts of the computer system that can be touched (and broken). *Software* is the programs (instructions) that make the hardware useful.

In order to get things into the computer for processing, you need *input devices*. The most common are a keyboard and mouse. Both are generally included with the purchase of a computer system, but vary in quality.

Processor performance is measured by clock speed and word size. *Clock speed* is generally listed in “Gigahertz” (abbreviated GHz), which is the number of times in a second that the computer can process an instruction. A computer listed at 2.2 GHz processes instructions 2,200,000,000 times in a second. *Word size* is a term that I use that measures how big the instructions are. Word size is really just a catch all for a bunch of techniques that processor designers use to get processors to work harder (versus faster). The most basic of these is the size of the instructions. Current processors are 32 bit, meaning they process a line of 32 ones and zeros at a time. Coming soon (and now available from Apple) are 64 bit processors. Current applications and operating systems have to be recompiled to take advantage of 64 bit processors. Other techniques include adding more pipelines, which are places for instructions to wait before they are processed, and making longer pipelines. These techniques are what differentiate 32 bit processors at the same clock speed. AMD and Intel have different approaches to processor design, with Intel emphasizing raw clock speed and AMD emphasizing the other techniques.

Both systems in this advertisement use the same kind of primary memory, PC2700 DDR SDRAM. *Primary memory* is used to store instructions for quick retrieval by the processor. The first number is essentially the speed of the memory. DDR stands for “double data rate,” which means that there are twice as many connections between the memory and the processor as normal memory. SDRAM indicates what kind of memory. Additional memory can be purchased and is generally easy enough for a user to install, but the specifications must match. In addition to primary memory, computer systems may have *cache memory*, which stores more frequently used instructions. Cache memory can be accessed more quickly and many processors have caches on the same piece of silicon as the processor (on-die).

Primary memory, cache memory and other items on the system bus (not listed) all have clock speeds. They measure the speed at which instructions can be passed from the device to the processor. Hardcore computer users (gamers, video editors, etc.) are the most concerned about these speeds.

*Output devices* are what the computer system uses to display the results of processing. A computer isn’t useful unless it has both input and output devices. The most common output devices are monitors and printers.

These systems are listed without monitors as a “hook” because a monitor will cost you at minimum \$119 more. When purchasing a monitor, you should first choose between a

CRT model and an LCD model. *CRT* is the traditional monitor that looks like a television.

It is possible to buy a bad CRT. Some things to look for are a low *dot pitch*, which measures how tiny the dots will be. A large dot pitch will make the monitor seem blurry. Getting a large *viewable area*, which is the amount of the screen that is actually available for use, is generally a good bet because most support a high *maximum resolution*, which is the maximum number of pixels that can be displayed at once. I have a 17" CRT monitor (16" viewable), and I use a 1024 x 768 resolution even though I would prefer 1152 x 870, which is a good resolution for my eyes (its maximum is 1600 x 1200). The reason I use a lower resolution is because I prefer a refresh rate of 85 Hertz. *Refresh rate* is the number of times a second that the screen is updated. Below that rate, I get a flicker effect from having fluorescent lights in my office. The refresh rate at different resolutions is determined by the features of your monitor and your video card (not listed on the ad). One other nice feature on a CRT is to have a flat screen. A flat screen reflects less light from the sides, which means less distraction.

Many people prefer LCD screens because they take up much less desk space. They also use less electricity. However, they cost about twice as much as a comparable (screen size and resolution) CRT monitor. The other disadvantages are 1) the screen has an exact pixel count and the display at other resolutions than *native* will be blurry, 2) the screen doesn't refresh the same way as a CRT, which can lead to annoying "ghosting" effects when playing computer games that refresh the screen often (first-person shooters), 3) they have "color balance" issues, which make them a poor choice for graphics professionals who need to have what they see on the screen match what will print out exactly.

The *video card* actually connects the computer to the monitor. Most cards now include 3D capabilities, which allow them to play the newest computer games. Hard core gamers are the most interested in comparing brands of video cards. In general, better video cards have more memory on them.

Some devices act as both input and output devices. *Secondary storage* includes hard disks, CDs, and floppy disks. *Hard disks* are rated in terms of their speed, which is faster than floppy disks because the magnetic platters inside them are very stiff. That means they can spin more rapidly (higher rpm) and they can store more things in a smaller area because the part that reads the data can be more accurate. The cheapest *optical* drives are read-only, meaning you can't record to them. More expensive will also read DVDs, will record CDs, and the most expensive will record DVDs. Since recordable CD drives are so common and the disks are so cheap, floppy drives are being phased out as standard equipment.

*Communication devices* also act as input and output devices. These include modems and network interface cards (NIC). Modems are available for different types of Internet access, including dial-up, DSL, and cable modems. NICs are either wired or wireless and can connect computers that are pretty close to each other (within about 300 feet) to form

a *local area network* (LAN). Additional hardware and skill is required to actually get a LAN working.

*Peripheral interfaces* are used to connect devices that weren't already built in, like scanners, printers, digital cameras, camcorders, etc. Almost all computers now use *USB* for connecting peripherals. USB version 1.0 is relatively slow speed and not fast enough for video, while USB 2.0 is about the same speed as *firewire*, which are fast enough for video and second hard drives. Older connections include *parallel* and *serial* ports.

Expandability is also an issue for many computer system buyers. The number of open *slots* on the motherboard determines how many additional *cards* can be attached. Usually, one is used for the NIC, but cards can be purchased that are modems, video cards, disk controllers, and other stuff. You will want to buy a computer that has as all of the devices you think you will need already installed because adding cards is often a hit or miss affair. For the more ambitious, the number of *bays* in the case determines the number of additional drives you can add, like a zip drive, CD/DVD recorder, and/or a second hard disk. Adding these devices is even trickier than cards and is best left to the professionals.

The *operating system* communicates with the processor and peripherals. It is generally packaged with the system. Microsoft stipulates to computer makers that they must include an operating system with each system to discourage piracy. The home version of Microsoft Windows is generally good enough for a computer that will only be used in your home and won't be connected to other computers. The professional version includes features for connecting to a large network like UTULSA. Most operating systems also include a lot of *applications software*, which are what you use to actually do your work. If you need a more sophisticated application, you have to buy it. Anti-virus software runs about \$100. It is a necessity for any computer that is connected to the Internet. General business software like Microsoft Office runs about \$500, while specialty packages like Adobe Photoshop are closer to \$1,000.

## Homework Assignment

Find two complete (including monitor) computer systems from different manufacturers that are within \$100 of each other in price and compare them on at least ten features. Make a table like the one in the ad above that lists each computer system and its price above a column with one row for each feature that you compare. You may want to use the Internet because ads in the newspaper often don't include very much information (although you could go into the store and ask).