

# Computer Hardware Lecture

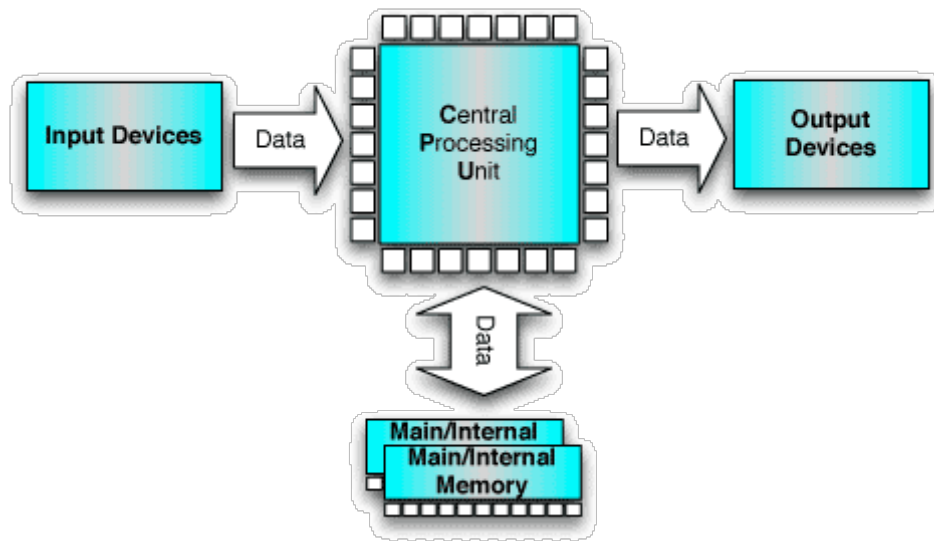
As of October 2014, there were nearly 2 billion personal computers used worldwide.

## What is a Computer?

A computer is an electronic (nowadays) device that ***processes*** information. To qualify as a computer a device must:

- Accept Input
- Remember and Store Information
- Process Inputs
- Produce Outputs

## Looking at a Computer

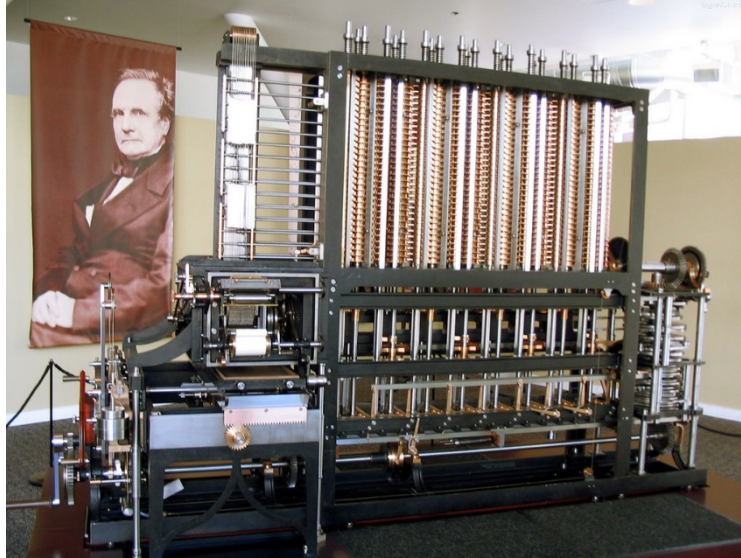


- **Input:** Your keyboard and mouse, for example, are just input units—ways of getting information into your computer that it can process. If you use a microphone and voice recognition software, that's another form of input.
- **Memory/storage:** Your computer probably stores all your documents and files on a hard-drive: a huge magnetic memory. But smaller, computer-based devices like digital cameras and cellphones use other kinds of storage such as flash memory cards.
- **Processing:** Your computer's processor (sometimes known as the central processing unit) is a microchip buried deep inside. It works amazingly hard and gets incredibly hot in the process. That's why your computer has a little fan blowing away—to stop its brain from overheating!

- **Output:** Your computer probably has an LCD screen capable of displaying high-resolution (very detailed) graphics, and probably also stereo loudspeakers. You may have an inkjet printer on your desk too to make a more permanent form of output.

## Computer History

Charles Babbage (1791-1971) along with Ada Lovelace are credited with the invention of the first programmable computers. While Babbage's machines were mechanical and unwieldy, their basic



architecture was similar to a modern computer. The data and program memory were separated, operation was instruction-based, the control unit could make conditional jumps, and the machine had a separate Input and Output unit.

First **programmable** computer. The **Z1** was created by German Konrad Zuse in his parents' living room between 1936 and 1938. It is considered to be the first electro-mechanical

binary **programmable** computer, and the first really functional modern computer.

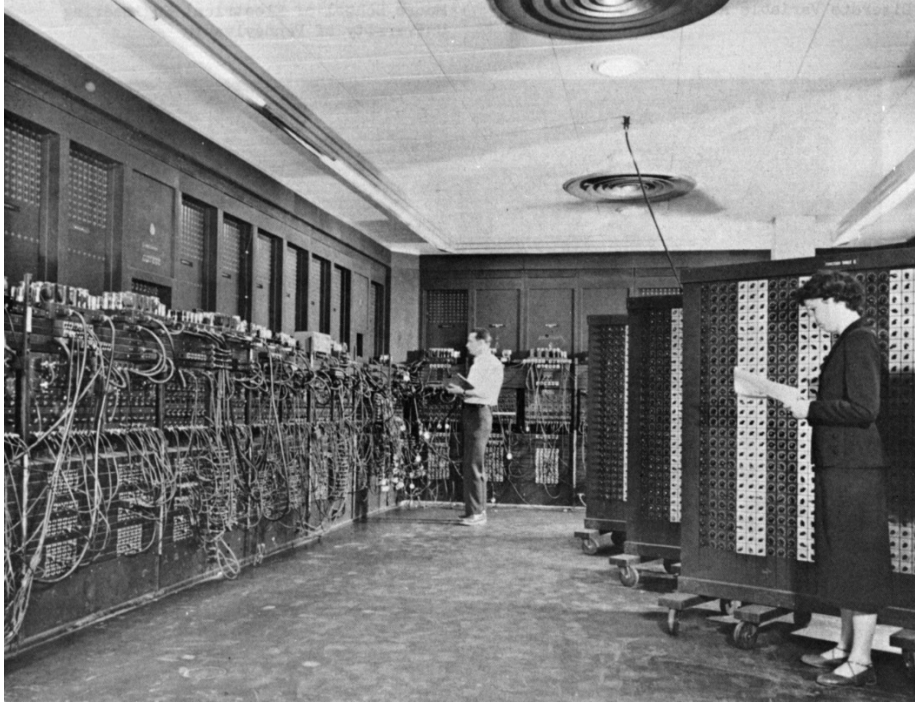
During the first and second World Wars computers were invented to do difficult calculations.

Built as an electromechanical means of decrypting Nazi ENIGMA-based military



communications during World War II, the British Bombe is conceived of by computer pioneer Alan Turing and Harold Keen of the British Tabulating Machine Company. Hundreds of bombses were built, their purpose to ascertain the daily rotor start positions of Enigma cipher machines, which in turn allowed the Allies to decrypt German messages.

ENIAC was the first electronic general-purpose computer. It was Turing-complete, digital, and could solve "a large class of numerical problems" through reprogramming. [Wikipedia](https://en.wikipedia.org/wiki/ENIAC)



By the Early 60's computers found their way into everyday businesses for accounting, and other applications. These "Mainframe" computers from IBM, Univac, and Honeywell were everywhere including college campuses.

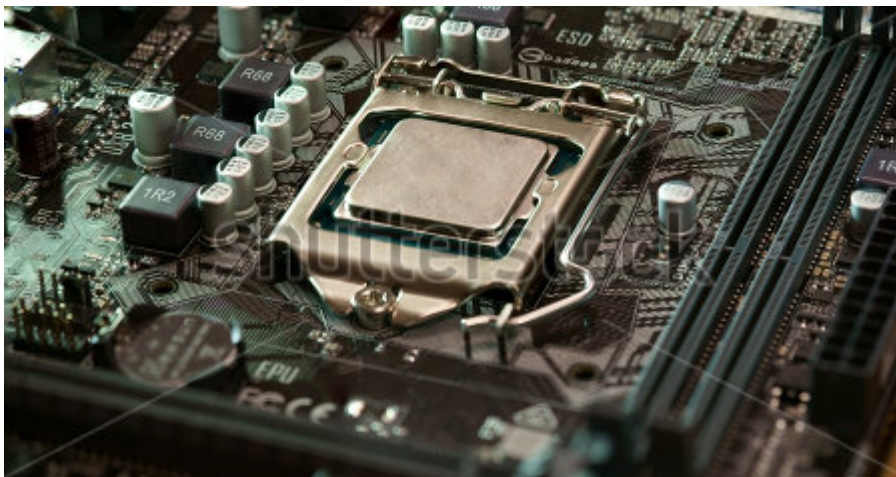


Mini computers appeared in the late 60's and made this tool available to medium size businesses.





But one of the most significant of the inventions that paved the way for the PC revolution was the microprocessor. Before microprocessors were invented, computers needed a separate integrated-circuit chip for each one of their functions. (This was one reason the machines were still so large.) Microprocessors were the size of a thumbnail, and they could do things the integrated-circuit chips could not: They could run the computer's programs, remember information and manage data all by themselves.



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As a result, the small, relatively inexpensive “microcomputer”—soon known as the “personal computer”—was born. In 1974, for instance, a company called Micro

Instrumentation and Telemetry Systems (MITS) introduced a mail-order build-it-yourself computer kit called the Altair. Compared to earlier microcomputers, the Altair was a huge success: Thousands of people bought the \$400 kit. However, it really did not do much. It had no keyboard and no screen, and its output was just a bank of flashing lights. Users input data by flipping toggle switches.



In 1975, MITS hired a pair of Harvard students named Paul G. Allen and Bill Gates to adapt the BASIC programming language for the Altair. The software made the computer easier to use, and it was a hit. In April 1975 the two young programmers took the money they made from “Altair BASIC” and formed a company of their own—Microsoft—that soon became an empire.

The year after Gates and Allen started Microsoft, two engineers in the Homebrew Computer Club in Silicon Valley named Steve Jobs and Stephen Wozniak built a homemade computer that would likewise change the world. This computer, called the Apple I, was more sophisticated than the Altair: It had more memory, a cheaper microprocessor and a monitor with a screen. In April 1977, Jobs and Wozniak introduced the Apple II, which had a keyboard and a color screen. Also, users could store their data on an external cassette tape. (Apple soon swapped those tapes for

floppy disks.) To make the Apple II as useful as possible, the company encouraged programmers to create “applications” for it. For example, a spreadsheet program called VisiCalc made the Apple a practical tool for all kinds of people (and businesses)—not just hobbyists.

The PC revolution had begun. Soon companies like Xerox, Tandy, Commodore and



IBM had entered the market, and computers became ubiquitous in offices and eventually homes. Innovations like the “Graphical User Interface,” which allows users to select icons on the computer screen instead of writing complicated commands, and the computer mouse

made PCs even more convenient and user-friendly. Today, laptops, smart phones and tablet computers allow us to have a PC with us wherever we go.

## Computer System

A computer system consists of two major elements: hardware and software. Computer **hardware** is the collection of all the parts you can physically touch. Computer **software**, on the other hand, is not something you can touch. Software is a set of instructions for a computer to perform specific operations. You need both hardware and software for a computer system to work.

Some hardware components are easy to recognize, such as the computer case, keyboard, and monitor. However, there are many different types of hardware components. In this lesson, you will learn how to recognize the different components and what they do.

## Types of Computers

### Supercomputer

The most powerful computers in terms of performance and data processing are the Supercomputers. These are specialized and task specific computers used by large organizations. These computers are used for research and exploration purposes, like NASA uses supercomputers for launching space shuttles, controlling them and for space exploration purpose.





The supercomputers are very expensive and very large in size. It can be accommodated in large air-conditioned rooms; some super computers can span an entire building.

## Mainframe computer

Although Mainframes are not as powerful as supercomputers, but certainly they are quite expensive nonetheless, and many large firms & government organizations uses Mainframes to run their business. The Mainframe computers can be accommodated in large conditioned rooms because of its size. Super-computers are computers with large data storage capacity, Mainframes can & store large amount of data. Banks educational institutions companies use mainframe computers to store data about customers, students & insurance policy holders.



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## Minicomputer

Minicomputers are used by small businesses & firms. Minicomputers are also called as “Midrange Computers”. These are small machines and can be accommodated on a disk with not as processing and data storage capabilities as super-computers & Mainframes. These computers are not designed for a single user. Individual departments of a large company or organizations use Mini-computers for specific purposes. For example, a production department can use Mini-computers for monitoring certain production process.

# Microcomputer

Desktop computers, laptops, personal digital assistant (PDA), tablets & smartphones are all types of microcomputers. The micro-computers are widely used & the fastest growing computers. These computers are the cheapest among the other three types of computers. The Micro-computers are specially designed for general usage like entertainment, education and work purposes.

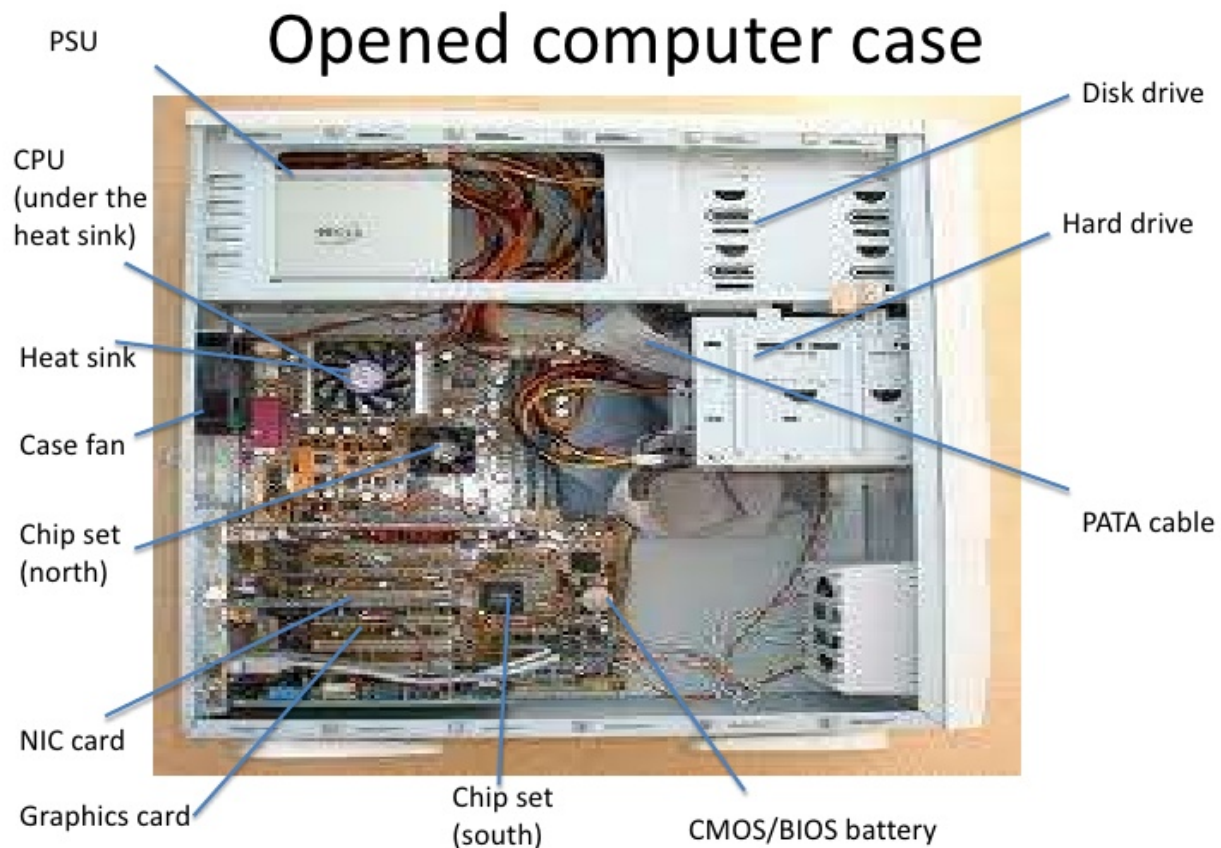
## Computer Hardware

Hardware is a comprehensive term for all of the physical parts of a computer, as distinguished from the data it contains or operates on, and the software that provides instructions for the hardware to accomplish tasks. The boundary between hardware and software is slightly blurry - firmware is software that is "built-in" to the hardware, but such firmware is usually the province of computer programmers and computer engineers in any case and not an issue that computer users need to concern themselves with.

A typical computer (Personal Computer, PC) contains in a desktop or tower case the following parts:

- **Motherboard** which holds the CPU, main memory and other parts, and has slots for expansion cards
- **power supply** - a case that holds a transformer, voltage control and fan
- **storage controllers**, of IDE, SCSI or other type, that control hard disk, floppy disk, CD-ROM and other drives; the controllers sit directly on the motherboard (on-board) or on expansion cards
- **graphics controller** that produces the output for the monitor
- **the hard disk**, floppy disk and other drives for mass storage
- **interface controllers** (parallel, serial, USB, Firewire) to connect the computer to external peripheral devices such as printers or scanners





## Computer Software

### What's the difference between hardware and software?

The beauty of a computer is that it can run a word-processing program one minute—and then a photo-editing program five seconds later. In other words, although we don't really think of it this way, the computer can be reprogrammed as many times as you like. This is why programs are also called **software**. They're "soft" in the sense that they are not fixed: they can be changed easily. By contrast, a computer's **hardware**—the bits and pieces from which it is made (and the **peripherals**, like the mouse and printer, you plug into it)—is pretty much fixed when you buy it off the shelf. The hardware is what makes your computer powerful; the ability to run different software is what

makes it flexible. That computers can do so many different jobs is what makes them so useful—and that's why millions of us can no longer live without them!

## What is an operating system?

An **operating system** is the core software in a computer that (essentially) controls the basic chores of input, output, storage, and processing. You can think of an operating system as the "foundations" of the software in a computer that other programs (called **applications**) are built on top of. So a word processor and a chess game are two different applications that both rely on the operating system to carry out their basic input, output, and so on. The operating system relies on an even more fundamental piece of programming called the **BIOS (Basic Input Output System)**, which is the link between the operating system software and the hardware. Unlike the operating system, which is the same from one computer to another, the BIOS does vary from machine to machine according to the precise hardware configuration and is usually written by the hardware manufacturer. The BIOS is not, strictly speaking, *software*: it's a program semi-permanently stored into one of the computer's main chips, so it's known as **firmware** (it is usually designed so it can be updated occasionally, however).

Operating systems have another big benefit. Back in the 1970s (and early 1980s), virtually all computers were maddeningly different. They all ran in their own, idiosyncratic ways with fairly unique hardware (different processor chips, memory addresses, screen sizes and all the rest). Programs written for one machine (such as an Apple) usually wouldn't run on any other machine (such as an IBM) without quite extensive conversion. That was a big problem for programmers because it meant they had to rewrite all their programs each time they wanted to run them on different machines. How did operating systems help? If you have a standard operating system and you tweak it so it will work on any machine, all you have to do is write applications that work on the operating system. Then any application will work on any machine. The operating system that definitively made this breakthrough was, of course, Microsoft Windows, written by Bill Gates. (It's important to note that there were earlier operating systems too.)

## Application Software

**Application software**, or simply **applications**, are often called productivity programs or end-user programs because they enable the user to complete tasks such as creating documents, spreadsheets, databases, and publications, doing online research, sending email, designing graphics, running businesses, and even playing games! Application software is specific to the task it is designed for and can be as simple as a calculator application or as complex as a word processing application. When you begin creating a document, the word processing software has already set the margins, font style and size, and the line spacing for you. But you can change these settings, and you have many more formatting options available. For example, the word processor application makes it easy to add color, headings, and pictures or delete, copy, move, and change the document's appearance to suit your need

Microsoft Word is a popular word-processing application that is included in the **software suite** of applications called Microsoft Office. A software suite is a group of software applications with related functionality. For example, office software suites might include word processing, spreadsheet, database, presentation, and email applications.

## Computers and the Binary System

Binary numbers – seen as strings of 0's and 1's – are often associated with computers. But why is this?

A modern-day "digital" computer, as opposed to an older "analog" computer, operates on the principle of two possible states of something – "on" and "off". This directly corresponds to there either being an electrical current present, or said electrical current being absent. The "on" state is assigned the value "1", while the "off" state is assigned the value "0".

The term "binary" implies "two". Thus, the binary number system is a system of numbers based on two possible digits – 0 and 1. This is where the strings of binary digits come in. Each binary digit, or "bit", is a single 0 or 1, which directly corresponds to a single "switch" in a circuit. Add enough of these "switches" together, and you can represent more numbers.

We only use binary because we currently do not have the technology to create "switches" that can reliably Binary numbers are closely related to digital electronics. With digital electronics a '1' means that current / electricity is present and a '0' means it is not present. The different parts of a computer communicate through pulses of current (**1s** and **0s**).

As we all know, computers can calculate complex equations and perform complex mathematics at lightening speed. Calculating using only **1s** and **0s** is called the BINARY SYSTEM. Although a computer will only process **1s** and **0s** there comes a point when the **1s** and **0s** have to be converted into our usual decimal numbers - that we are familiar with.

We tend to use the **DECIMAL SYSTEM** when attempting maths. This system deals with numbers that we are using on a daily basis: 1,2,3,4,5,6,7,8,9, 10s, 100s, 1000s etc..... As the **BINARY** system is composed of only two numbers (1s and 0s) you may be wondering how it is possible to count beyond one. The table below will help you understand how this is done.

hold more than two possible states. (Quantum computers aren't exactly on sale at the moment.) The binary system was chosen only because it is quite easy to distinguish the presence of an electric current from an absense of electric current, especially when working with trillions of such connections. And using any other number base in this system ridiculous, because the system would need to constantly convert between them.

Decimal		Binary			
10	1	8	4	2	1
	0				0
	1				1
	2			1	0
	3			1	1
	4		1	0	0
	5		1	0	1
	6		1	1	0
	7		1	1	1
	8	1	0	0	0
	9	1	0	0	1
1	0	1	0	1	0

Because binary uses base two as opposed to the decimal base ten, the numbers get larger much more quickly, but they still obey the same principles.

In this case, the number ten is represented by **10**(no 1s, one x 10) in decimal, and **1010** (no 1s, one x 2, no 4s, one x 8) in binary

## Big Binary Numbers

Kilo, mega, giga, tera, and peta are among the list of prefixes that are used to denote the quantity of something, such as, in [computing](#) and



telecommunications, a [byte](#) or a [bit](#). Sometimes called *prefix multipliers*, these prefixes are also used in electronics and physics. Each multiplier consists of a one-letter abbreviation and the prefix that it stands for.

Prefix	Symbol(s)	Power of 10	Power of 2
pico-	p	$10^{-12}$ *	--
nano-	n	$10^{-9}$ *	--
micro-	μ	$10^{-6}$ *	--
milli-	m	$10^{-3}$ *	--
centi-	c	$10^{-2}$ *	--
deci-	d	$10^{-1}$ *	--
(none)	--	$10^0$	$2^0$
deka-	D	$10^1$ *	--
hecto-	h	$10^2$ *	--
kilo-	k or K **	$10^3$	$2^{10}$
mega-	M	$10^6$	$2^{20}$
giga-	G	$10^9$	$2^{30}$
tera-	T	$10^{12}$	$2^{40}$
peta-	P	$10^{15}$	$2^{50}$
exa-	E	$10^{18}$ *	$2^{60}$
zetta-	Z	$10^{21}$ *	$2^{70}$
yotta-	Y	$10^{24}$ *	$2^{80}$

# What to Think About When Buying a Computer

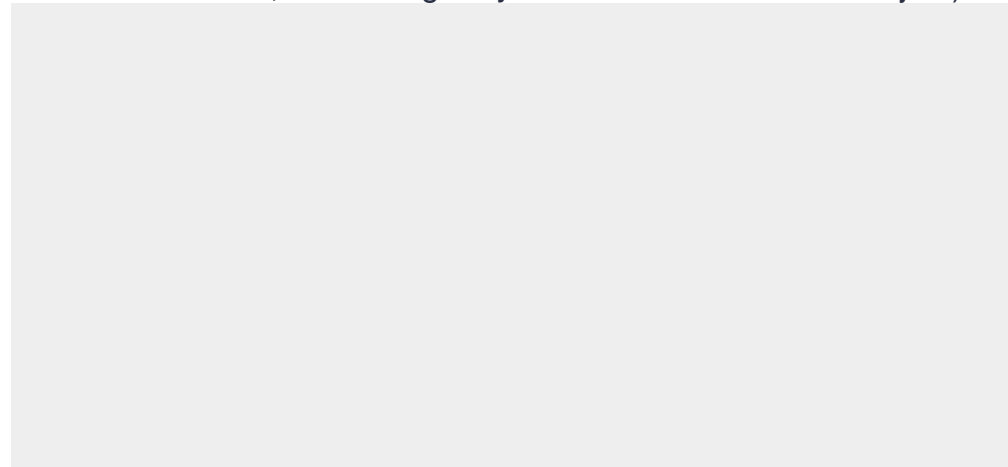
## 1. Desktop or Laptop?

This is probably one of the simplest choices to make, and one that can have a big impact on the overall cost of your computer, including expenses that might not come right at the time of the purchase. In general, if a laptop and desktop are boasting all of the same performance specs, the desktop will be cheaper. It might not make sense, since it's a bigger piece of hardware, but the ability to cram a lot of components into a small space and the need for a battery is what ups the price of the laptop — notice the premium paid for Apple's thinner devices.

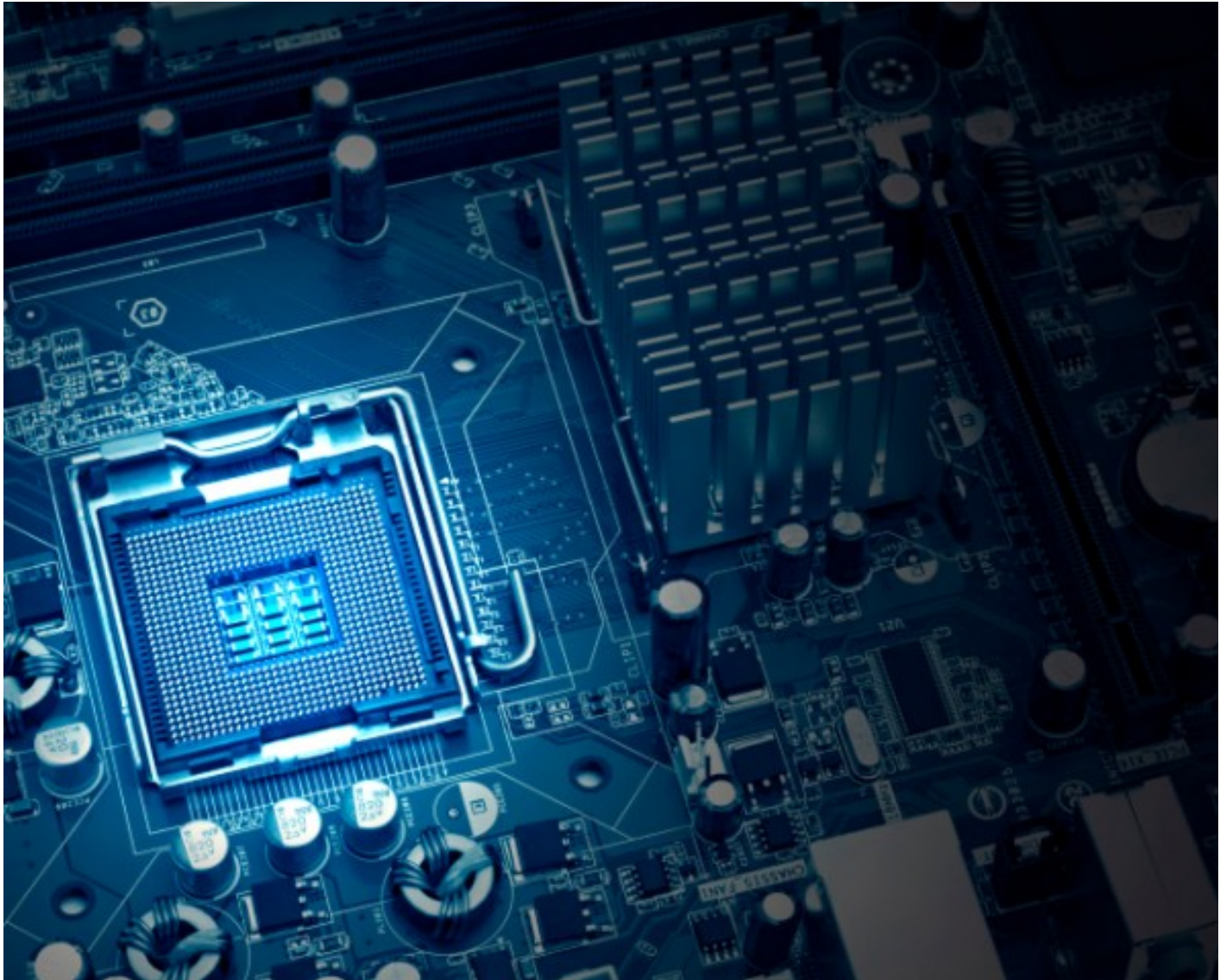
If you plan on having a steady workstation and don't need to run around with your for-all-purposes device, consider getting a desktop and saving yourself some money, or spending what your budget allows and getting a computer with higher specs. An added benefit of a desktop is that it's easier to keep cool, since there is more room for powerful fans, which will help the machine have a longer lifetime and [maintain optimum performance levels](#). Additionally, it's easier to change out parts and upgrade components in a desktop, which will keep your machine from falling behind the constantly increasing demands of the digital world.

If you often need your computer on the go, the choice is simple: laptop. If your need for portability is only occasional and you don't need much more than a browser or word processor, you may be able to [find a cheap tablet](#) or netbook to do the job, and could potentially afford it with the money you save by getting a desktop as your primary computer. Keep in mind that you'll still have to buy a monitor if one doesn't come as a bundle with the desktop.

(Note on laptop screens: If you're planning to use your laptop for mostly work, consider a matte screen, which will have less glare and be easier on the eyes. If your laptop will be a media device, a normal glossy LCD screen should do the job.)



## 2. Know the processor and what it means



Before you buy a new computer, make sure you know what you're getting with the processor | Source: Thinkstock

The simplest way to explain the processor is that it's the brain of the machine. If you want a fast computer that boots up programs in a flash, completes tasks as soon as you start them, and doesn't keep you waiting, then you want the strongest processor available — and who doesn't? You just have to know what you're looking at when you see a processor's details.

Basic: the short and simple of processors is in the number of cores and the speed (labeled in GHz or Gigahertz) of the processor. The speed of the chip will tell you how much data it can process in how much time, so the bigger the number, the better. The number of cores functions as a multiplier, as the processor is actually a stack of cores

that each run at the listed speed (e.g. a single-core 2GHz processor is a lot slower than a four-core 2GHz processor).

Multiple cores can also help with multi-tasking, as each can be working on different tasks. If you don't use a lot of programs at the same time, you may be content with just one or two cores and don't need to fork out the extra cash to snag a few more. Make sure to ask how many cores are on the chip and what the clock speed is. Two computers might both say they have an Intel i5 chip, but the number of models that go into the group are many, and their speeds and core counts can be leagues apart.

Advanced: If you want to get into really nitty-gritty bits of the processor, check out the benchmark tests at [CPUBenchmark](#). You can compare a number of different CPUs to see if you're getting the best one, and even see if you're getting the best for your money. Also, check out the L1, L2, and L3 cache sizes — these are the closest and fastest memory spaces to the CPU and the bigger they are, the better. You can also see how many threads the core has — again, the more, the merrier.

### 3. RAM isn't just a type of goat



Before you buy a computer, know how much RAM you need | Source: Gskill.com



Just as the number of processor cores in a computer affects its speed and ability to multitask, the amount of Random Access Memory, or RAM, in a computer can affect just how much multitasking it can handle and how fast it will be. RAM is basically a small, extra-fast form of memory (like L1, L2, or L3 cache, but bigger and slower).

Basic: Nowadays most RAM is measured in gigabytes, and as is often the case, the more, the merrier. By having more RAM, your computer is able to keep more data close at hand, rather than having to go digging around through the slower hard drive for the information it needs. Of course, because RAM is smaller, there is only so much room for data. That's why it's useful to have more RAM if you want to keep multiple tasks going at the same time, and to be able to jump between them relatively quickly. If you're also guilty of having too many web browser windows open at the same time, more RAM will make that a lot easier.

Advanced: There is, of course, a bit more to RAM than just the size of it. If you check out the specifics of the RAM in a computer and see that it's DDR2-800, you can get a quick sense that this is a faster memory than one labeled DDR2-400, as that last number signifies how many millions of data transfers the RAM can make each second. RAM also has clock speeds, similar to processors, and the faster, the better. However, that speed is limited to the speed of your computer's motherboard, so if you're buying RAM separately from your computer, figure out the speed of your motherboard and don't buy RAM that's any faster — as it will probably cost you more for no reason — and don't buy RAM any slower — as it will force your motherboard to run at the slower speed. One final number you can note is in the module name, where you may see something like PC3-8500, which indicates that the memory can transfer around 8,500MB per second — once again, the bigger, the better.

## 4. Hard drives aren't hard choices



How you plan to use your new computer will determine what kind of hard drive you need | Source: Seagate.com

Every computer needs data storage, and though that is something RAM does, the majority of it will go onto your hard drive. There are typically a few different options you'll need to consider in the search for a hard drive, but what it really comes down to is how you plan to use your computer.

**Basic:** If you plan to just have your computer and no peripherals, you may want to opt for the biggest hard drive you can (measured in gigabytes, or terabytes for extra large drives), since all of your files and programs will be stored on the computer. If you don't plan to have many applications on your computer, and won't store media on it, then you can opt for a smaller hard drive and save yourself some money. If you can handle a small hard drive but want it to be extra fast and you have the cash, consider going for a solid-state drive, or flash hard drive.

**Advanced:** The size of your drive is one thing. If it's a disk drive, the spin speed is another. Naturally, the faster your hard drive disk is spinning, the quicker information can be gathered from it. So, between a 5400rpm drive and a 7200rpm drive, the second would be faster. If you can handle having only a few larger programs installed on your computer at a time, and plan to keep everything else stored on an external device, you can probably get a quick device with a solid-state drive to keep the computer zippy at all times, and still manage to stream high-quality media through a USB connection —

some applications may even be able to run from an external hard drive. You'll also want to pay attention to data transfer bandwidth. The higher, the better.

## 5. Check your peripherals



You can figure out the peripherals you need by considering how you're going to use your computer | Source: Thinkstock

The peripherals on your computer are going to be pretty specific to your needs, so you'll need to think about whether you'll need them, and just how many of them you want. You may want ten USB ports but not have a care in the world about having a DVD drive. On the other hand, you may do everything online and just want as few holes in your machine as possible for soda to spill into and frazzle the circuitry.

USB: There is, thankfully, a standard that most computer peripherals opt to use, and it can be for anything from mice and keyboards to hard drives and monitors — heck, you can even plug a guitar in via USB if you've found the right cord. A modern version of USB, called USB 3.0, is faster than its predecessors, but there's an even newer version of USB, called USB Type-C, which offers gigabits of bandwidth and the ability to handle enough current to power a laptop. While USB Type-C will eventually become the single [technology](#) that you'll use to connect all your devices, and is a good thing to have on a new machine, you'll need to avoid off-brand cables that can [fry your brand-new computer](#).

If you plan to transfer a lot of data, make sure you have a fast USB port— or a fast wireless network. An alternative for some major externals (like CD drives and hard drives) is to get a computer with an eSATA port, which will let you plug in those peripherals on the fly with high data transfer rates.

HDMI: If you're going to use your machine for entertainment, you'll probably want an HDMI output. This will allow you to connect it to most modern televisions for a high quality visual display, and it will also run the audio out if you're planning to use the TV for sound.

SD slot: If you work a lot with photography, an SD slot can be a handy way to get the files from your camera over to your computer. For computers with small hard drives, an SD card can also function as a small, out-of-the-way addition to the computer's overall memory. For the slightly more savvy users, SD cards can even be used to speed up the system.

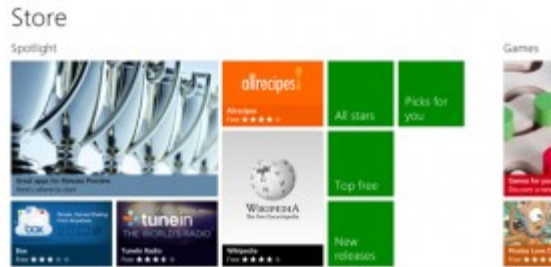
Wi-Fi: if you plan to connect to a lot of networks a lot of places and want to do it wirelessly, you're probably best off getting a built-in Wi-Fi receiver rather than working with some sort of external Wi-Fi device. If you're running a desktop computer, you can probably get away with running an ethernet cable straight into the computer without being constantly annoyed by the need for a wire to get Internet.

Bluetooth: Just like Wi-Fi, you can get a built-in Bluetooth receiver with your computer, and that may be a smart move if you want to be a true wireless warrior. Whether it's for sending audio to headphones or to a 7.1 channel surround sound set up that will keep your neighbors on their toes, [Bluetooth](#) is a handy way to make those connections easy



and tangle-free. It may be worth it for these types of uses, otherwise, you can probably save yourself a few bucks by not seeking it out.

## 6. Mac OS, Windows, and Linux, oh my!



Choose the operating system for your new computer carefully | Source: Microsoft

The short and simple of it is that you should probably stick with what you're familiar with, as it can be hard to adjust to a new operating system unless you're ready to put in the work. If you know what Linux is, you probably don't need to read this section. If you don't know what Linux is, you almost definitely don't want it.

If you want an easy-to-use system that keeps most things basic for you, check out Mac. If you like a little bit more control of your computer's nitty-gritty, you'll probably have an easier time getting to do that on Windows. If you're comfortable with an operating system, stay with it. However, it's worth noting that not all software is available for every operating system; so, if you absolutely need Final Cut for that feature film you're shooting on the weekend, don't buy a Windows computer expecting it to run Mac-only software.

## 7. There's more to graphics than a sticker on your computer



Lately, computer makers have been tagging stickers on their computers to boast about the AMD or [NVIDIA graphics cards](#) they have included in their machines. Unfortunately, those mean thousands of different things, and it's pretty hard to tell just what.

Basic: If you just want to know whether the card in the computer on the left is better than the one in the computer on the right, you can do a quick search on [PassMark's site](#) for the graphics components in each. Some buzz words to be aware of are "integrated" and "dedicated." The former is built into the computer's processor and relies on the computer's memory — typically this is a lower performance graphics component. A dedicated graphics card will include its own processor and memory, and will tend to be higher-performing — though a very old card might not best modern integrated graphics.

Advanced: If you're looking into the specifics of graphics processors, you will have to think of them like their own pair of a processor and RAM. This is another case of the more, the merrier. Higher speed, higher capacity RAM in the graphics card will let it handle a more intense graphic load and do it quicker. This will allow for better, more fluid visuals. The card's processor speed will be similarly important and can be looked at much the same as a computer's processor. You can dig into the details and see how many shaders it has and what its core speed is, but in the end, it will probably be most valuable to check out a benchmark score that has evaluated its actual performance.

## 8. Oh, so you want to get into PC gaming?



Shop for computers carefully if you plan to use your machine for gaming | Source: Thinkstock

To play the latest games with the graphics on high (or ultra) and keep a high frame-rate, you'll be needing to look into a truly high-performance machine. Modern games take up a lot of space, so a big hard drive is a must if you plan on having more than one game installed at a time — you'll want it to be a fast drive, too. Running those games also takes a lot of processing power, so a heavy-hitting processor will be important. You can do without too many cores in your processor if each is extra-fast, but if you're planning to play your games and keep other programs open in the background, consider bumping up the core count.

Integrated graphics? Forget about it. Unless you want to sputter out low-quality visuals on the newest games, you'll need a dedicated graphics card, and a good one at that. You can probably get by with something in the mid-range of graphics cards, but a high-end card is your best bet. Be sure to get plenty of VRAM on that card. When it comes down to making your choice, you'll still probably be best consulting the benchmarks mentioned on the last page.

Thinking about anything other than Windows? Reconsider. Some games are made available for Mac and Linux, but there will be a great number of games unavailable to you if you aren't running Windows — though there is the tricky option of dual-booting.

Thinking about a laptop? Reconsider again. As mentioned in the beginning, there is a premium to be paid for cramming high-end hardware into an extra small box, and a PC gaming rig requires a lot of high-end hardware. There are plenty of quality gaming laptops out there, but in most instances, they will be more expensive than an equal desktop. Then there's the problem of overheating, which a laptop will be much more prone to do. An added benefit of going with a desktop is that you will be able to swap out components or add more when the games' demands start to trump your computer — upgrading to a new graphics card is much easier in a desktop, and in some cases a second graphics card can be added to share the load. With a little careful shopping, you might be able to grab a gaming rig and a cheap netbook for the same price you would have paid for a gaming laptop.

## 9. Great, now how do we buy it?





Do your research to determine the best way to buy your new computer | Source: Thinkstock

One of the most important things to do when buying a new computer — as with any expensive purchase — is to be very patient. Technology evolves fast, and if you buy a new computer today, you might not have noticed a newer one was set for release tomorrow — and would have likely cost the same as the one you just bought, or made yours less expensive to buy. You could get into a logical loop that has you waiting indefinitely, but choosing the best time to pounce is key.

Check refresh cycles for products. If you know ‘Computer Maker A’ comes out with a new model around the same time every year, expect to get a discount on an old model just before a new one comes out, or wait until the new one is out so that you have the latest technology.

It can also be useful to get friendly with the computer maker’s website, as they often allow you to customize a computer rig with the components you want. On top of it all, you’re much more likely to stumble across an incredible sale if you shop regularly for a good stretch of time instead of just spending the better part of a day to make your pick and purchase it then and there. Also, don’t be afraid to spend a few more bucks to nudge up your computer’s specs — this can be helpful down the road, as it will ensure your computer can handle the more intensive tasks that will only start to show up months and years down the line. If you make the cheapest purchase, you might be looking at buying another new computer much sooner than you would otherwise.

One last tid-bit: go ahead and ask a salesperson to give you a deal. Maybe they won’t bump down the price of the computer, but if you’re going to need a mouse, a keyboard, a monitor, or any other device to go with your computer, see if they will cut off sales tax or give you some other discount for purchasing the items together. You will often be pleasantly surprised.