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Buying a pre-built computer is a nightmare. It is a pain, wading through technical sheets and reviews just to find a computer that you are inevitably going to overpay for. For example, a 500-dollar pre-built office computer can be built for 300 dollars. Building a pc is both a great experience and a money-saver. In addition to being cheaper than buying a pre-built, computers have become so modular over the past few years that makes building a pc about as easy as putting together a Lego set. However, if you want to build a computer, you must first plan it out. When I plan computers, I use pcpartpicker.com to keep track of my list and simplify the process, but you can also use Newegg. Though planning a computer can be a difficult process, it is easily worth it due to both the money you will save and the fun you will have.  
 The first step is to decide what you want the pc for and create a budget. To simplify this process, I will split the computer market into three subsets: office, gaming, and enthusiast. If you want a cheap computer that can process word documents smoothly, you want an office pc, which should cost between 3 to 6 hundred dollars. Next, if you plan on gaming or photo and video editing, you want a gaming computer. These will cost from 7 to 12 hundred dollars. The final group of computers are enthusiast computers, which will be anything over 12 hundred dollars. Before you start planning your build, you need to understand what each piece of a computer does. A computer is made up of many components, which are all placed on a motherboard so they can communicate. All computers have a CPU (Central Processing Unit), which manages most of the processing done in the computer. There is also RAM (Random-Access Memory), which is essentially high-speed storage that the CPU uses to temporarily store information for the tasks it is completing. A GPU (Graphics Processing Unit), for processing the monitor output, but this is optional in some cases. Next is storage, which stores all data you keep on your computer, such as documents and pictures. Next is your PSU (Power Supply Unit), which delivers power to the rest of the computer. When planning, make sure that your computer is balanced. A computer is only as fast as its slowest part, and you can minimalize bottlenecks by purchasing components that complement each other. Now that you know your budget and what all the parts of a computer are, you can start deciding what parts you want.  
 The first component to choose is your CPU. This part does most of the processing in a computer. In the current computer market, there are only two companies producing CPUs. These are AMD and Intel. We will be using AMD because of their great price to performance. AMD’s current CPUS are called Ryzen. There are five series of Ryzen chips, Ryzen 1000 to 5000. Each series was released around the same year, with 1000 being the oldest and 5000 the newest. In each series, there are 4 main models, called Ryzen 3, 5, 7, and 9. AMD names their Ryzen lineup with a 4-digit model number, with the least powerful and least expensive chips having the smallest numbers. For example, the most powerful Ryzen CPU is the Ryzen 9 5950x, and it has the highest model number. CPUs are made up of cores, with each core completing separate tasks. Most office computers only need four, but gaming can benefit from more. CPUs clock speeds are measured in GHz and measures how many actions can be done in a second, so the higher, the better. If your computer is an office computer, you should get an APU, or Accelerated Processing Unit, which are capable of handling graphics and can be used as a replacement for a GPU. Thankfully, Ryzen APUs are extremely easy to distinguish, as they have a G immediately succeeding the model number (Ex. 3400G). For an office PC, I recommend a Ryzen 3 3400G, and for gaming and enthusiast computers, I recommend a Ryzen 5 3600 and a Ryzen 9 5900X, respectively. After the CPU, you should decide whether you need a better CPU cooler. While all Ryzen processors come with an included CPU fan, you may need more if you are using a more powerful chip. Some recommended brands are Arctic and Noctua.   
 Next, you should choose your RAM. There are three main attributes to RAM, these being capacity, number of sticks, and frequency. First is capacity, or the amount of data you can store in your RAM. A modern computer needs at least 4 Gb of RAM to run, but I would highly recommend 8 Gb as a minimum. For an office computer, I would recommend at least 8 Gb of RAM, and for Gaming and Enthusiast computers, I recommend 16 plus Gb. Next is number of sticks. RAM comes in rectangular sticks, and up to four can be inserted in the motherboard. Sticks of RAM work together to contribute to the total amount of RAM. Typically, splitting up RAM into more sticks has better performance than a single stick. For example, two sticks of 8 Gb would perform better than 1 stick of 16 Gb. For office computer, it is fine to settle with one stick, but for gaming and enthusiast computers, two or more are a necessity. Finally, the frequency of RAM is similar to the clock speed of a CPU – it is just how fast the component runs, and a higher number is better. Some trusted RAM manufacturers include Crucial, G. Skill, and Corsair. For an office computer, I would recommend one 8 Gb stick of 3000 to 3200 MHz RAM. For gaming, I would recommend 16 or more Gb of 3200 plus MHz RAM.  
 Your next decision is the GPU, sometimes known as a graphics card. If you are building an office computer, you can skip this step, as your APU (Advanced Processing Unit) will fulfill the needs of a GPU. For this example, we will be using graphics cards developed by Nvidia, which currently offer the best performance. There are two types of Nvidia cards in the main market, called GTX and RTX. RTX offers better performance and more accurate lighting effects, but GTX is usually cheaper. A GPU is essentially its own computer, containing a processor and RAM. As with a CPU, the higher the clock speed of the processor, the more powerful. And like RAM, the higher the Capacity and Frequency of the memory, the better. Nvidia has three main series in the market, the GTX 1600 series, and the RTX 2000 and 3000 series. As with the CPUs, the higher the number, the more powerful it is. The GTX 1600 series has two main cards, the 1650 and the 1660, while the 2000 and 3000 series each have four main models that take their names from the last two digits of their model number, these models being 60, 70, 80, and 90. The RTX 3090 is the most powerful GPU in the consumer market, while the GTX 1650 is the best value proposition. Some models also have Super models and TI models, such as the GTX 1650 Super and the RTX 2080 TI. Super and TI models are like intermediary models. They are better than their stock model, but they are less powerful than the next model for example, the 1650 Super falls between the 1650 and 1660. For an introductory gaming computer, I would recommend something from the GTX lineup, such as the 1650 super or 1660. For an enthusiast computer, I would recommend an RTX card, specifically the 3000 series. The RTX 3070 has great performance for its price, while the 3080 and 3090 maximize performance.  
 Next up is storage. There are two primary devices for storage SSDs, or solid-state drives, and hard drives. Hard drives work by reading and writing to spinning disks as opposed to SSDs, which work like a USB drive. However, hard drives are usually many times cheaper. Many hard drives and Solid-State drives use a cable called SATA to connect to the motherboard, but some SSDs are much smaller and are known as M.2 drives, which plug directly into the motherboard. If you decide on an M.2 drive, make sure your motherboard has a M.2 slot, and if you are using a SATA drive, make sure your case has either 2.5- or 3.5-inch bays. Next is capacity. Most office workers need under 500 Gb, while most gamers need over 500 Gb. Some reputable storage companies are Samsung, Western Digital, Seagate, and Crucial.   
 PSUs, or power supply units, are also very important for a computer. They deliver electricity that powers all components inside the computer. Once the rest of your PC is planned out, I recommend using a power supply calculator such as outer vision’s tool. This will give you the wattage of your power supply. Because power supplies are the most likely part of a computer to fail and can destroy your computer if it fails badly, I warn against spending less than 50 dollars on a power supply. For PSUs, I recommend Corsair, EVGA, and Be Quiet.  
 After the PSU, it is time to choose the motherboard. Because we are using AMD CPUs, the Motherboard must use AMD chipsets. Information chipset compatibility can be found on AMD’s website. If you are using an M.2 drive, you must ensure that your motherboard has an M.2 slot. Finally, if you plan to use LED lights in your case, your motherboard must have an RGB headers.

The last thing you should choose is your case. For the most part, this part is simply for aesthetic purposes, but there are some considerations. First is that the case size matches your motherboard. Because most motherboards are in the ATX shape and size, you should buy a Full or Mid ATX sized case. The second and final consideration is Airflow. More openings in the case means more airflow, which can be great for cooling, but may allow more dust in the case. Now that you have chosen all your components, you can purchase and build your computer. Having built your own computer, you can feel satisfied knowing that you both saved money and created a useful piece of technology. Building your own PC is a great experience, and I encourage you to try it.

**More Information:**

I use PC Part picker to plan my part lists: <https://pcpartpicker.com/>

You can also use Newegg to organize your lists: <https://www.newegg.com/>

While writing this process paper, I created some example component lists:

For an office PC: <https://pcpartpicker.com/list/2zdmTJ>   
For a gaming/editing PC: <https://pcpartpicker.com/list/wk23p2>   
For an enthusiast PC: <https://pcpartpicker.com/list/nXjXrr>

Information about AMD chipset compatibility can be found here: <https://www.amd.com/en/chipsets/b550>

The power supply calculator I use can be found here: <https://outervision.com/power-supply-calculator>