**Overview:**

Students work individually to understand and establish the specifications for a PC dedicated to a specific task or function. (The specific task or function will be assigned to the student from the list below.) The function and features of various hardware components are researched to develop a general understanding. Specific components and features are then selected based on appropriate need for the assigned task or function. The final product is a brochure that will be shared with other classmates during a tradeshow event.

**Objectives:**

· Use correct terminology to describe computer hardware, speed measurements, and size

measurements

· Describe the functions of the internal components of a computer

· Describe the functions of common computer peripheral devices

· Assess user computing needs and select appropriate hardware components for different

situations

**Getting Started:**

1. You will be required to design a “dream machine” personal computer (PC) for one of the tasks assigned to you from the list below.

2. To get started, develop a general understanding of what will be important features and what will be less important features of our dream machine. Consider the following:

a. Operating system software

b. Special application software

c. Processor & motherboard speed

d. Main memory speed and size

e. Secondary storage speed and size

f. Graphics and display speed and resolution

g. External devices (e.g. keyboard, pointing devices, joysticks, etc.)

h. Network connectivity

i. Power and data backup

j. Printers, scanners, and similar equipment

k. Portability and durability

l. Budget (cost) considerations

Specific Tasks & Functions

A. ***Game Computer***: Dedicated to playing PC games in a home environment

B. **Photo Editing & Organization**: Dedicated to editing and producing photographs and images in a home or professional environment

C. ***Business Office Computer***: Dedicated to producing documents and presentations and communicating with other people in a professional office environment

D. ***Student Home Computer***: Dedicated to completing homework, paying bills, communicating with friends and other similar tasks in a home environment

E. ***Factory Floor Computer***: Dedicated to reading documents, filling in forms, processing orders, etc. in a factory or warehouse environment.

F. ***Media Production and Streaming Computer***: Dedicated to production and distribution of video and/or music media in a semi-professional environment

G. ***Web Surfing Computer***: Dedicated to surfing the web, streaming media, and communicating through on-line services in a home environment

**Level 1: Processor & Memory**

1. Research and summarize the main features and function of a CPU processor chip. Consider the following:

a. Physical packaging shape and size

b. Processing speed and power

c. Memory speed and size

The central processing unit (CPU) of a computer is a piece of hardware that carries out the instructions of a computer program. It performs the basic arithmetical, logical, and input/output operations of a computer system. The CPU is like the brains of the computer - every instruction, no matter how simple, has to go through the CPU. So let's say you press the letter 'k' on your keyboard and it appears on the screen - the CPU of your computer is what makes this possible. The CPU is sometimes also referred to as the central processor unit, or processor for short. So when you are looking at the specifications of a computer at your local electronics store, it typically refers to the CPU as the processor.

2. Research and summarize the history of how a CPU processor chip has changed over the years. Consider the following:

a. Typical processor speed, size, model numbers in the early 1990’s

b. Typical processor speed, size, model numbers in the early 2000’s

c. Typical processor speed, size, model numbers in the current time

Intel's first CPU, or Central Processing Unit, was a 4-bit processor, with a clock speed of 740 kHz, and was developed in November, 1971, by the computer giant, Intel. The Intel 4004's successor, and the first 8-bit Central Processing Unit, the 8008 was available in clock speeds of 500 kHz and 800 kHz. It became the standard CPU for computers. Again, developed by Intel, the first 16-bit microprocessor was codenamed P1, but was actually called the Intel 8086, and could run at clock speeds of 5 MHz to 10MHz.As a newer version of the Intel 80286, the 80386 was a 32-bit chip, and ran at a speed of 12MHz. The Intel Pentium, was a 64-bit microprocessor, and was released by Intel at a hefty price of $878.00, and with clock speeds between 60MHz, and 300MHz. Eventually these innovations led to the modern day CPUs we have today.

3. Research and summarize the main features of motherboards. Consider the following:

a. Physical packaging shape and size

b. Speed and size

A motherboard is one of the most essential parts of a computer system. It holds together many of the crucial components of a computer, including the central processing unit (CPU), memory and connectors for input and output devices. The base of a motherboard consists of a very firm sheet of non-conductive material, typically some sort of rigid plastic. Thin layers of copper or aluminum foil, referred to as *traces*, are printed onto this sheet. These traces are very narrow and form the circuits between the various components. In addition to circuits, a motherboard contains a number of sockets and slots to connect the other components.

4. Research and summarize the history of how motherboards have changed over the years. Consider the following:

a. Typical speed, size, model numbers in the early 1990’s

b. Typical speed, size, model numbers in the early 2000’s

c. Typical speed, size, model numbers in the current time

The first ever type of motherboard was the AT motherboard which was produced in the mid 80s lasted a good span from the Pentium p5 to the times when Pentium 2 had been started to be used. Advanced technology extended, or popularly known as the ATX, are the motherboards which were produced by the Intel in mid 90’s as an improvement from the previously working motherboards such as AT. This type of motherboards differ from their AT counterparts in the way that these motherboards allow the interchangeability of the connected parts. The low profile extension motherboards, better known as LPX motherboards, were created after the AT boards in the 90’s. The major difference between these and previous boards is that the input and output ports in these boards are present at the back of the system. This concept proved to be beneficial and was also adopted by the AT boards in their newer versions. BTX was developed to reduce or avoid some of the issues that came up while using latest technologies. Newer technologies often demand more power and they also release more heat when implemented on motherboards in accordance with the circa-1996 ATX specification. These are the main motherboards that show and display how it has evolved from the very first AT motherboard.

5. Research and summarize the main features and function of RAM memory. Consider the following:

a. Physical packaging shape and size

b. Speed and size

Random-access memory (RAM) is a type of computer data storage. A RAM device makes it possible to access data in random order, which makes it very fast to find a specific piece of information. Certain other types of storage are not random-access. For example, a hard disk drive and a CD will read and write data in a predetermined order. The mechanical design of these devices prescribes that data access is consecutive. This means that the time it takes to find a specific piece of information can vary greatly depending on where it is located on the disk.

6. Research and summarize the history of how RAM memory has changed over the years. Consider the following:

a. Typical speed, size, model numbers in the early 1990’s

b. Typical speed, size, model numbers in the early 2000’s

c. Typical speed, size, model numbers in the current time

The first form of RAM came about in 1947 with the use of the Williams tube. It utilized a (CRT (cathode ray tube) and data was stored on the face of the CRT as electrically charged spots. The second widely used form of RAM was magnetic-core memory, invented in 1947. Frederick Viehe is credited with much of the work, having filed for several patents relating to the design. Magnetic-core memory works through the use of tiny metal rings and wires connecting to each ring. One bit of data could be stored per ring and accessed at any time. However, RAM as we know it today, as solid-state memory, was first invented in 1968 by Robert Dennard. Known specifically as dynamic random access memory, or DRAM, transistors were used to store bits of data.

7. Research and summarize the main features and function of Hard Disk Drives (HDD). Consider the following:

a. Physical packaging shape and size

b. Speed and size

Hard disk drives have been the dominant type of storage since the early days of computers. A hard disk drive consists of a rigid disc made with non-magnetic material, which is coated with a thin layer of magnetic material. Data is stored by magnetizing this thin film. The disk spins at a high speed and a magnetic head mounted on a moving arm is used to read and write data. A typical hard disk drive operates at a speed of 7,200 rpm (rotations per minute), so you will often see this number as part of the technical specifications of a computer. The spinning of the disk is also the source of the humming noise of a computer, although most modern hard disk drives are fairly quiet.

8. Research and summarize the history of how Hard Disk Drives (HDD) have changed over the years. Consider the following:

a. Typical speed, size, model numbers in the early 1990’s

b. Typical speed, size, model numbers in the early 2000’s

c. Typical speed, size, model numbers in the current time

When the IBM produced the first hard drive on 13 September 1956, few people had imagined the impact that it would have on our daily lives for over 50 years. The RAMAC ("Random Access Method of Accounting and Control") was the size of two refrigerators and weighed a ton. The RAMAC was available for long-term loan at a modest sum of USD $35,000, equivalent to USD $254,275 today. Twenty-five years later, the first hard drive for PC was invented. This had led to a series of innovations and inventions that is now our modern day hard drive.

9. Explain and justify the processor and memory requirements for your ‘dream machine’ task. Discuss the following:

a. Minimum and “would be nice” requirements for the CPU chip

b. Minimum and “would be nice” requirements for the Motherboard

c. Minimum and “would be nice” requirements for the RAM memory

d. Minimum and “would be nice” requirements for the HDD

An Intel celeron would be good as the cpu, any motherboard will do, at least 4GB of ram is required, and an SSD of 100+GB would be preferred over a HDD.

In all honestly the minimum would be the same as the would be nice requirements since cost effectiveness is the real objective here.

**Level 2: Display & Peripherals**

1. Research and summarize the main features and function of Computer Display Monitor. Consider the following:

a. Physical construction (CRT, LCD, etc)

b. Display Standards (CGA, VGA, SVGA, XGA, etc.)

c. Resolution & Colour depth

**VGA:** Short for Video Graphics Adapter or Video Graphics Array, VGA is a popular display standard developed by IBM and introduced in 1987. VGA provides 640 x 480 resolution color display screens with a refresh rate of 60 Hz and 16 colors displayed at a time. If the resolution is lowered to 320 x 200, 256 colors are shown.

**DVI:** Short for Digital Visual Interface, DVI is a video display interface. It was developed to be an industry standard for transmitting digital video content to display devices at resolutions as high as 2560 x 1600. Common devices that utilize the DVI connection are computer monitors and projectors. DVI can even be used with some TVs, although HDMI is more common as only some DVI cables can transmit audio signals. The DVI connector (shown below) may have one of three names depending on the signals it supports: DVI-A (analog only), DVI-D (digital only), or DVI-I (both digital and analog).

**Flat Panel Technology:** Sometimes abbreviated as FPD, a flat-panel display is a display technology which succeeds CRT as the new standard for desktop computer displays. Unlike CRT monitors, flat-panel displays use LCD (liquid crystal display) or LED (light-emitting diode) screens, making them lighter and thinner.

The first commercial colour CRT was produced in 1954. CRTs were the single most popular display technology used in television sets and computer monitors for over half a century; it was not until the 2000s that LCDs began to gradually replace them.

2. Research and summarize the main features and function of a Computer Graphics Card. Consider the following:

a. Physical packaging (e.g. On the motherboard, expansion card, etc.)

b. Speed and frame rate (2D vs 3D)

c. Resolution, colour depth, and memory size

A GPU is a device with a set of specific hardware capabilities that are intended to map well to the way that various 3D engines execute their code, including geometry setup and execution, texture mapping, memory access, and shaders. There’s a relationship between the way 3D engines function and the way GPU designers build hardware. AMD’s HD 5000 family used a VLIW5 architecture, while certain high-end GPUs in the HD 6000 family used a VLIW4 architecture. With GCN, AMD changed its approach to parallelism, in the name of extracting more useful performance per clock cycle. Nvidia first coined the term “GPU” with the launch of the original GeForce 256.

3. Research and summarize the main features and function of External Storage and Backup. Consider the following:

a. Removable media (e.g. floppy disks, CD/DVD-RW, CompactFlash, etc.)

b. USB media (e.g. Memory Stick, External HDD, etc.)

c. Cloud based storage

External storage, more commonly referred to as an external drive, external storage is storage that is not part of the computer. Examples of external storage are floppy disk drives, hard drives, tape drives, etc. The picture is an example of a Drobo and an example of a popular external storage solution. Cloud storage is a model of computer data storage in which the digital data is stored in logical pools. The physical storage spans multiple servers, and the physical environment is typically owned and managed by a hosting company.

4 Research and summarize the history of how External Storage and Backup has changed over the years. Consider the following:

a. Typical speed, size, model numbers in the early 1990’s

b. Typical speed, size, model numbers in the early 2000’s

c. Typical speed, size, model numbers in the current time

The IBM 350 RAMAC was the first hard disk drive, and it stored up to five megabytes of data on 50 24-inch disks. The entire unit weighed approximately one ton. At the time of its release in 1956, the drive could be leased for $3,200 per month. The first customer to lease one of the drives was United Airlines, who used it to store data from its reservation system.Over the past 60 years, since the IBM RAMAC was first produced, hard-disk drive manufacturers have used new technological breakthroughs to reach higher capacities, better performance, and sensible form factors for use in servers and data center system racks. Most recently, helium-filled drives have pushed capacity limits to create denser, energy-efficient drives that drive down total cost of ownership, allowing storage arrays to hundreds of terabytes. Advanced systems approach multiple petabytes and offer capacity that can continue to scale well beyond current data needs.

5. Research and summarize the main features and function of Network Connectivity. Consider the following:

a. Connection technology (e.g. Dial-Up, Ethernet, WiFi, BlueTooth, Fibre, etc.)

b. Upload and download speed

c. Security

A Network interface card, NIC, or Network card is an electronic device that connects a computer to a computer network, usually a LAN. It is considered a piece of computer hardware. Today, most computers have network cards. Network cards let a computer exchange data with the network. To achieve the connection, network cards use a suitable protocol, for example CSMA/CD. Network cards usually implement the first two layers of the OSI model, that is the physical layer, and the data link layer. Today, most network cards use Ethernet. Other network types are ARCNET, introduced in 1977, LocalTalk or Token Ring. There are many network cards which are compatible to only respective software. depending on your computer architecture you have to find a compatible network card.They are needed to access the Internet and local networks, and they can function with custom networks types

6. Research and summarize the history of how Network Connectivity has changed over the years. Consider the following:

a. Typical speed, size, model numbers in the early 1990’s

b. Typical speed, size, model numbers in the early 2000’s

c. Typical speed, size, model numbers in the current time

“The first NIC was organized at Jackson Hole in 1996 by Tony Zador, who has played some role in organizing most of the rest. Other organizers have included Wulfram Gerstner, Andreas Herz, Peter Latham, Zach Mainen, Mayank Mehta, Sheila Nirenberg, and Alex Pouget. The goal of NIC is to bring together experimental and theoretical neuroscientists for small (60-80 people) invitation-only intensive three day workshops. The emphasis is on how new experimental and theoretical approaches can be combined to understand neural coding better. Most years there is a particular theme, but the overall spirit is maintained from year to year. Topics include information theoretic approaches; experimental approaches to understanding population coding (e.g. multi electrode recording); plasticity; and the possible importance of timing in neural transmission. Systems range from invertebrates to monkeys. The NIC meetings have traditionally been held at ski resorts. The afternoon schedule is kept available for informal discussion, on or off the slopes. Since 2000, NIC has been held outside the USA in Europe on even-numbered years (when it is called "NIC-E," or simply "NICE," for Europe; and NICI for India). However, in 2005 there was no NIC meeting; instead, participants were be encouraged to attend the larger Cosyne meeting.”

7. Research and summarize the main features and function of Printer Technology. Consider the following:

a. Printing Technology (e.g. Dot Matrix, Ink Jet, Laser, etc.)

b. Connection Technology (e.g. Parallel Port, USB, WiFi, Network, etc.

c. How printing has changed over the years

A **printer** is an external hardware output device that takes the electronic data stored on a computer or other device and generates a hard copy of it. For example, if you created a report on your computer you could print several copies to hand out at a staff meeting. Printers are one of the most popular computer peripherals and are commonly used to print text and photos. The picture to the right is an example of an inkjet computer printer, the Lexmark Z605.The first mechanical printer was invented by Charles Babbage, for use with the Difference Engine, which Babbage developed in 1822. Babbage's printer utilized metal rods with printed characters on each rod to print text on rolls of paper that were fed through the device.

8. Explain and justify the processor and memory requirements for your ‘dream machine’ task. Discuss the following:

a. Minimum and “would be nice” requirements for the Computer Display

Intel Celeron or Pentium since only web browsing will be done on my PC.

b. Minimum and “would be nice” requirements for External Storage and Backup

A SSD would be nice as it would speed up the computer overall.

c. Minimum and “would be nice” requirements for Network Connectivity

I'm not having any network connectivity built in so I recommend an ethernet wire for an internet connection.

d. Minimum and “would be nice” requirements for Printer Technology

That wouldn’t be required as I’m only going to do web browsing.

**Level 3: Building Your Dream Machine**

1. Identify the minimum requirements for each component of your dream machine as follows::

a. CPU processor chip speed and type

b. Motherboard type

c. RAM memory speed and size

d. HDD speed and size

e. Display Monitor resolution, type, and size

f. Graphics card resolution and type

g. Audio card type

h. Audio Speakers type

i. External backup type and size

j. Network interface requirements

k. Printing Technology

l. Other Peripherals (e.g. mouse, keyboard, joystick, etc.)

Since I am making a web surfing computer the only real requirement is to have a good cost effective pc. Components such as audio cards and speakers wouldn’t be as important as a HDD, RAM, etc.

2. Prioritize you list of components from question #1 from those that are essential down to those that would be nice.

1. RAM memory speed and size
2. HDD speed and size
3. CPU processor chip speed and type
4. Motherboard type
5. Graphics card resolution and type
6. Other Peripherals (e.g. mouse, keyboard, joystick, etc.)
7. External backup type and size
8. Display Monitor resolution, type, and size
9. Audio card type
10. Audio Speakers type
11. Network interface requirements
12. Printing Technology

3. Establish a target budget (cost) for your dream machine.

a. Justify your cost based on your projected component needs.

b. Justify your cost based on a realistic assessment of your application and target user

Having a build that is less than $300 is great for a web surfing pc since it is not very expensive and is very effective for the cost. It has a 120 GB SSD and 4 GB of RAM which is more than enough.

4. Build your dream machine or locate a ready to buy machine using on-line vendor web sites.

Dell Optiplex 970

a. Find at least two sources for your dream machine

Amazon.ca, Newegg Canada, PC MARKET online, Canada Computers, Vuugo

b. Provide a copy of the cost and feature list summary for each source

(refer to brochure)

c. Explain how the machine from each source matches (or is different) from your ideal configuration.

The Dell optiplex 970 is similar to my machine in how it is good for web surfing and is fairly cheap in costs.

Suggested on-line computer sources:

·  [www.bestbuy.ca/](http://www.bestbuy.ca/)

·  [www.dell.com/en-ca](http://www.dell.com/en-ca)

·  [www.staples.ca](http://www.staples.ca/)

·  [www.tigerdirect.ca/](http://www.tigerdirect.ca/)

·  [www.canadacomputers.com](http://www.canadacomputers.com/)

**Level 4: Sharing Your Dream Machine**

1. Prepare a brochure documenting your dream machine options and choices.

1. The target audience is other students in the class

b. You should explain your target task (e.g. game computer) and how this affects configuration choices.

c. You should explain your configuration choices in greater detail

d. Your two purchase options should be explained and compared

2. Share your brochure

a. By uploading it to your repository

b. By presenting it during the in-class tradeshow (date TBD)

3. Visit and report on other trade show presentations / brochures

a. Complete the Passport Template (TBD) as you participate in the in-class tradeshow.

**Task & Function Signup**

|  |  |
| --- | --- |
| **Task** | **Student Name** |
| ***Game Computer*** |  |
| **Photo Editing & Organization** |  |
| ***Business Office Computer*** |  |
| ***Student Home Computer*** |  |
| ***Factory Floor Computer*** |  |
| ***Media Production and Streaming Computer*** |  |
| ***Web Surfing Computer*** |  |
| ***Game Computer*** |  |
| **Photo Editing & Organization** |  |
| ***Business Office Computer*** |  |
| ***Student Home Computer*** |  |
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| ***Media Production and Streaming Computer*** |  |
| ***Web Surfing Computer*** |  |
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