Hard Drive Notes

**********Background Info**********

ATA – Advanced Technology Attachment – an interface standard (the connector and the signaling protocols) for the connection of storage devices such as hard disks, solid-state drives, floppy drives, and CD-ROM drives in computers that was originally developed by IBM for their PC/AT, the old connection standard.

IDE – Integrated Drive Electronics – an evolution of ATA developed by Western Digital and Compaq to include the controller for the hard drive inside the hard drive itself.

When you install a hard drive, you attach two screws on one side and then two other screws on the other side. You should put all the screws in part way before tightening them because if you put in one and tighten it all the way it may be difficult to get in the other screws.

You should always install all 4 screws when installing a hard drive to reduce vibrations.

If you are using two IDE hard drives on one cable, the first one recognized by your system is called the master.

If you are using two IDE hard drives on one cable, the second one is called the slave.

Unlike SATA hard drives, to use more than one IDE hard drive one needs to configure the jumpers.

FAT – File Allocation Table – the older (Win ME and below) standard computer file system developed by Microsoft.

NTFS – New Technology File System – the new (NT/XP and above) standard computer file system developed by Microsoft.

**********Teacher Talks – Students Listen**********

HDD – Hard Disk Drive

Disk formatting is the process of preparing a hard disk drive for its use by an operating system (OS), usually including the setting up of an empty file system.

SATA – Serial Advanced Technology Attachment – the new connection standard it uses less wires at faster rates so it has much better transfer rates than IDE/ATA but with simpler connectors and more convenient cabling. SATA drives are capable of hotplugging which means they can be attached while the computer is on.

The speed of IDE even in its enhanced best form maxed out at 133 MB/sec. The speeds of SATA are as follows: SATA1 = 150 MB/sec, SATA2 = 300 MB/sec, SATA3 = 600 MB/sec. Notice that from SATA1 to SATA2 the speed doubles and from SATA2 to SATA3 the speed doubles again.

A file system is a method of storing and organizing computer files and their data. Essentially, it organizes these files into a database for the storage, organization, manipulation, and retrieval by the computer's operating system.

Cache – a small amount of RAM placed on the hard drive to increase its speed by accessing the most frequently expected data more quickly.

All data is stored on your hard drive when your computer is off.

How much storage space a hard drive has is called capacity.

Many companies make mechanical hard drives. Western Digital sells the most. They color code them for applications. Blue is for everyday use. Green has the best power savings but it does sacrifice some performance to save power. Black is made to have the best performance and best reliability and comes with the longest warranty. Red is for business applications like servers that will have mirrored drives. Purple is for surveillance systems as they are made to be more efficient in writing data rather than reading data.

**********PowerPoint Slideshow**********

A hard disk partition is a defined storage space on a hard drive and most operating systems allow users to divide a hard disk into multiple partitions, in effect making one physical hard disk into several smaller logical hard disks.

Tracks are concentric rings on the platters for storing chunks of data.

Sectors are parts of tracks that store a fixed amount of user data.

**********Videos**********

Virtual memory is a section of the hard drive used as system memory where temporary data is put when the level of RAM is exceeded. This drastically slows down the computer.

Defragmentation – when a file is stored it is placed in adjoining sectors. When the file is edited and resaved the hard drive may have to save the additional data in a location not adjoined to the initial location. This creates fragmentation meaning the file is stored in pieces around the hard drive. This slows down access speed since the heads have to travel to many places to open all the parts of the file. When you defrag your hard drive it takes all the pieces of files and places them in adjoining sectors to increase access speed.

SSD – Solid State Drive – hard drives that have no moving parts but instead are made of static memory modules, they are much faster than mechanical hard drives and more reliable but also more costly.

SSD's should not be defragged since you gain no benefit and can wear out the electronic components more quickly.

The disc or sometimes multiple discs inside the hard drive are called platters.

The head is the part of the hard drive that reads and writes info to the platters without actually touching them.

There are two heads per platter.

The actuator moves the heads across the platters.

Mechanical hard drives store data on the platters magnetically.

The base material of the platters of a hard drive is usually made of aluminum.

Nickel and/or Cobalt is plated onto the base metal of the platters to make them magnetic.

The platters are polished to a mirror finish to prevent surface roughness from causing a head crash.

The main factor in determining the data throughput of a hard drive is its rotational speed.

**********Hands-On Demonstration**********

When a computer is properly shut down the hard drive parks the heads in a special landing place of the platters where no data is written thus protecting the head from any shock to the hard drive.

One of the ways a hard drive can fail is by having the heads touch the platters which is called a head crash.

Air gets in and out of the hard drive through a vent hole.

The air that goes in and out of the hard drive through the vent hole is kept clean by a filter.

If you open a hard drive it is immediately ruined by contaminants in the air.