UBC OKANAGAN

COSC 122

Computer Fluency

Computer Terminology

Dr. Abdallah Mohamed

Acknowledgement: Original slides provided courtesy of Dr. Lawrence.

Why are you here?
Reasons Why People Take This Course

A) I want an easy credit.

B) I want an easy Science credit (Arts Majors).

C) I want to learn more about Microsoft Office.

D) I want to learn more about how technology works.

E) I am interested in computing, web development, programming, or future courses.

What to Learn
What Topic are You Most Interested In?

A) Microsoft Office (Word, Excel, Access)

B) How the Internet/Computers Work

C) Building Web Pages using HTML/JavaScript Programming

D) The Effect of Technology on Society

E) None of the above

What do you expect?
What Grade are You Expecting to Get?

A) A

B) B

C) C

D) D

E) F

Key Points

1) People do not have any natural technological abilities, so systems are designed to match **users previous knowledge** about the domain or other systems.

2) ***Fundamental concepts*** of information technology:

- abstraction
- generalization
- algorithmic thinking

3) ***Programming*** is the process of constructing programs in order to instruct a computer on how to solve problems. It is the act of writing out the steps of an algorithm.

Why is Terminology Important? Why is there so much of it?

Using terminology precisely and correctly demonstrates ***understanding of a domain*** and ***simplifies communication.***

Information technology (IT) has many terms because:

- Information technology (IT) is a ***broad*** field.
- IT concepts are often virtual and described using **metaphors**.
- Abbreviations and ***acronyms*** are extensively used.
- IT businesses use ***marketing*** terminology to differentiate and sell their products.

Computers

A ***computer*** is a device that can be programmed to solve problems.

Question: Is a cell phone a computer?

A) yes

B) no

Computers Are Everywhere

Computers are not just desktops and laptops but also tablets, smart phones, and embedded chips in consumer electronics, cars, televisions, and appliances.

- ⇨ There have been over **30 billion ARM embedded processors** shipped.
- ⇨ There are over 350 million computers sold annually.

Question: If you consider this general definition of "computer", how many "computers" do you own?

A) 0

B) 1 to 5

C) 6 to 10

D) 11 to 20

E) 21 or more

Software and Hardware

Hardware refers to the physical part of the computer.

- "*Hardware is something that you can hit with a hammer*."
- This includes components like:
  - Input/Output (I/O) devices – mouse, keyboard, monitor, printer, scanner, sound system
  - Storage devices – CD/DVD readers/writers, hard drives, USB drives
  - Motherboard, processor, memory, graphics card, sound card, bus

Software is the programs the computer follows to perform functions.

- *Software is virtual*. Although programs may be stored on media, **the essence of software is information**.

Computer Components
The Monitor

The ***monitor*** is a video screen that displays information stored in the computer's memory. Monitor types include:

- **CRT** – cathode ray tubes – big bulky monitors.
- **LCD** – liquid crystal displays – slim, flat monitors
- **LED** – light-emitting diode – **LCD** with power efficient semiconductor backlight source
- **OLED** – organic light-emitting diode – each pixel provides its own illumination

Touch/multi-touch

- ***capacitive*** touchscreen (human touch distorts electrostatic field)
- ***resistive*** (force connects layers)

3D Touch - iPhone

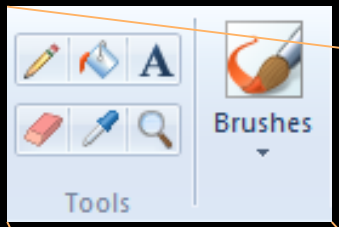
Digitizer layer to determine the (x,y) location

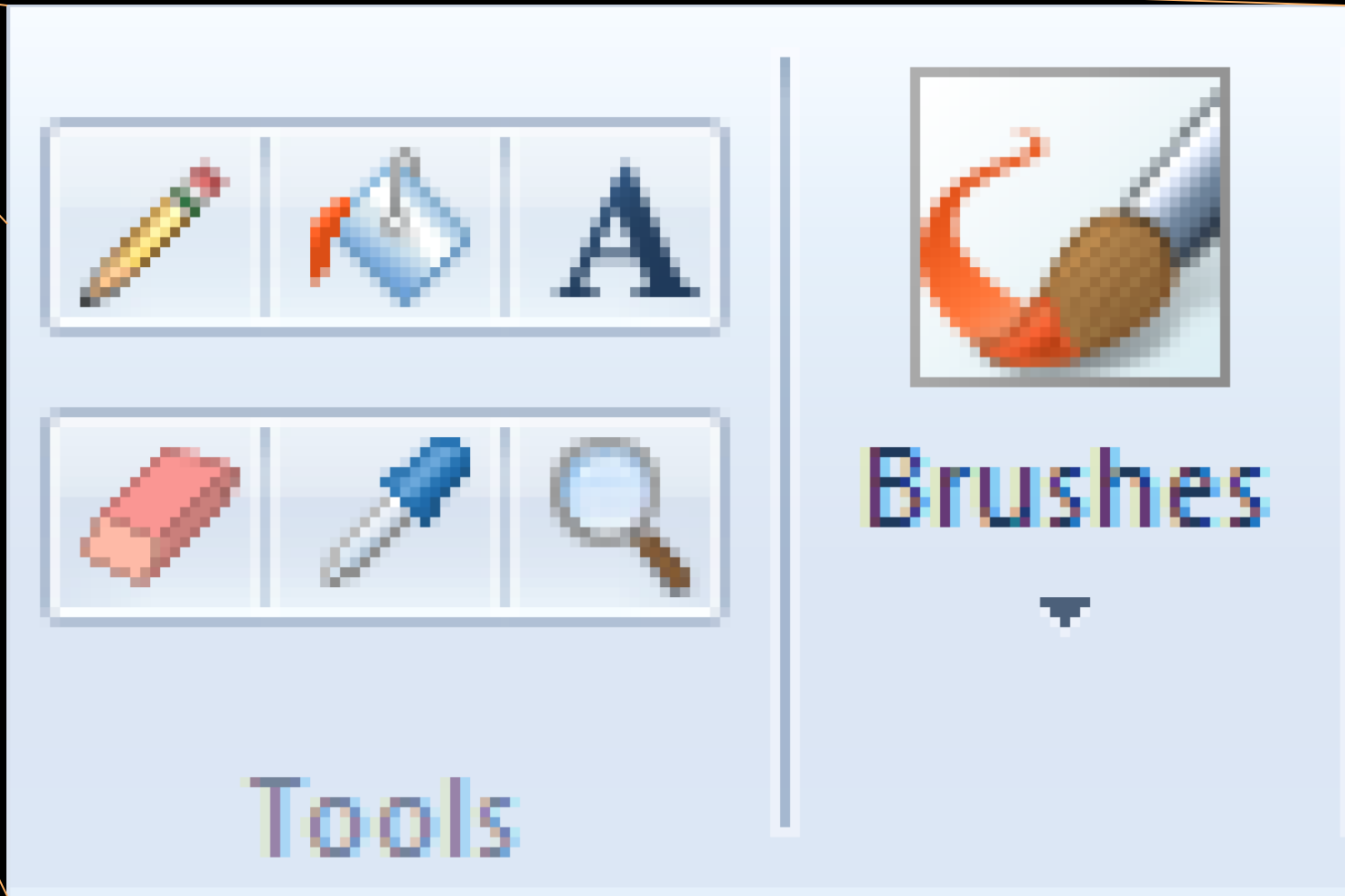
Extra pressure sensors layer to determine when a user presses the screen. The glass is able to bend under pressure.

Image source: www.knowyourmobile.com

Computer Components
The Monitor

The screen is divided into a grid of ***pixels*** (picture elements).





Computer Components
The Monitor

Screen resolution is the number of pixels along both dimensions (width X height)

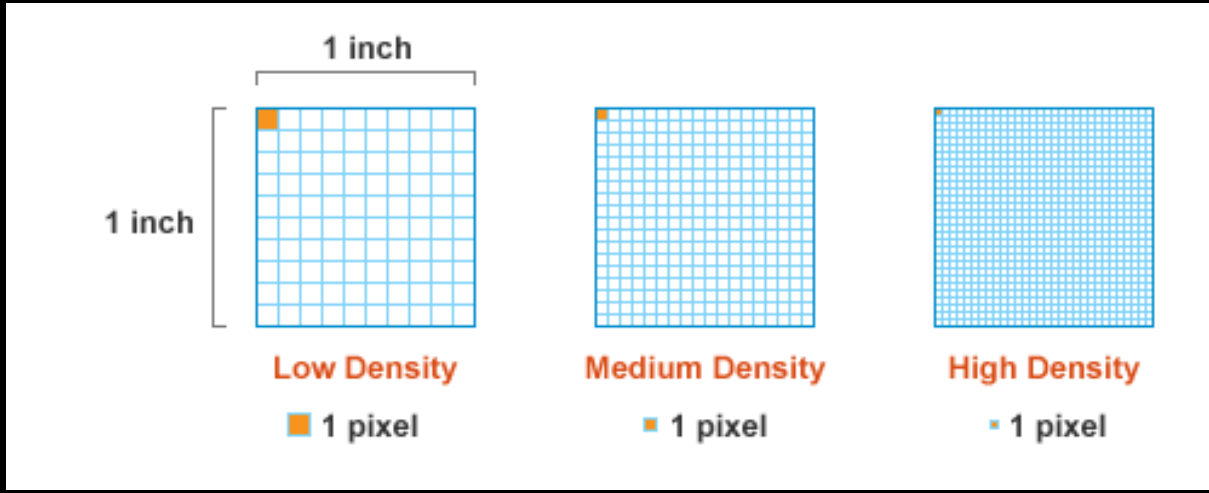
- Common screen sizes: 1024 x 768 and 1280 x 800
- The more pixels the finer (more detailed) the resolution and the crisper images appear.

Pixel density denotes the number of pixels in an area.

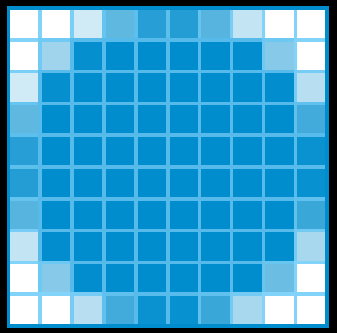
- iPhone 6 has 326 pixels/inch (ppi) compared to about 120 for most laptops.

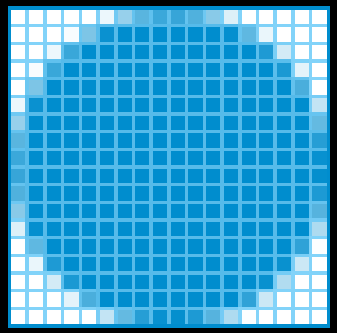
Computer Components
The Monitor

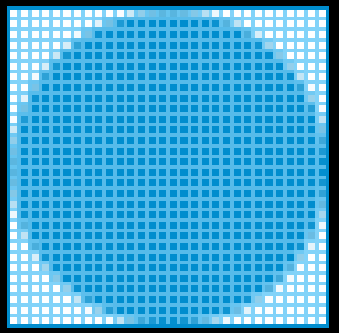
pixel density (ppi)



Low vs. high ppi







Source: www.bbc.co.uk/gel/tablet/tablet-device-considerations/pixel-density

Screen Resolution

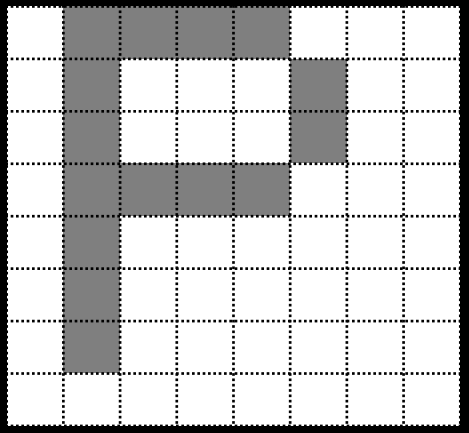
Question: The current screen resolution is 1024 x 768 pixels, and we change the screen resolution to 1280 x 800 pixels. What happens to the text (characters) on the screen:

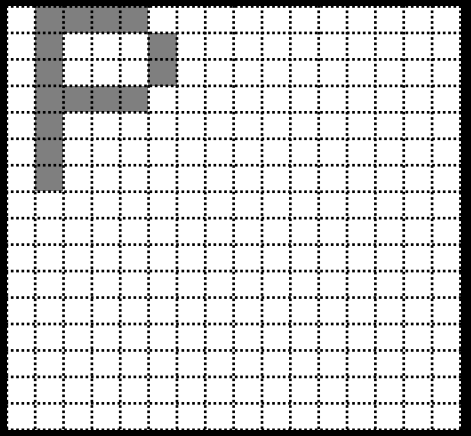
- ***Note***: text have a fixed size in pixels that they are drawn in unless they are scaled, which we assume doesn't happen here

A) get smaller

B) get larger

C) stay the same size





Resolution

Question: The iPhone5 screen is 4" (326 ppi). The iPad4 screen is 9.7“ (264 ppi). Select a true statement:

A) The iPad4 screen resolution is almost twice the iPhone5.

B) The iPhone5 screen resolution is almost twice the iPad4.

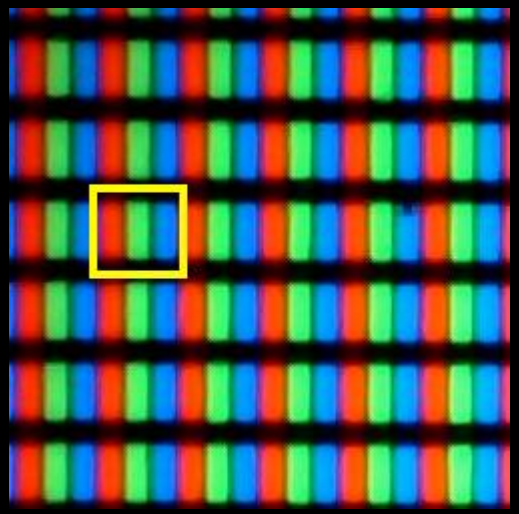
C) The resolution of both displays is very close to each other (within 10%).

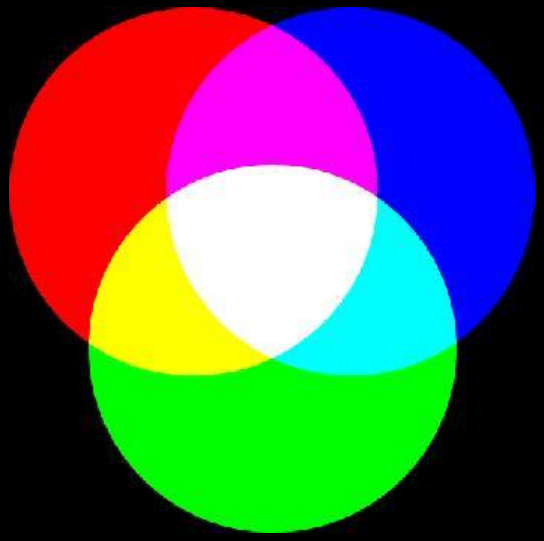
Computer Components
The Bitmapped Monitor

A monitor is ***bitmapped*** as each pixel on the screen shows the values of ***one or more bits*** in the computer's memory.

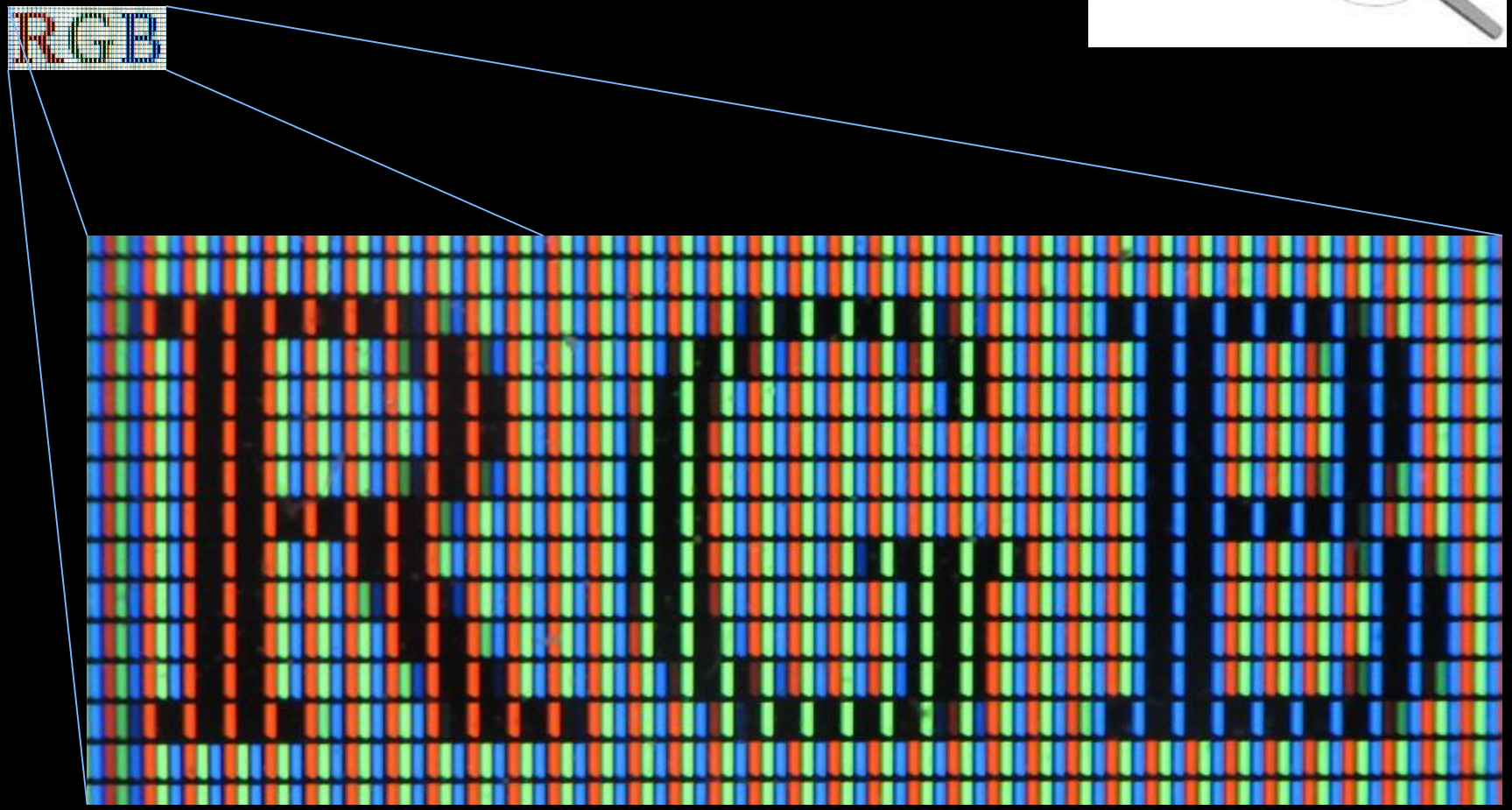
- Black and white – only one bit needed (black = 1, white = 0)
- Colors – may have multiple bits representing relative intensities of three primary colors: red, green, blue (RGB)
  - ⇨ Note: Mixing light primary colors is different than pigment primary colors: red, yellow, blue.

0	1	1	1	1	0	0
0	1	0	0	0	1	0
0	1	0	0	0	1	0
0	1	1	1	1	0	0
0	1	0	0	0	0	0
0	1	0	0	0	0	0
0	1	0	0	0	0	0





Computer Components
The Bitmapped Monitor



Computer Components Processor

The ***Central Processing Unit (CPU)*** or ***processor*** is the "brains" of the computer as it directs data flow inside the machine and knows how to perform basic operations.

CPU executes program instructions, performs math operations, fetches/stores data in memory, controls data flow of devices.

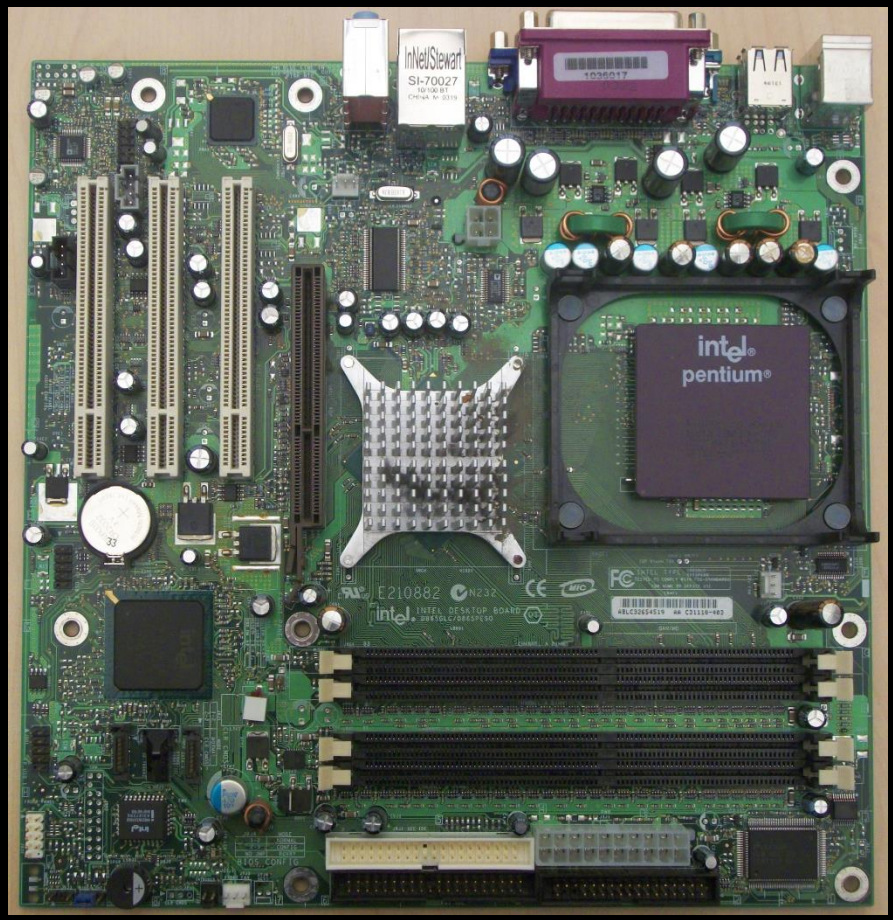
- e.g. Intel Pentium/Core/Xeon, AMD Athlon/Phenom, Apple A6 (ARM processor) (iPhone)

Computer Components Motherboard

The ***motherboard*** is a circuit board that connects components including the CPU, memory, and devices.

The ***bus*** is a set of wires that interconnects the components.

- e.g. When the CPU requires data from memory, the data is sent over the bus from the memory to the CPU.
- The bus is the freeway in the system and can be a ***bottleneck*** if it cannot transmit data as fast as the CPU and other devices require.



Computer Components
Memory

Memory - is the general term for devices which allow the computer to store data either ***temporarily*** or ***permanently***.

- **Temporary memory**: only stores data while the computer is on
  - ⇨ random-access memory (RAM) stores data and programs while the computer is on and is a fast, **common type of memory**
- **Permanent memory**: data is stored even after computer is off
  - ⇨ read-only memory (ROM) is permanent memory that cannot be changed
  - ⇨ Most permanent memory is considered *secondary storage* because the memory is stored in a separate device (hard drive, DVD, flash).
  - ⇨ Since memory in secondary storage is in a separate device, the device is capable of holding more data, but is often **slower than main memory**.

Cache - is a term used to describe memory which stores a subset of data in a larger memory for performance.

- processor cache (Level 1 & 2), disk cache, network cache

iPod Memory

Question: Is the memory that stores the songs in an iPod/MP3 player temporary or permanent?

A) temporary

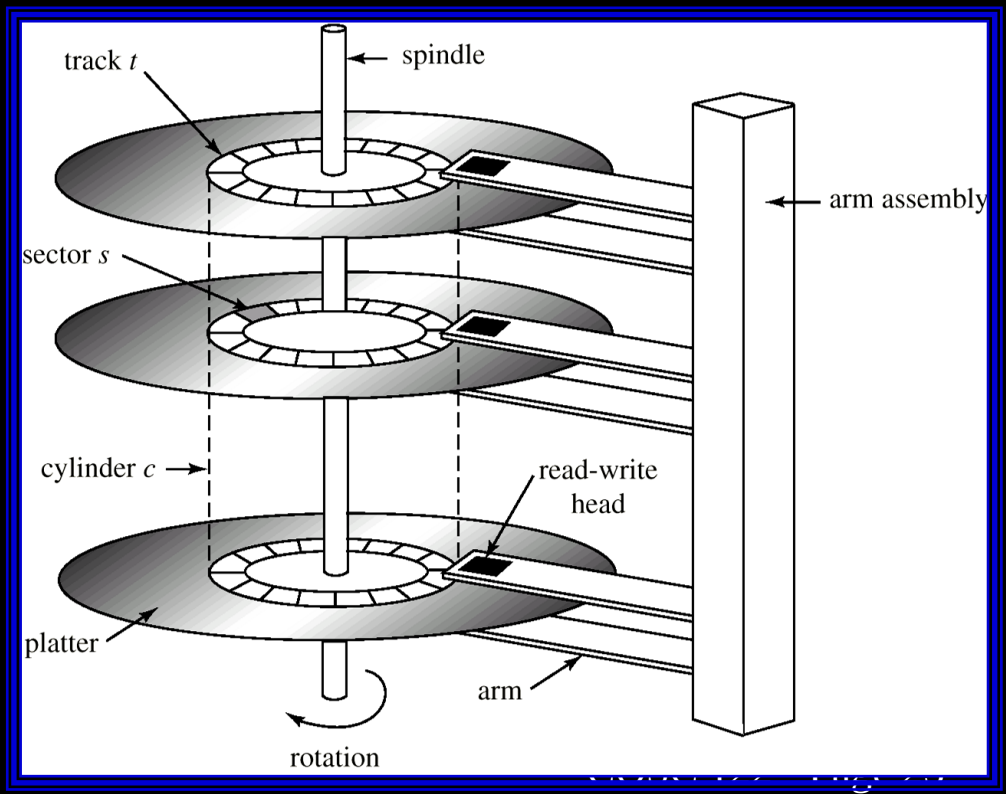
B) permanent

Computer Components
Hard Disk

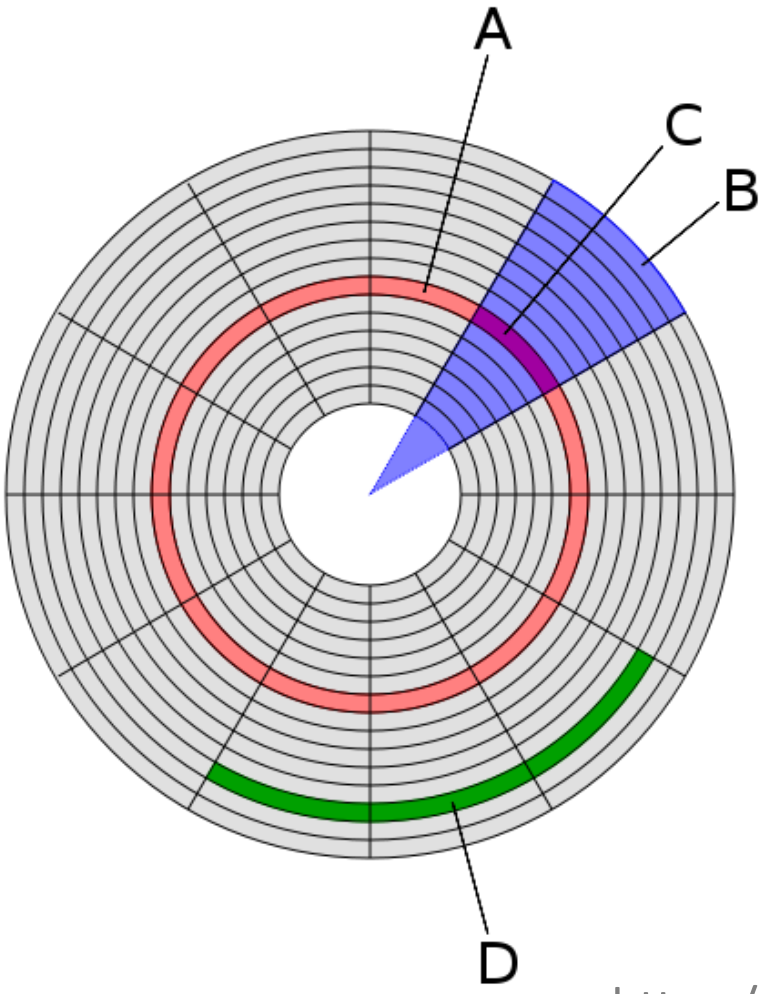
A ***hard drive*** is a permanent secondary storage device.

- It magnetizes areas on the disk. The charge remains even with no power to drive.

The read/write ***head*** is on an ***arm*** that moves to different ***tracks*** on the ***platter***.



Computer Components
Hard Disk



A. Track
B. Geometrical sector
C. Sector
D. Cluster

https://en.wikipedia.org/wiki/Disk_sector

Computer Components
Flash Memory

Flash memory is permanent memory used in

- ⇨ many portable devices (USB, cell phones, music/video players) and also
- ⇨ Solid-State Drives (**SSD**).

Flash memory replaces **random access memory** in portable devices. It can also be used for **secondary storage** (USB devices) or to replace hard drives.

Flash drives have many benefits over hard drives including:

- ◆ Increased performance (especially random reads)
- ◆ Better power utilization
- ◆ Higher reliability (no moving parts)

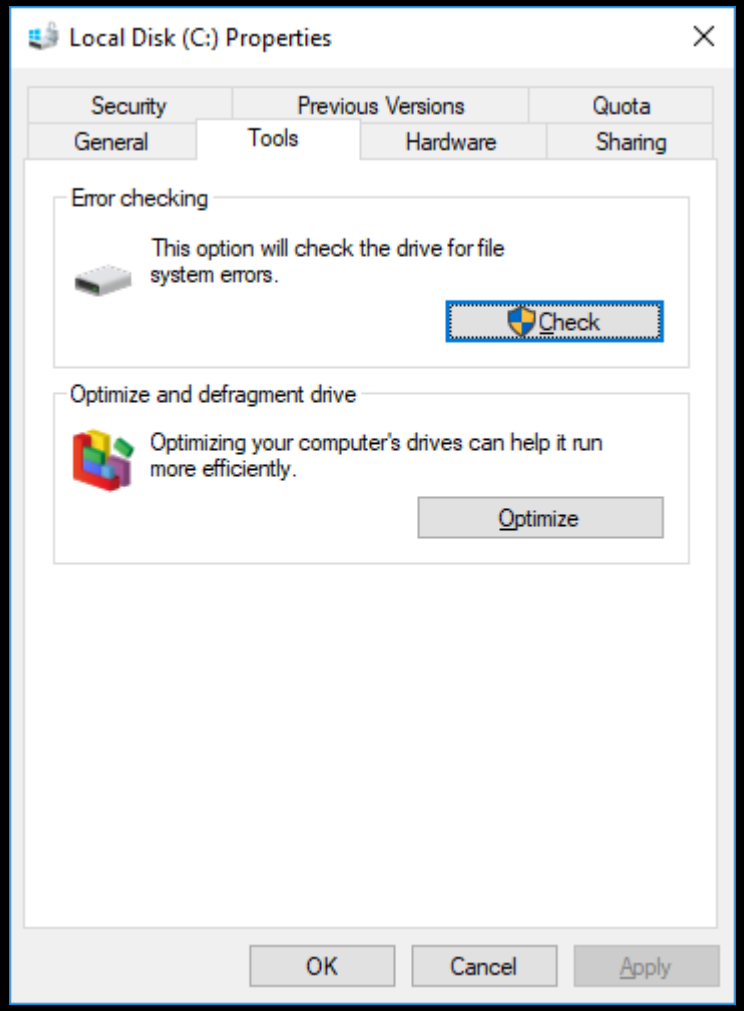
Sequential vs. Random Access

RAM*, *hard drives*, and *flash memory allow random access. ***Random access*** means that you can access any location in any order.

Tape drives and VCR tapes allow sequential access. ***Sequential access*** means that you can only get to a particular location by visiting previous locations in sequential order.

- That is, you cannot skip ahead, but must go through the tape in order until you reach the desired location.

Aside: What is Disk Defragmentation?



A computer tries to store your files in one contiguous block on the hard drive but may not be able to.

Each piece of a file is called a *fragment* and a table is used to keep track of where all the fragments of a file are.

The ***disk defragmenter*** will try to combine fragments at various locations on the disk into one larger fragment in order to improve performance.

On the other hand, the ***error checker*** will find physical errors and logical errors in files.

Research Question
Solid State Disk Defragmentation

Question: TRUE or FALSE: Disk defragmentation should be performed on solid state disks (SSDs) just like hard drives (HDs).

A) true

B) false

Computer Components
Memory Size

Memory size - is a measure of memory storage capacity

- Memory size is measured in **bytes**.
  - Each byte contains **8 bits** - a bit is either a 0 or a 1.
  - A byte can store one character of text.
- Memory sizes are measured in:
  - kilobytes (KBs) - 1,000 bytes (one thousand)
  - megabytes (MBs) - 1,000,000 bytes (one million)
  - gigabytes (GBs) - 1,000,000,000 bytes (one billion)
  - terabytes (TBs) - 1,000,000,000,000 bytes (1,000 billion)

Various memory devices and their storage capacities:

- RAM (Main memory) : 2 GB to 256 GB
- Hard Drive : 100 GB to 8 TB
- CD-ROM/DVD: 640 MB / 10 GB

"The Cloud"

"The Cloud" is not part of your computer but rather **a network of distributed computers** on the **Internet** that **provides storage, applications, and services** for your computer.

These systems and services simplify tasks that otherwise would be done by programs on your computer.

Examples:

- **Dropbox** is a cloud service that allows you to store your files on machines distributed on the Internet. Automatically synchronizes any files in folder with all your machines.
- **iCloud** is an Apple service that stores and synchronizes your data, music, apps, and other content across Apple devices.

Research Question
Cloud Computing

Question: What company was the largest cloud computing company based on revenue in 2017? Consider only revenue from cloud computing services.

A) Microsoft

B) Apple

C) Amazon

D) Google

E) IBM

Algorithm

An ***algorithm*** is a precise and **systematic method** for solving a problem.

Exercise: With a partner, describe how you would **find a person's name** in a list of names sorted by last name. Assume your partner does not know very much!

Remember algorithms must be precise!

Algorithm

Question: Put the following steps in order to write an algorithm to construct a camp fire.

1) light match

2) place wood in fire pit

3) put match on wood

4) gather wood

a) 2,4,3,1

b) 4,2,1,3

c) 1,2,3,4

d) 4,3,2,1

Programming

What is programming?

- ***Programming*** is the process of constructing programs in order to instruct a computer on how to solve problems. It is the act of **writing out the steps of an *algorithm***.

- A ***program*** is a sequence of simple computer instructions in some ***language*** which tell the computer the necessary steps to solve a problem or complete a task.

- A ***language*** is the **structure and syntax** used to communicate to the computer the tasks it is required to perform.

We all "program" by giving instructions to others!

Abstraction

Abstraction focuses on the key concept while ignoring details.

Examples:

- We ignore details around us to focus on "the task at hand."
- As users we do not see the details on how a system works when we use it.
- When building a system or solving a problem, we focus on a particular component or piece at a time.
- Children's stories often have a moral that is independent of the story characters.

Generalization

Generalization is **applying a common idea or concept in many different situations**.

- Note: Generalizations may not apply in every single situation. **There may be "exceptions to the rule."**

Examples:

- Cars *generally have their pedals/controls in the same locations*.
- Caps usually twist left (counter-clockwise) to loosen and right (clockwise) to tighten.

Birds generally can fly

Analytical Thinking

Analytical thinking uses ***specific***, ***quantitative*** facts.

- Non-analytical statement:
  - The world record in the mile run has improved.
- Analytical statement:
  - The world record in the mile has improved from 3.59.4 in 1954 to 3.43.13 in 1999, a 7% improvement.

Computer vs. Human Improvement

How much faster have computers become?

Computer	Year	Speed (ops./second)	Improvement
UNIVAC 1	1951	2000	
IBM 650	1954-1962	2500	25%
IBM S/360	1964-1978	1,000,000	500 times
Apple II	1977	1,000,000	500 times
Commodore64	1982	1,000,000	500 times
PC 486 (50 MHz)	1994	40 million	20,000 times
iPhone4 ARM Cortex A9	2009	5,000 million	2.5 million times
i7Core PC (3.4 Ghz)	2011	160,000 million	80 million times
K Computer	2011	8 quadrillion	4 trillion times
Sunway MPP	2016	125 quadrillion	64 trillion times

Technological Ability is from Experience not Genetics

People ***do not have natural technological abilities***.

Our experience using systems helps us know what to expect. Designers who create devices know about this experience and design products to match what we already know.

Understanding how a system works allows us to be more effective users.

- e.g. By knowing that lids usually twist counter clockwise to loosen, we know which way to twist if they are stuck.

Question: When you get a new gadget do you read the manual first or starting using it right away? Does it depend on what type of gadget it is?

Designing Software for Users

Products are designed to make it simpler for users to use them.

Software designers use two key ideas:

- 1) Users have *knowledge of the domain* of the software including prior experience with *non-computer products*.
  - ⇨ E.g. The ***desktop*** environment on a computer is a *metaphor* as working at a computer is similar to working at a desk. Now everything is **touch**!
  - ⇨ Question: What do these buttons do?

- 2) Users have *knowledge of other software* and user interfaces that can be transferred to a new application if developed consistent with this prior experience.
  - ⇨ e.g. command buttons, sliders, etc.

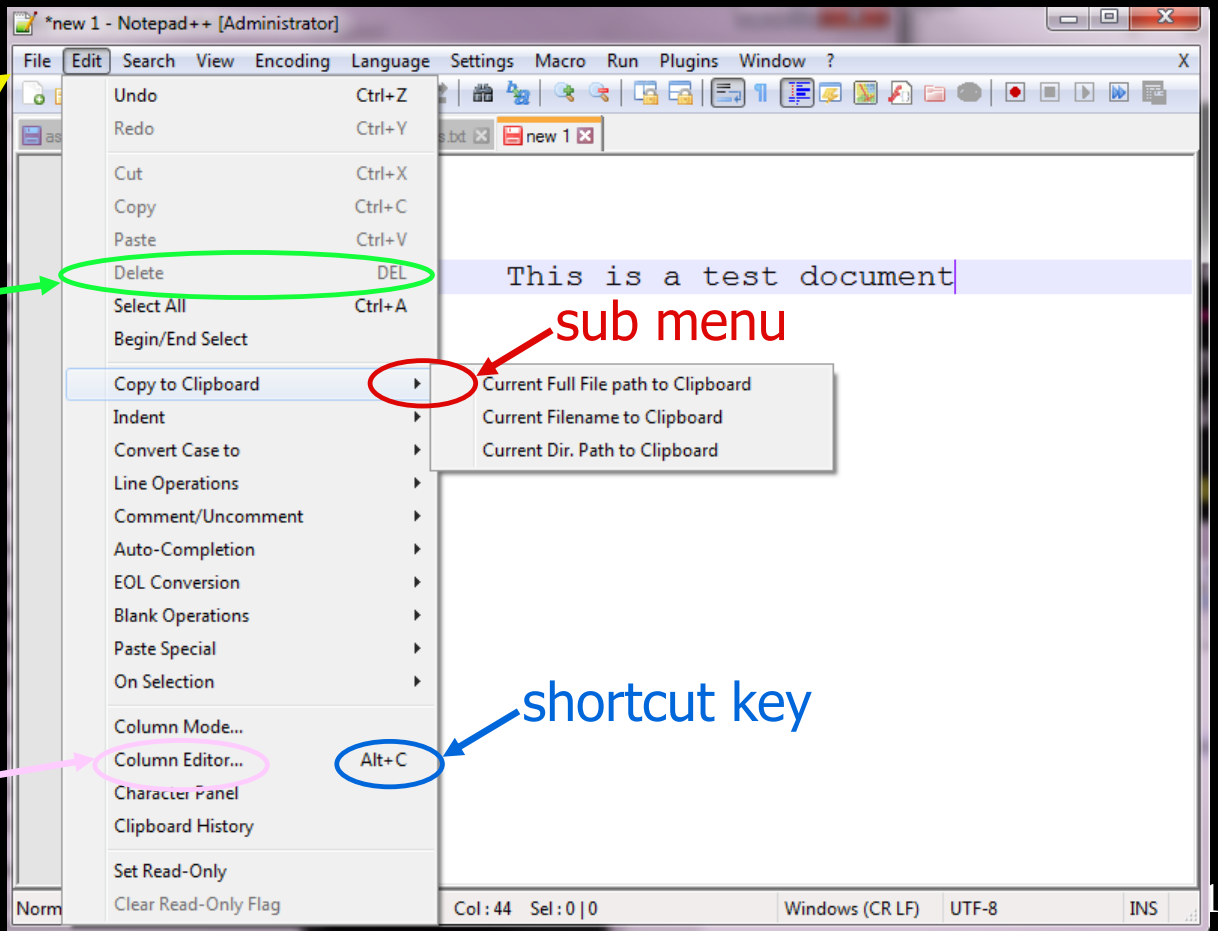
User Interface Design Goals

1) Strive for familiarity and consistency
   - Exploit users knowledge of domain and other software
2) Choose good mappings and metaphors
   - Proper use of color, spatial, and organization cues
3) Provide useful feedback
   - Let the user understand what is going on
     - e.g. Indicate that the computer is still working on a task (change cursor) or action occurred (button animation).
4) Manage complexity
   - Show the right amount of information required for the task and make operations simple to perform and remember.

Standard Interface Components - Menu

A ***menu*** is a list of operations the software can perform. The operations are grouped by function and shown in a ***menu bar***.

- Menus on the top bar are called *pull-down* or *drop-down* menus.



Experimenting with Technology

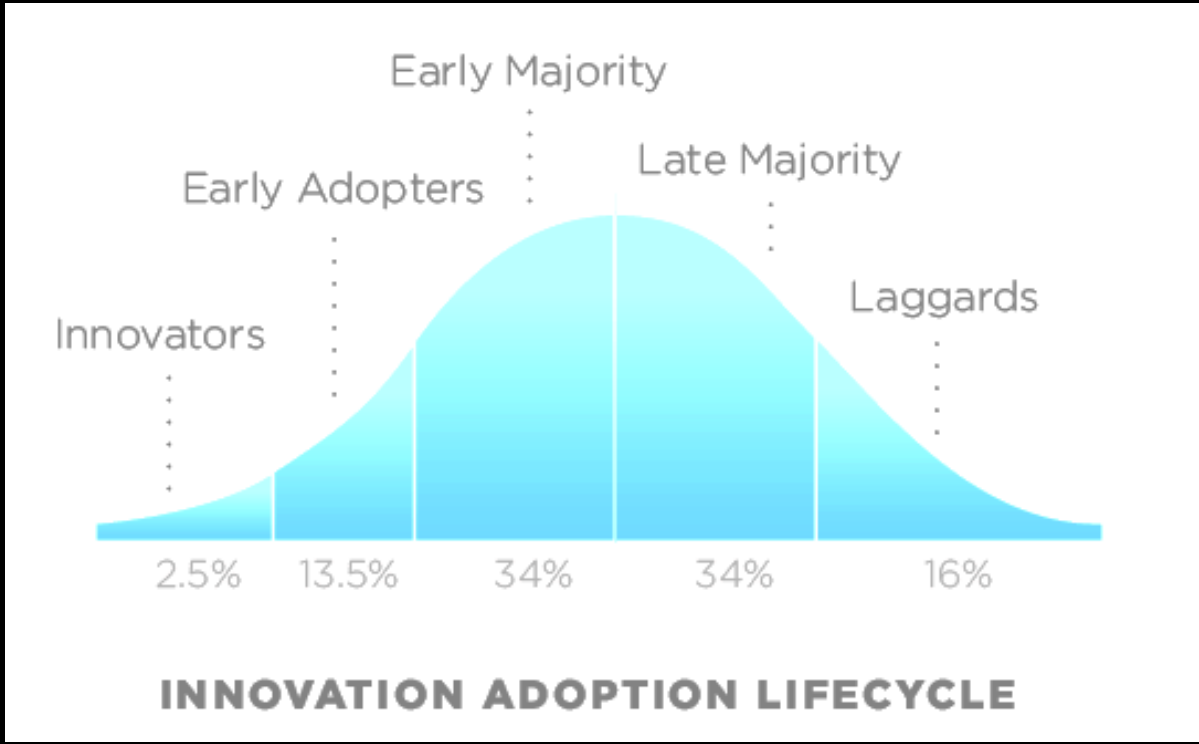
The key to being a expert user is to:

- be willing to **apply past knowledge** to learn new technology
- be willing to **experiment and test features**

The easiest way to learn technology is to experiment with its features and interface. Nothing will break… usually..!!

Watching others is another good way to learn.

Innovation Adoption Lifecycle



Innovators – seek new solutions and take risks to gain advantages

Early adopters – opinion leaders who will go before the crowd

Early majority – slower adoption ; adopt **when peers do**; "group think"

Late majority – innovation skeptics ; follow crowd after

Laggards – do not want to change ; traditional

Innovation Adoption

Question: Which of the categories for innovation adoption do you fall in?

A) Innovators

B) Early adopter

C) Early majority

D) Late majority

E) Laggards

Virtual World

Virtual world is a computer-based simulated environment

- The virtual world and experiences provided by computers is limited only by creativity and imagination.

Although our interactions with computers is based on familiar, real-world concepts and abilities, **computers provide new opportunities and experiences not controlled by physical reality**.

Examples:

- **Virtual realities**: 3D experiences, online games
- **Communications**: Facebook, Twitter, messaging, email
- **Creativity**: Almost anyone can create art or music or videos and share with a world-wide audience.

Is There Any Money in IT?

The opportunities to profit from IT knowledge are enormous. There are numerous IT jobs and opportunities for businesses.

Job	Salary	Description
IT support	$35-75,000	Technical support for users
Computer trainer	$35-50,000	Train users on software/hardware
Database Admin	$55-100,000+	Develop/maintain databases
Data entry staff	$20,000+	Input information into systems
Systems manager	$80,000+	Manager position, CIO
Network admin.	$50-95,000	Manage organization network
Programmer	$60-100,000+	Develop and test software
Software engineer	$50-100,000+	Design software systems with users
Technical writer	$40-80,000	Write user documentation for systems
Webmaster	$50-75,000	Develop web sites and marketing
IT Business	$$$$$	Easiest way to be a millionaire…

Conclusion

A computer consists of numerous components, but as users we can normally ***abstract*** away the hardware internal functions.

Since a computer is very fast but not very smart, a computer must be given instructions or programs in the form of ***software***.

Software is developed by programming an ***algorithm*** in a language that the computer understands. Programming involves specifying precisely the sequence of operations and representation of information used.

We become more effective users of technology if we use the correct terminology, understand how systems work, and are confident on using prior knowledge to learn new systems.

Objectives

- Explain why it is important to understand and use IT terminology.
- List some reasons why there are so many IT terms.
- Define: computer, hardware, software
- Define: monitor, LCD, pixel, bitmapped
- Define: processor, memory (temporary/permanent), cache
- Compare: random vs. sequential access
- Define: motherboard, bus
- Define: algorithm, program, language, programming
- Define: abstraction, generalization, analytical thinking
- List and explain four ideas designers use to make their software easier for us to use.
- Explain the characteristics of an expert user.
- List and explain the five steps in the innovation lifecycle.

Review
Memory – Temporary or Permanent

Question: Is main memory (RAM) in your computer temporary or permanent?

A) temporary

B) permanent

Review
Memory – Temporary or Permanent

Question: Is your hard drive considered temporary or permanent memory?

A) temporary

B) permanent

Review
Sequential vs. Random Access

Question: What device performs sequential access?

A) main memory (RAM)

B) DVD

C) VCR

D) iPod

E) hard drive

Review
Memory Size

Question: Which is bigger?

A) 10 GB

B) 100 MB

C) 1,000,000,000 bytes

D) 1 TB

Review Programming

Question: Match the programming related terms with related terms in cooking.

Programming, Language, Algorithm, Program

1) Cooking **2)** Recipe written in French **3)** English

4) Recipe **5)** Writing a cook book

A) 1,3,2,4

B) 5,3,4,2

C) 5,3,2,4

D) 1,3,4,2

Review
Hard Drive Terminology

Question: Put the following hard drive terminology in order of smallest to largest size:

platter, sector, cylinder, track

A) platter, sector, cylinder, track

B) sector, cylinder, track, platter

C) sector, track, cylinder, platter

D) sector, track, platter, cylinder