Topic 1

Hardware and Software

Digital devices consist of both hardware and software components. From the hardware perspective, it is important to understand the technologies that enable these devices. From the software perspective, it is important to understand licensing and maintenance.

1.1 Hardware

These are the physical parts/ intangible parts of a computer.
eg Input devices, output devices, central processing unit and storage devices

Question: How to classify computers based on hardware?

Features and functions of contemporary digital devices

a. Portability – how easy it is to move a device

For example, mobile phone is very portable as it is light and small, but PC tower has bad portability because it's heavy and unwieldy.

b. Performance – how well/quickly a device performs a task
For example, a high end modern PC can perform far more complex tasks more quickly than a PC from the 1980s

c. Storage- how much data or memory a device can store
A PC has a greater storage capacity than a mobile phone, generally, as it can physically fit more space for memory storage.

d. User interface - It is the point of human-computer interaction and communication in a device.
This can include display screens, keyboards, a mouse and the appearance of a desktop.

e. Connectivity – the ability of a device to connect to other devices, with or without wires
A PC has a connectivity with Wifi, LAN connectivity. But a smartphone has a better connectivity because it can connect to Wifi, but also has 3G, 4G and Bluetooth functions.

f. Media support – it is where a device can support media applications such as video or music.
A mobile phone has good media support as it can play videos and music. But a PC has better media support as , PCs play videos and music to better quality as well as play flash files.

g. Energy consumption – how much energy it consumes over a period of time
For example, a TV consumes more power than a monitor (because of TV has the large screen surface), as they perform similar functions.

h. Expansion capability - add functionality to a computer. Many expansion devices can be used with both laptops and desktops.
For example, Network cards, Wireless adapters, Printers, Other peripherals

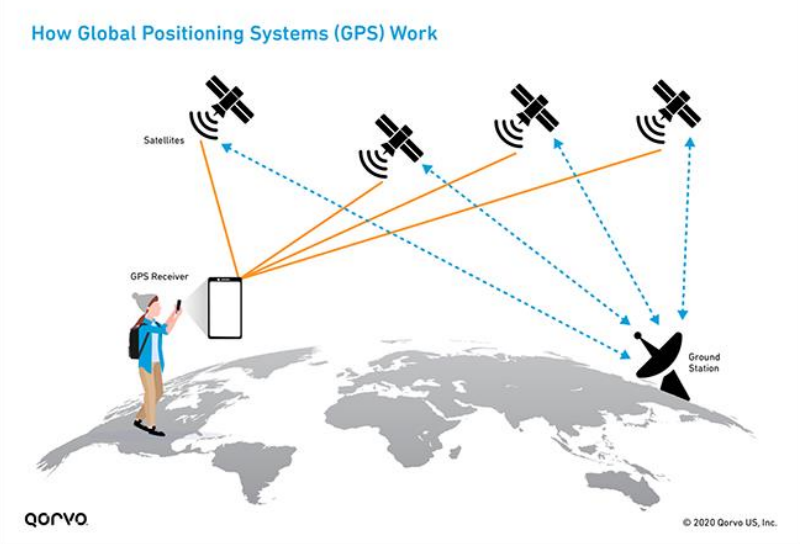
i. Security features – features that make a device more secure from things like identity theft or compromise bank accounts.

For example, mobile phone has a password or pattern lock to prevent people from accessing private material.

Technologies used by the digital devices

a. Global Positioning System (GPS)

GPS is the only system today that can show your exact position on the Earth anytime, in any weather, no matter where you are. It is a global navigation satellite system that provides location, velocity. You can find GPS systems in your car, your smartphone and your watch.



b. Biometrics

Biometrics are physical or behavioral human characteristics to that can be used to digitally identify a person to grant access to systems.
Ex:
Fingerprint, face recognition, DNA, palm print, iris recognition, voice recognition etc..

c. Touchscreen

d. Sensor

Sensors are input devices that record data about the physical environment around it.
Sensors send data to a microprocessor (computer). They do not make judgements, decisions or control any output devices.
There are many types of sensors used in a variety of household, commercial and industrial applications.

Ex: Motion sensor (automatic doors), temperature sensor (greenhouse), Sound sensor (burglar alarm system), humidity/moisture sensor (clothes dryer), pressure sensor (traffic light control), gas sensor (air pollution monitoring), light sensor (controlling street lights)

What are the advantages of using computer sensors?

e. Memory

f. Storage

g. Battery power

h. Miniaturisation

Miniaturization is the trend to manufacture ever smaller mechanical, optical and electronic products and devices. Examples include miniaturization of mobile phones, computers and vehicle engine downsizing.

i. Processors

j. Radio-Frequency Identification (RFID)

Radio-frequency identification (RFID) uses electromagnetic fields to automatically identify and track tags attached to objects. Tagging items with RFID tags allows users to automatically and uniquely identify and track inventory and assets.

k. Near-Field Communication (NFC)

NFC (Near Field Communication) presents the technology which permits the users to transfer the files and perform the transactions with ease, NFC helps the individuals to share the data cost-efficiently as it has the ability to transfer the files such as the pictures or music without carrier charges.

l. Quick Response (QR) code

A QR or Quick Response code is a two-dimensional barcode. These are often used for adding web links to a printed page. When you scan such a QR bar code using a webcam or mobile phone camera, the QR reader application takes you to a Web site, a YouTube video or some other web content. QR codes are an easy way of sending people to a site without having to type a URL.

m. Connectivity.

1.2 Software

Computer software, or simply **software**, is a collection of data or computer instructions that tell the computer how to work. This is in contrast to physical hardware, from which the system is built and actually performs the work.

Software can be categorized in to two.

a. System software
   It is software for managing computer hardware as to provide basic functionalities that are required by users. System software is also designed for providing a platform for running application software. It has following sub categories.

   a. Operating Systems.
      Operating systems include essential collections of software that manage resources and provide common services for other software that runs "on top" of them.

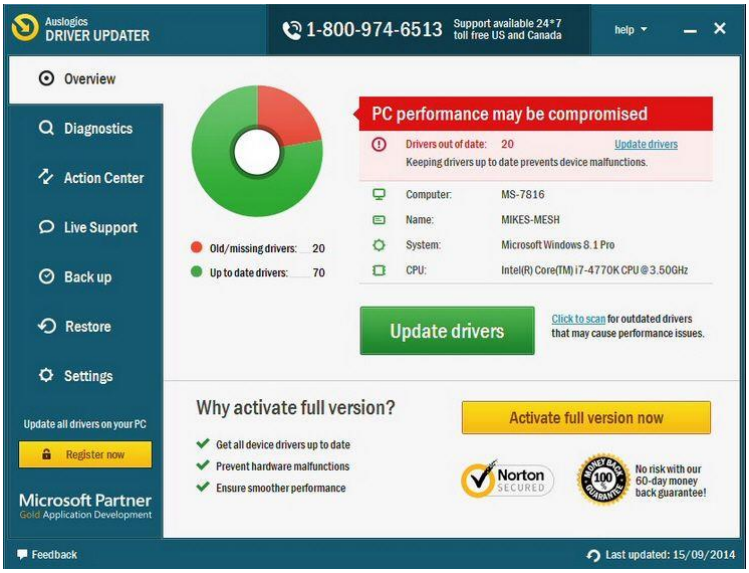
Question:

1. What are the examples of OSs?

2. What is the main role of the Computer Programmer?

b. Device Drivers

It is used to operate or update a particular type of device that is attached to a computer.



Question:

1. Which types of devices have driver software?

2. What is the reason for installing device driver software?

c. Utilities

These software analyze and maintain a computer. These software focused on how OS works on that to perform task to enable smooth functioning of computer.

Ex: Antivirus, backup software, file manager, disk compression, disk defragmentation (https://www.youtube.com/watch?v=mquaQ7JKMEk)

b. Application Software

Application software (app for short) is a program or group of programs designed for end users.

Examples of an application include a word processor, a spreadsheet, an accounting application, a web browser, an email client, a media player.

Questions:

1. What is the purpose of the following Application software?
   MS Word, MS Excel, MS Powerpoint, MS Access, Mozilla Firefox, Google Chrome, Avira Antivirus.
2. Consider Linux software. Is it a System or Application software?

Role of Operating System

It is the main system software which is used to manage;

- Devices
- Processes
- Users
- Security

Question:

1. List some names of popular OSs.

Copyright

Software copyright is used by software developers and proprietary software companies to prevent the unauthorized copying of their software. When someone creates an original piece of software, that person then holds something called the copyright for that software. (This is also true when people create books, films and songs)

Holding the copyright for software means that you have the protection of the law if anyone tries to steal your software.

Copyright Types

- Free
- Open Source
- Proprietary
- Creative Commons - Creative Commons works within copyright law. It allows creators to grant permission to everyone in the world to use their work in certain ways.

Question:

- Find some examples for each of the copyright type. Do an internet research.

Licensing Options

A software license is a document that provides legally binding guidelines for the use and distribution of software. Software licenses typically provide end users with the right to one or more copies of the software without violating copyrights.

- Single user
- Multiple user
- Institutional (The software license is based upon the number of people in the organization)
- Fixed Term (A Fixed Term License is for the definite time specified by IBM)
- Indefinite (Indefinite means that you may use it as long as you can)
- Network

Managing Software Updates

Software updates are a way for software developers to fine-tune a product to make it the best it can be. They offer small, frequent improvements rather than major changes.

Unlike a software upgrade, updates need the existing software program you're using to work.

Updates sometimes run automatically in the background.

Software upgrade is a new version of the software product entirely.

Other times, software updates are commonly referred to as 'patches'. It comes as a free download.

User Requirements

User requirements, often referred to as user needs, describe what the user does with the system, such as what activities that users must be able to perform.

Ex: Word processing, Web browsing, Calculations, programming etc..