9

CITY SCHOOLS DIVISION OF DASMARIÑAS

TLE

COMPUTER SYSTEMS
SERVICING

TLE 9
Computer System Servicing
Quarter 2

Guide in using Learner's Module

For the Parents/Guardian

This module is designed to assist you as the learning facilitator at home. It provides you with activities and lesson information that the learners need to accomplish in a distance learning modality.

For the Learner

This module is designed to guide you in your independent learning activities at your own pace and time. This also aims to help you acquire the competencies required by the Department of Education (DepEd) at the comfort of your home.

You are expected to answer all activities on separate sheets of paper and submit the outputs to your respective teachers on the time and date agreed upon.

I *What I need to know?*

Welcome to Lesson 3: **Performing Mensuration and Calculation**
This lesson consists of (3) three learning outcomes. Each learning outcomes contains activities supported by each performance task and activities. Are you ready to take the challenge?

The module contains the following lessons.

Lesson 3: Performing Mensuration and Calculation

> **Select measuring instruments**
>
> Carry out measurement and calculation
>
> Maintain measuring instruments

After going through this module, you are expected to:

- Select components to be measured.

I *What is new?*

Hi! You are about to start this module. Before anything else, take this **SELF-ASSESSMENT** survey questionnaire. Answer the table below.

Learning Outcome 3: Select measuring instruments		
Can I…	YES	NO
Identify object/s or component to be measured		
Obtain correct specifications from relevant source		
Select measuring tools in line with job requirements		

Well done! How many of those in the survey are you knowledgeable of the competencies? Do you want to know more about this module? Then let's proceed.

D What I know?

Hello there! This part of the module is about the first learning outcome of the Lesson 3 which is **select measuring instruments.**

As an aspirant computer technician, it is very vital to know the different components of a computer system. Computer hardware refers to the physical parts or components of a computer such as the monitor, mouse, keyboard, computer data storage, hard disk drive (HDD), system unit, graphics cards, memory, sound card and motherboard), etc. all of them are tangible objects of the whole computer unit.
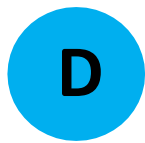
D What is in?

Let us determine how much you already know about components in Computer Systems Servicing to be measured. Take this test.

Learning Task 1: Match Me!

Direction: Match items on Column A with Column B. Write your answers on a separate sheet of paper.

COLUMN A	COLUMN B
__ **1.** Chips that are located on the motherboard	**A.** Registers
__ **2.** A magnetic storage device that is installed inside the computer.	**B.** Flash drive or thumb drive
__**3.** Early drive controller interface that connects computers and hard disk drives which an interface that uses a 40-pin connector.	**C.** Read-only memory
__**4.** Temporary storage for data and programs that are being accessed by the CPU.	**D.** IDE
__**5.** A storage device that uses lasers to read data on the optical data.	**E.** Floppy drive
__**6.** A storage device that uses removable 3.5-inch disk	**F.** Random Access Memory
__**7.** Soldered the memory chips on a special circuit board.	**G.** Optical drive
__**8.** A removable storage device that connects to a USB port.	**H.** DDR
__**9.** Memory cells built right into the CPU that contain specific data needed particularly the Arithmetic and Logic unit.	**I.** Hard drive
__**10.** Technology that doubles the maximum bandwidth of SDRAM.	**J.** Memory Module

D *What is it?*

Memory Storage Devices

Compare the main types of memory storage device in terms of speed, cost and capacity e.g. internal/external hard disk, zip disk, data cartridges, CD-ROM, diskette etc.

Internal Hard Disks	**Speed:** Very fast! The speed of a hard disk is often quoted as "average access time" speed, measured in milliseconds. The smaller this number the faster the disk. There are different types of disk, and commonly used types are known as EIDE and SCSI drives. SCSI is better for large network servers while EIDE drives are often better for desktop computers. **Capacity:** Enormous! Often in excess of 10 Gigabytes. A Gigabyte is equivalent to 1024 Megabytes. **Cost:** Hard disks costs are falling rapidly and normally represent the cheapest way of storing data.
External Hard Disks	**Speed:** Normally slower that internal disks, but more expensive versions offer the same performance as internal hard disks. **Capacity**: Same as internal disks. **Cost:** More expensive than internal disks.
Zip Drives **Zip Drives**	You can install a Zip drive into your computer and then you can insert Zip disks into that drive. The great thing about these disks is that you can remove one disk and replace it with another, in exactly the same way that you can place different diskettes in your diskette drive. They are great for backing up data and for exchanging data between non-networked computers. **Speed:** Slower than normal hard disks but ideal for backups. **Capacity:** 100 or 250 Megabytes. **Cost:** You have to consider both the cost of the drive, plus the cost of each disk that you wish to use in the drive. Often suppliers will sell the drive plus a pack of 5 disks at a bundled discount price.

Jaz Drives	A Jaz drive is similar in concept to a Zip drive. The main difference between them is that a Jaz drive can hold a lot more data. Alas, the disks are not the same as used in a Zip drive and as a result, you cannot use a Zip disk in a Jaz drive or a Jaz disk in a Zip drive. **Speed:** Slower than normal hard disks but ideal for backups **Capacity:** Around 2 Gigabytes (2048 Megabytes). **Cost:** You have to consider both the cost of the drive, plus the cost of each disk that you wish to use in the drive. Often suppliers will sell the drive plus a pack of 5 disks at a bundled discount price. **More information:** http://www.iomega.com
Diskettes (floppy disks)	**Speed:** Very slow! **Capacity:** Normally 1.44 Mbytes. **Cost:** Very cheap.
CD-ROM Disks	**Speed:** Much slower than hard disks. The original CD-ROM speciation is now given a value of 1x speed, and later, faster CD-ROMs are quoted as a multiple of this value. Thus, a 50x CD-ROM is 50 times as fast as the original 1x speed CD-ROM specification. **Capacity:** Around 650 Mbytes. **Cost:** Below £100 each (UK sterling).
DVD Drives	**Speed:** Much faster than CD-ROM drives but not as fast as hard disks. **Capacity:** up to 17 Gigabytes. **Cost:** Slightly higher than CD-ROM drives.
What is the difference between internal and external hard disks?	Internal hard disks are located inside your main computer unit, while external hard disks are joined to the main computer unit via a lead that you plug into the back of your computer unit. Some external hard disks will plug into the serial port (connector) located at the back of your computer. Other external hard disks require the installation of a special card within your computer that allows the connection of the external hard disk to the computer unit.

Types of Memory

Understand different types of computer memory: e.g. RAM (random-access memory), ROM (read-only memory). Understand when they are used.

What is RAM?	Random Access Memory (RAM) is the main 'working' memory used by the computer. When the operating system loads from disk when you first switch on the computer, it is copied into RAM. The original IBM PC could only use up to 640 KB of memory (just over half a megabyte), whereas a modern computer can effectively house as much RAM is you can afford to buy! Commonly modern computers are supplied with over 64 MB of RAM. As a rough rule, a Microsoft Windows based computer will operate faster if you install more RAM. Data and programs stored in RAM are volatile (i.e. the information is lost when you switch off the computer).
What is ROM?	Read Only Memory (ROM) as the name suggests is a special type of memory chip that holds software that can be read but not written to. A good example is the ROM-BIOS chip, which contains read-only software. Often network cards and video cards also contain ROM chips.
What is the ROM-BIOS?	The 'Read Only Memory Basic Input Output System' chip is a chip located on the computer's system (mother) board, which contains software. This software performs a variety of tasks. When you first switch on the computer the ROM-BIOS software performs a self-diagnostic to check that the computer is working OK. This software then loads your operating system from the disk into the RAM.
What is flash BIOS?	Most modern computers are actually supplied with a flash BIOS rather than a ROM-BIOS. This chip contains exactly the same type of in-built software, but has the advantage that the software on the chip can be upgraded. This upgrade is achieved by simply running a small program supplied by the computer manufacturer.
The ROM-BIOS and the Year 2000 bug	Many older computers required the upgrading of the ROM-BIOS chip to fix the so-called "Millennium year 2000 bug". This was because the older computers held the year information as two digits, so that 99 would be used to represent 1999.

| What is Video (graphics) memory?	The picture that you see on your screen is a form of data and this data has to be stored somewhere. The on-screen pictures are held in special memory chips called video memory chips, these chips are usually located on the video card. A modern computer will be supplied with several Megabytes of video memory.

E *What is more?*

Now that you are familiar with selecting components to be measured, take this **SELF-ASSESSMENT** survey questionnaire. Answer the table below.

Learning Outcome 3: Select measuring instruments		
Can I……..	YES	NO
Identify object/s or component to be measured		
Obtain correct specifications from relevant source		
Select measuring tools in line with job requirements		

E *What I can do?*

Learning Task 2: Identify and Draw
Direction: Draw five memory hardware you are familiar with.
Put your answers in the circle provided below.
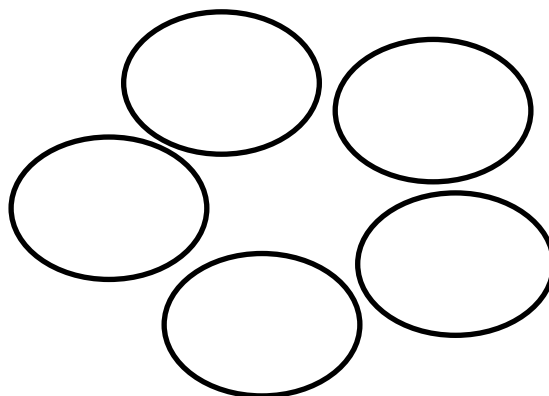
E *What else can I do?*

Learning Task 3: This is It

Task: For you to deepen your knowledge and skills and understanding in selecting measurements to be measured, you need to obtain necessary information to complete this task. Your task is to research and write down (5-10 sentences only) data pertaining to the different computer memory and storage with their functions. Your output will be rated using the following criteria below:

CRITERIA	PERCENTAGE	SCORE
Accuracy (Accurate function and information of the device was accurately included)	**30%**	
Presentation (Organization and sequence of the paragraph was shown and included)	**30%**	
Clarity (Clearly delivered each topic)	**30%**	
Neatness	**10%**	
Performance Rating		

What I have learned?

Learning Task 4: Know It Well

Direction: Identify the appropriate term and description in each memory. Use a separate sheet of paper for your answers.
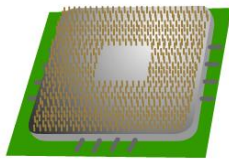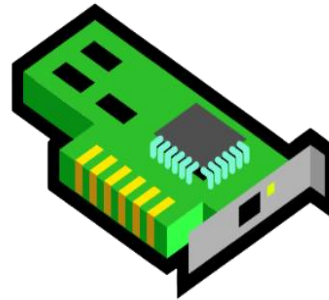
1. .

3.

2. .

4.

I   *What I need to know?*

You are now in the learning outcome 2 of Lesson 3 which is **carry out measurement and calculation**. In this module you are able to understand more about computer memory computations done in Computer Systems Servicing.

All is set! Let's Go.

The module contains the following lessons.

Lesson 3   Performing mensuration and calculation

      Select measuring instruments

      Carry out measurement and calculation

      Maintain measuring instruments

After going through this module, you are expected to:

- Carry out mensuration and calculation.

I   *What is new?*

Hi! You are about to start this module. Before anything else, take this SELF-ASSESSMENT survey questionnaire.

Take time to answer the table below.

| Learning Outcome 2: Carry out measurement and calculation	YES	NO
Select appropriate measuring instrument to achieve required outcome		
Obtain accurate measurements for job		
Perform calculation needed to complete task using the four mathematical fundamental operations addition (+), subtraction (-), multiplication (x), and division (÷)		
Use calculation involving fractions, percentages and mixed numbers to complete workplace tasks		
Self-check and correct numerical computation for accuracy		
Read instruments to the limit of accuracy of the tool		

D *What I know?*

Hi! You are about to start this module. Before anything else, let us talk about systems specifications.

These are the necessary specifications your computer must have in order to use the software or hardware. Example, a computer game may require your computer to have Windows 10 or later, a 3.4 GHz processor, 16 GB of RAM, 4 GB graphics card and 1 TB or hard drive space. If your computer unit does not meet all of these requirements, the game will not run very well or might not run at all.

DIGITAL REPRESENTATION

Within a computer information is being represented and stored in a digital binary format. The term bit is an abbreviation of binary digit and represents the smallest piece of data. Computers interpret only patterns of bit.
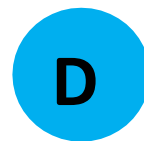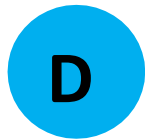
D *What is in?*

Let us determine how much you already know about carrying out mensuration and calculations. Take this test.

Learning Task 1: Self-Check
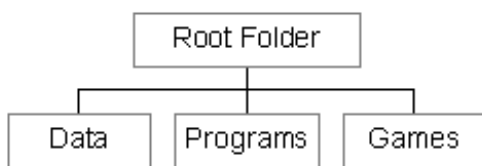**Direction**: Perform the following:
1. Convert 14 to binary.
2. If a 10 KB file is stored in a 1 MB folder, then approximately how many files can be stored in that folder?

What is it?

Measuring Memory

Know how computer memory is measured; (bit, byte, KB, MB, GB). Relate computer memory measurements to characters, fields, records, files and directories/folders.
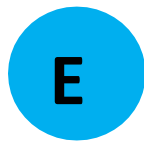
Basic Units of Data Storage	It is important to realize that the term digital computer refers to the fact that ultimately the computer works in what is called binary. Humans work in tens (because we have 10 fingers). To use the jargon humans, work in base 10. A digital computer uses the numbers 0 and 1 (or on and off if you prefer). Thus, when we talk about computer storage, either the amount of memory (RAM) or the hard disk capacity we are talking about numbers that are multiples of 0 or 1.
Bit	All computers work on a binary numbering system, i.e. they process data in one's or zeros. These 1 or 0 levels of storage is called a bit. Often hardware is specified as a 32-bit computer, which means that the hardware can process 32 bits at a time. Software is also described as 16 bit, 32 bit or 64 bit software.
Byte	A byte consists of eight bits.
Kilobyte	A kilobyte (KB) consists of 1024 bytes.
Megabyte	A megabyte (MB) consists of 1024 kilobytes.
Gigabyte	A gigabyte (GB) consists of 1024 megabytes.
Files	Data and programs are stored on your disk as files. There are different types of files, such as the files that you store your data in, the files that contain your programs and also files used to store your operating system (such as Microsoft Windows).
Directories (folders)	Directories or folders are used to group files with a similar theme together. For example, you could have a folder called "Accounts" containing all your accounting related files, or a folder called "Customers" containing correspondence with your customers. Folders can also contain sub-folders to further divide files. The uppermost level folder is often referred to as the "root" folder (or directory). Sometimes you may see a diagrammatic representation of folders, as illustrated below. Root Folder Data Programs Games

	In this example, we have the root folder at the top. Below this are three sub-folders called Data, Programs and Games.
Records	A record is a collection of data held within a file. It is the sort of storage unit used by a database. For more information, please see the ECDL module concerned with databases.

Computer Performance

Know some of the factors that impact on a computer's performance, e.g. CPU speed, RAM size, hard disk speed and capacity.

Computer speed	The single most important feature governing overall speed of a given PC is the speed of its CPU (measured in MHz). Additional factors are important, especially on a Windows based PC, where as a rule the more memory you have the faster the PC will appear to operate. Windows also uses the hard disk a lot so logically the faster the hard disk can operate then again, the faster the PC will appear to run. To get the most out of your Windows based PC, you not only need a fast-hard disk you need a large hard disk with plenty of "spare space". This is due to the fact Windows is constantly shuffling data between the hard disk and RAM (Random Access Memory). Microsoft Windows will create many so-called "temporary files" that it uses for managing your programs. In fact, if you have very little free hard disk you may find that Microsoft Windows will not be able to load your programs at all! If you are running Windows 95/98/2000 (or a similar version of Windows), you will find that if you click on the **Start** menu, select **Programs**, and then select the **Accessories** / **System tools** group, there is a de-fragmentation program. Running this periodically may noticeably speed up the operation of your PC!

E *What is more?*

Now that you are familiar with assessing your own workplace, take this **SELF-ASSESSMENT** survey questionnaire. Answer the table below.

Learning Outcome 2: Carry out measurement and calculation	YES	NO
Select appropriate measuring instrument to achieve required outcome		
Obtain accurate measurements for job		
Perform calculation needed to complete task using the four mathematical fundamental operations addition (+), subtraction (-), multiplication (x), and division (÷)		
Use calculation involving fractions, percentages and mixed numbers to complete workplace tasks		
Self-check and correct numerical computation for accuracy		
Read instruments to the limit of accuracy of the tool		

E *What I can do?*

Learning Task 2: Conversion Time!
Directions: Convert the decimal numbers shown below to binary.
Perform checking to verify answers.

1. 19
2. 28
3. 37

E What else can I do?

Show that you learned something by doing this activity
Learning Task 3: Solve and Apply
Direction: Solve the problems indicated below. Show your solution.
1. **Situation 1 - music storage on a smart phone**
   You have a smart phone with 6GB of storage.
   You want to store music on the phone.
   A typical mp3 encoded music file takes up 4MB.
   How many tracks can be stored on the phone?
2. **Situation 2 - photo storage on a smart phone**
   You have a smart phone with 6GB of storage.
   You want to store photos on the phone.
   Assume that a typical photo taken by a phone will be around 2MB

A What I have learned?

Learning Task 4: Process Your Knowledge
Directions: Now, in order to for you to better understand the topics under system's specification, dig deep into your mind and answer the following essential questions correctly:
1. In your point of view, what is system specification?
2. How does computer memory affect the performance of the computer?
3. What is the relevance of knowing the calculation of a computer memory?
4. Why do you think that carrying out measurements and calculating computer data and memory is one of the most important considerations in purchasing software and hardware for your computer?

CRITERIA	PERCENTAGE	SCORE
Accuracy (Accurate function and information of the device was accurately included)	**30%**	
Presentation (Organization and sequence of the paragraph was shown and included)	**30%**	
Clarity (Clearly delivered each topic)	**30%**	
Neatness	**10%**	
	Performance Rating	

I *What I need to know?*

You are now in the Learning Outcome 3 of Lesson 3 which is **maintain measuring instruments.**

Quality refers to the characteristics of a product or service that bear on its ability to satisfy stated or implied needs. It also refers to a product or service free of deficiencies. The quality of a product or service refers to the perception of the degree to which the product or service meets the customer's expectations. Quality has no specific meaning unless related to a specific function and/or object. Quality is a perceptual, conditional and somewhat subjective attribute.

Lesson 3   Performing mensuration and calculation

      Select measuring instruments

      Carry out measurement and calculation

      Maintain measuring instruments

After going through this module, you are expected to:

Maintain the measuring instruments; and

Proper storage of instruments.

I *What is new?*

Hi! You are about to start this module. Before anything else, take this **SELF-ASSESSMENT** survey questionnaire.

Learning Outcome 3: Maintain measuring instruments	YES	NO
Ensure proper handling of measuring instruments to avoid damage and clean it before and after using		
Identify tasks to be undertaken for proper storage of instruments according to manufacturer's specifications and standard operating procedures		

D What I know?

All tools and equipment must be properly maintained so that workers are not endangered. Regulations requires inspections of tools, machines and equipment before use.

Advantages of maintaining measuring instruments:
1. Well organized
2. Exact measurement; and
3. Defines operational procedures.

D What is in?

Learning Task 1: **What Am I? NAME ME!**

Instruction: Draw and identify the function of the measuring instruments given below:
1. Straight edge
2. Torque gauge
3. Try square
4. Protractor
5. Combination gauge
6. Steel rule

D *What is it?*

The degree of detail to include regarding tools and equipment maintenance will depend on the kinds of tools/ equipment used. Some construction equipment may have very specific inspection and maintenance requirements. Electronic equipment may have different maintenance requirements. Hand tools may require only basic maintenance. Power tools should be maintained in good working order. This may be limited to ensuring that blades and bits are replaced when needed and those guards or other safety devices are operable and any damaged electrical cords and plugs are repaired or replaced. Damaged or defective equipment tools should be tagged and removed from service.

General requirements for tools equipment maintenance include:
1. Store Instruments in the Appropriate Location.
2. Lubricate Instruments Properly to Avoid Corrosion.
3. Proper Handling of Instruments.
4. Avoid Exposing Your Tools to Temperature Extremes.
5. Obtain Professional Maintenance Services if Needed.
6. Clean After Every Use.
7. Use Them for Their Designated Purposes Only.

E *What is more?*

Now that you are familiar with the lesson, take this **SELF-ASSESSMENT** survey questionnaire. Answer the table below.

Learning Outcome 3: Maintain measuring instruments	YES	NO
Ensure proper handling of measuring instruments to avoid damage and clean it before and after using		
Identify tasks to be undertaken for proper storage of instruments according to manufacturer's specifications and standard operating procedures		

E What I can do?

Learning Task 2: CHOOSE THE BEST FOR ME

Instruction: Complete the measuring instruments cleaning chart shown below:

Measuring Instrument/s	Clean / Maintain with:
1. Steel rule	
2. Protractor	
3. Torque gauge	
4. Combination gauge	

E What else can I do?

Learning Task 3: TRUE or FALSE

Let us determine how much you already know about maintaining measuring instruments. Write your answer on a separate sheet of paper.

1. Measuring tools, by their very nature, are meant to be perfectly precise and to keep them that way they will have to be cared for and maintained properly.
2. Damaged or defective equipment tools should be tagged and removed from service.
3. Proper lubrication, as suggested to care for your measuring tools, is important to prevent damage due to corrosion and oxidation
4. Proper lubrication, as suggested to care for your measuring tools, is important to prevent damage due to corrosion and oxidation
5. There are a lot of different tools for measuring a lot of different things. But, no matter which ones you have, proper care is required if you want to be able to depend on them for accuracy.

Learning Task 4: Know Me More

Measuring tools, by their very nature, are meant to be perfectly precise and to keep them that way they will have to be cared for and maintained properly.

There are a lot of different tools for measuring a lot of different things. But, no matter which ones you have, proper care is required if you want to be able to depend on them for accuracy.

Disregard this advice at your own risk! Measuring devices that have been abused and not maintained as they should have been are apt to be off. In fact, they may be way, way off. Imagine ruining a whole job because you couldn't be bothered to give your hard-working tools the care they deserve.

Some tools used for measuring are, of course, more delicate than others and need more care than something like a measuring tape.
There are many types of tools used to measure.

Lubrication Method

Proper lubrication, as suggested to care for your measuring tools, is important to prevent damage due to corrosion and oxidation. Using a thin film of mineral oil such as WD40, on a soft rag or cloth, wipe the tool over ensuring to cover all the metal parts of the tool. Be sure to wipe away any excess oil.

Your measuring tools should be cleaned regularly, ideally once a week. However, your cleaning routine all depends on a couple factors.

I *What I need to know?*

Welcome to Lesson 4: **Preparing and Interpreting Technical Drawing**

This lesson consists of (4) four learning competencies. Each learning competencies contains activities supported by each performance task and activities.

Are you ready to take the challenge?

This lesson contains the following learning outcomes.

> LO 1. Identify different kinds of technical drawings
>
> LO 2. Interpret technical drawing
>
> LO 3. Prepare/ make changes to electrical/ electronic schematics and drawings

After going through this module, you are expected to:

a. identify and interpret basic symbols and basic elements used in technical drawing;

b. select and use equipment in accordance with job requirements;

c. make a flowchart that illustrates a scenario

I *What is new?*

SELF-ASSESSMENT

Hi! You are about to start this module. Before anything else, take this **SELF-ASSESSMENT** survey questionnaire. Answer the table below.

Learning Outcome 3: Select measuring instruments		
Can I……..	**YES**	**NO**
Select correct technical drawing in accordance with the job requirement		
Identify and interpret symbols used in the drawing		
Draw and identify correctly electrical/ electronic schematic		

Well done! How many of the competencies in the survey are you knowledgeable of? Let us deepen your knowledge and understanding by proceeding to the next page.
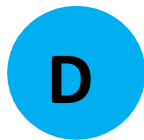
D What I know?

At this point, you are heading into meaningful activities and learning encounters. Complete the exercises and activities to experience lifelong, practical learning that awaits at the end of this course.

Pre-Assessment:

Directions: Match Column A with Column B. Write only the letter of the correct answer on a separate sheet of paper.

Column A	Column B
1. It is represented by a rectangle. It refers to an action in a business process.	a. Decision
2. It is represented by a diamond. A process that can answer a decision of "yes" or "no" requires a decision boxes.	b. Process
3. It is represented by a small circle or a connector box and is labeled using letters.	c. Arrow line
4. Drawn in one direction, preferably from top to bottom to keep a flowchart clear.	d. Connector
5. A process is represented by a rectangle with double lines on each side.	e. Sub-process
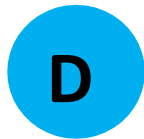
D What is in?

Learning Task 1: Four Pics, One Word

   Let us determine how much you already know by playing the game four pics, one word.

Direction: In this task, you'll be shown 4 photos in a grid, all of which share a word/s in common. Your goal is to figure out the common word based on word length, which is provided to you, and a selection of possible letters. The first one has already been done to serve as your example. Do the following numbers. *Let's start and have fun!*
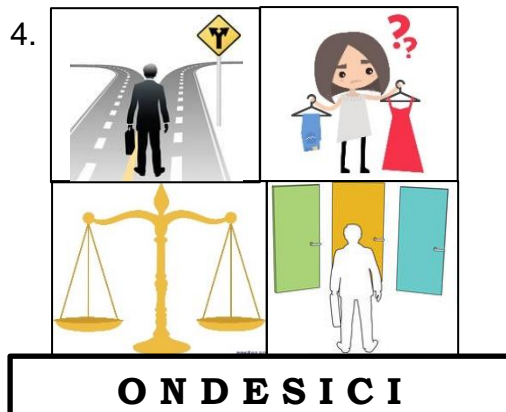
O R M I T R E N A T

1. Answer: _____Terminator_____

2.

N T O N E R C O C

Answer: _____

3.

S P E R O C S

Answer: _____

4.

O N D E S I C I

Answer: _____

5.

O C H L A R W T F
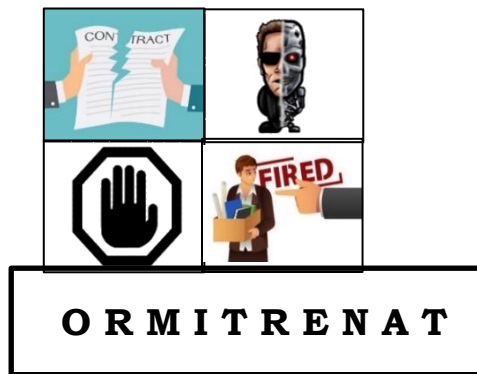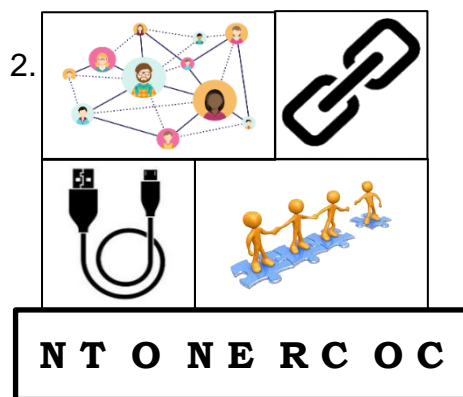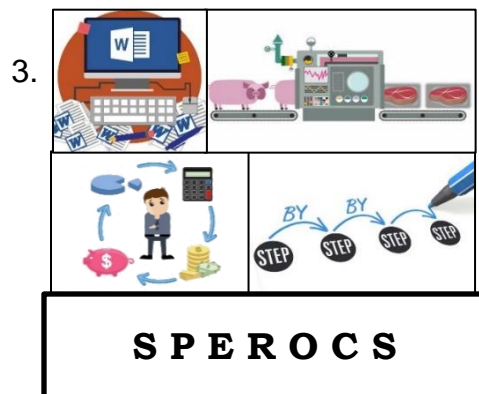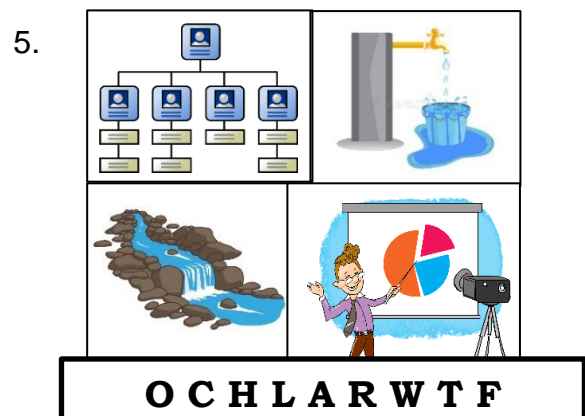
Answer: _____

D *What is it?*

Read the information below and try to assess your understanding by answering the learning on page 7.
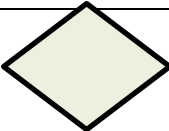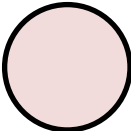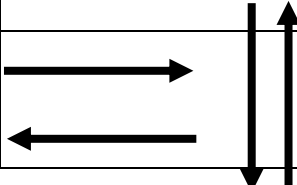
FLOWCHART

What is flowchart?

A flowchart is simply a graphical representation of steps. It shows steps in sequential order and is widely used in presenting the flow of algorithms, workflow or processes. Typically, a flowchart shows the steps as boxes of various kinds, and their order by connecting them with arrows.

Nowadays, flowcharts play an extremely important role in displaying information and assisting reasoning. They help us visualize complex processes, or make explicit the structure of problems and tasks. A flowchart can also be used to define a process or project to be implemented.

What are the elements of Flowchart?

A flowchart consists of elements, such as the terminator, process, sub process, decision, arrow lines, and connectors.

| Elements	Shape	Description
Terminator		A terminator is represented by a small rectangle with curved corners. A terminator appears at the start and at the end of a flowchart.
Process		A process is represented by a rectangle. It refers to an action in a certain process. It must be described clearly and concisely. A process can be described using a single verbnoun phrase; for example, "Order Office Supplies." The same level of detail must be kept in processes on a single flowchart.
Sub-process		A sub-process is represented by a rectangle with double lines on each side. A subprocess is a major process that could be broken up into simpler processes developed into another flowchart.
Decision		A decision is represented by a diamond. A process that can answer a decision of "yes" or "no" requires a decision box.
Connector		A connector is represented by a small circle or a connector box and is labeled using letters. A flowchart written on a single page is clearer than a flowchart on several pages. A connector ensures that the processes are connected logically and correctly on several pages.
Arrow Lines		Arrow lines drawn in one direction, preferably from top to bottom, keep a flowchart clear. Avoid arrow lines that loop because this could indicate redundancy in the business process

Flowcharts are the framework or diagram to visually illustrate a process. For example, a flowchart can be used to show the flow of diagnosing and repairing a computer hardware.

The following should be considered in making flowchart:
1. Spell out the process and purpose of the flowchart.
2. Identify the people who will be involved in planning, communicating, executing, evaluating, and monitoring the system.
3. Establish the parameter or boundary of the process. This means that the beginning and ending points are provided. Also, the primary and secondary tasks or activities should be included.

4. Indicate the rules, steps, activities, and decisions to be included in the flowchart. If there are gray areas, decisions should be deferred or investigated afterwards.
5. Arrange the steps in chronological and logical manner, a backward design can be done.
6. Decide on what symbols and flow line/direction to use. This will distinguish the activities and decisions in the system.
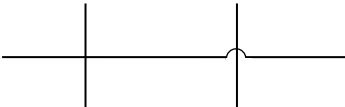7. Review and give the flowchart a title.
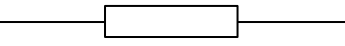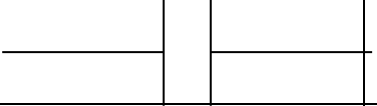
Example of Flowchart:

Turn on a Computer
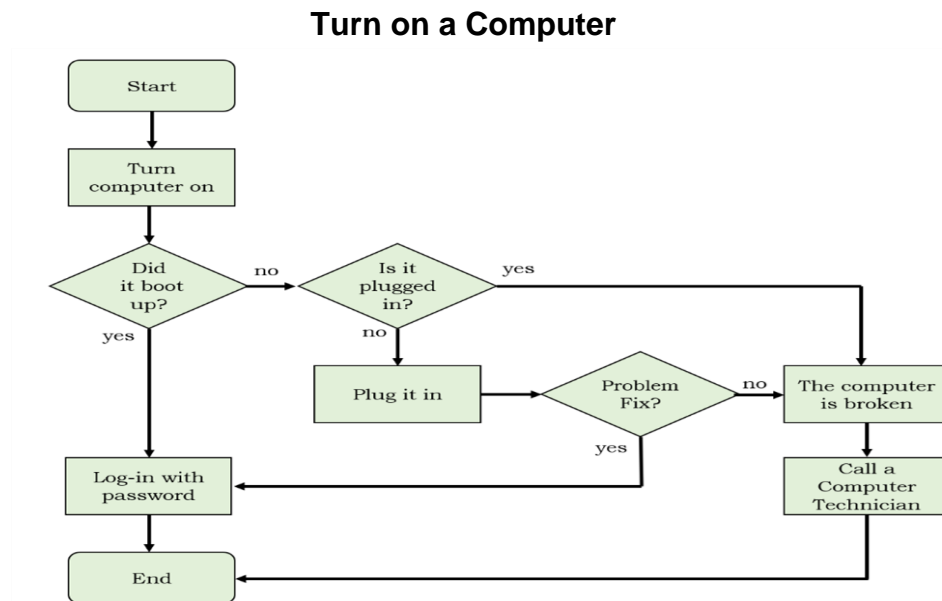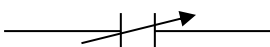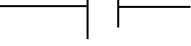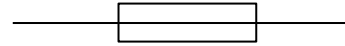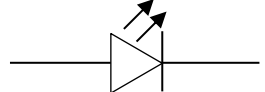
Schematic Diagrams

A **schematic diagram** is a picture that represents the components of a process, device, or other object using abstract, often standardized symbols and lines.

Schematic diagrams do not include details that are not necessary for comprehending the information that the diagram was intended to convey. For example, in a schematic diagram depicting an electrical circuit, you can see how the wires and components are connected together, but not photographs of the circuit itself.

Below is the table showing the common electrical and electronic symbols used in computer schematic diagrams.

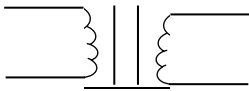| Component	Symbol	Function
Wire		It is a path where a current pass through.
Toggle Switch or Switch		Disconnects current when open
Wires joined		A black dot is drawn to display wire connection or junction.

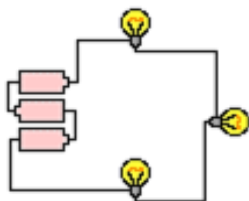|		
Wires not joined		A "bridge" is drawn to represent that no wires are connected.
Resistor		It restricts the flow of current through a LED.
Capacitor		It stores electric charge and is used with a resistor in a timing circuit.
Polarized Capacitor		It is used as a filter to block DC signals, but allows AC signals to pass.
Variable Capacitor		It is most commonly used as radio tuner.
Dry Cell		This device supplies electrical energy. The larger the terminal (on the left) is the positive (+).
DC Supply		The current supply flows in one direction.
AC Supply		The current supply periodically changes its direction.
Fuse		A safety device that melts and breaks the current flowing through it if has exceeded a specified value.
Transformer		It is used to increase and decrease AC voltages.
Diode		This semiconductor device allows current to flow in one direction.
LED (Light Emitting Diode)		This semiconductor diode converts electrical energy to light.
Light Bulb		Generates light when current flows through

Example of Schematic Diagram

Description with Words: Three Dry cells are placed in a battery pack to power a circuit containing three light bulbs.
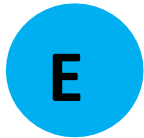
Drawing Circuit of Circuit   **Schematic Diagram of Circuit**
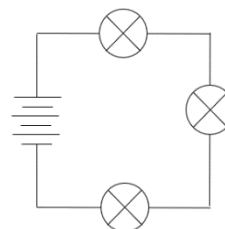
Using the verbal description, one can acquire a mental picture of the circuit being described. This verbal description can then be represented by a drawing of three cells and three light bulbs connected by wires. Finally, the circuit symbols presented above can be used to represent the same circuit. Note that three sets of long and short parallel lines have been used to represent the battery pack with its three D-cells. And note that each light bulb is represented by its own individual resistor symbol. Straight lines have been used to connect the two terminals of the battery to the resistors and the resistors to each other.

The above circuits presumed that the three light bulbs were connected in such a way that the charge flowing through the circuit would pass through each one of the three light bulbs in consecutive fashion. The path of a positive test charge leaving the positive terminal of the battery and traversing the external circuit would involve a passage through each one of the three connected light bulbs before returning to the negative terminal of the battery. But is this the only way that three light bulbs can be connected? Do they have to be connected in consecutive fashion as shown above? Absolutely not! In fact, example 2 below contains the same verbal description with the drawing and the schematic diagrams being drawn differently.

E *What is more?*

Now that you are familiar with selecting components to be measured, take this **SELF-ASSESSMENT** survey questionnaire. Answer the table below.

Learning Outcome 4: Preparing and Interpreting Technical Drawing		
Can I……..	**YES**	**NO**
Draw and identify correctly electrical/ electronic schematic.		
Identify correct drawing; select and use equipment in accordance with job requirements.		
Identify tasks to be undertaken for care and maintenance of drawings according to company procedures.		

E   *What I can do?*

Learning Task 2: Matching Type
Directions: Match the electrical component in Column A with its symbols in Column
   B. Write only the letter of the correct answer on a separate sheet of paper.
   And answer this learning task honestly, without looking at the previous pages.

Column A	Column B

1. Wire   a.
2. Fuse   b.
3. Variable Capacitor c.
4. Resistor   d.
5. Wires joined   e.
6. DC Supply   f.
7. Light Bulb   g.
8. Battery   h.
9. Switch   i
10. Capacitor   j.
                        k.

E *What else can I do?*

Learning Task 3: Challenge your Understanding

Direction: Draw a schematic diagram of the given scenarios below on a separate of paper. Use electrical and/or electronic symbols to construct schematic diagrams for the following circuits.

1. The circuit composed of a dry cell, and light bulb that are placed together with a switch that can be opened and closed to turn on the light bulb.
2. A student builds the circuit with a 9V battery and connect it to 2 resistors.

Learning Task 4: Flowchart Making

Directions: Using the basic symbols used for flowchart, make your own simple flow chart to illustrate the process of cleaning the computer parts and peripherals properly. Include the given activities below.

1. Preparation of cleaning tools
2. Identifying the parts to be clean
3. Cleaning the different peripherals

Your output on Learning Task 3 (Challenge your Understanding) and Learning Task 4 (Flowchart Making) will be graded according to the scoring rubrics below:

CRITERIA	PERCENTAGE	SCORE
Accuracy (Accurate function and information of the symbols was accurately included)	**30%**	
Presentation (Organization and sequence of the scenarios was shown and included)	**30%**	
Clarity (All assigned details and elements have been added. The details are clear and easy to identify)	**30%**	
Neatness (The output submitted is neat and no smudges.)	**10%**	
Performance Rating	**100%**	

A What I have learned?

Learning Task 5: My Learning

Direction: Answer the question below in an essay form. Avoid text spelling. Write your answer on a separate sheet of paper.

How can I turn learning into something beneficial to me and to others?

_____
_____
_____
_____
_____
_____

Your output will be graded according to the scoring rubrics below:

Criteria	5 points	3 points	1point	Score
Ideas	Presents ideas in an original manner	Presents ideas in a consistent manner	Ideas are too general	
Understanding	Writing shows strong understanding	Writing shows a clear understanding	Writing shows adequate understanding	
Sentence Structure	Sentence structure enhances meaning; flows throughout the piece	Sentence structure is evident; sentences mostly flow	Sentence structure is limited; sentences need to flow	

I   *What I need to know?*

Welcome to Lesson 5: **Using Hand Tools**

This lesson consists of (4) four learning outcomes. Each learning outcomes contains activities supported by each performance task and activities. Are you ready to take the challenge?

The module contains the following lessons.
Lesson 5   Using Hand Tools
   Plan and prepare for tasks to be undertaken
   Prepare hand tools
   Use appropriate hand tools and test equipment
   Maintain hand tools
After going through this module, you are expected to:
Prepare hand tools for computer systems servicing.

I   *What is new?*

Hi! You are about to start this module. Before anything else, take this **SELF-ASSESSMENT** survey questionnaire. Answer the table below.

Learning Outcome 5: Plan and prepare for tasks to be undertaken		
Can I……..	**YES**	**NO**
Identify tasks to be undertaken properly		
Identify and select appropriate hand tools according to the task requirements		

      Well done! How many of those in the survey are you knowledgeable of the competencies? Do you want to know more about this module?
Then let's proceed.

Hello there! This part of the module is about the first learning outcome of the Lesson 5 which is **plan and prepare for tasks to be undertaken.**

To do any repair work on PC, or before you event think about taking off the cover or case of your computer unit, it is suggested that you furnish yourself first with a computer tool kit. The proper use of hand tools is very important in computer application. Remember that troubleshooter must be knowledgeable in the tools and equipment.

D *What is in?*

Let us determine how much you already know about hand tools in Computer Systems Servicing to be measured. Take this test.
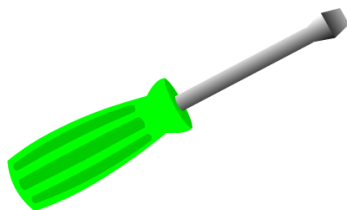
Learning Task 1: Identify Me!
Direction: Identify the tools. Write your answers on a separate sheet of paper.
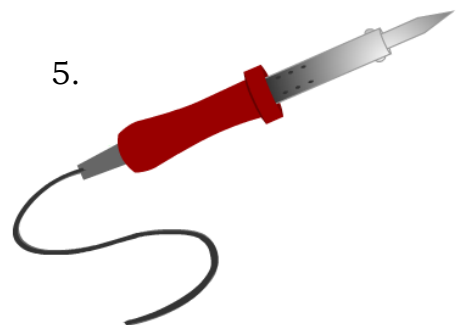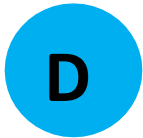
1.

4.

2.

3.

5.

Proper Tool Selection

A tool is a handheld device that aids in accomplishing a task. Tools range from a traditional metal cutting part of a machine to an element of a computer program that activates and controls a particular function.

Preparing for the task to be undertaken includes proper tool selection.

1. How do you select the best tool for the job? First, know and understand in detail the scope of work to be accomplished, second, plan for the scope considering the sequence of tasks.

2. Selecting the best tool for each task requires training in the proper use of the tools, field experience in their safe use, and following the manufacturer's guidance and instructions for that specific tool.

3. When obtaining the tool all the associated tooling and consumable parts, as recommended by the manufacturer, must be included. In addition, related consumable parts must be selected and used according to their manufacturer's instructions.

Safe Use of Tools
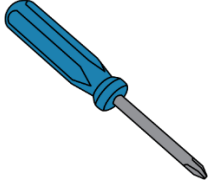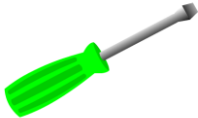
Once selected, use the tool for the purpose for which it was designed. Not all tools come with detailed instructions, but there are those that do spell out the safety "Do's and Don'ts" for your safety. If there are set-up /use options, operator judgement must always be based on what is the safest way to use the tool.

Environmental Safety and Health Program requires the following:

- All tools be kept in good condition with regular maintenance
- The right tool be used for the job
- Each tool be examined before use AND damaged or defective tools NOT to be used
- Tools be operated according to manufacturer's instructions
- The right protective equipment for the tool and activity be used

Hand tools

A *hand tool* is a device for performing work on a material or a physical system using only by hands. The hand tools can be manually used by employing force, or electrically powered---using electrical current. This are examples of hand tools:

	Philips head screwdriver - used to loosen or tighten cross head screwdriver.
	Flat head screwdriver – used to loosen or tighten slotted screws.
	Hex driver – sometimes called the "nut driver", is used to tighten nuts in the same way that a screwdriver tightens screws.
	Needle nose plier – used to hold small parts and to bend, re-position and snip wire. - (also known as pointy-*nose pliers*, *long-nose pliers*, pinch-*nose pliers* or snipe-*nose pliers*)
	Wire cutter – used to strip and cut wires.
	Tweezers - used to manipulate small parts.
	Flashlight – used to light up areas that you cannot see well.

E **What is more?**

Now that you are familiar with the different hand tools, take this **SELF-ASSESSMENT** survey questionnaire. Answer the table below
.

Learning Outcome 3: Select measuring instruments		
Can I……..	**YES**	**NO**
Identify tasks to be undertaken properly		
Identify and select appropriate hand tools according to the task requirements		

E **What I can do?**

Learning Task 2: More Tools, More Fun!
Direction: Draw other computer tools you are familiar with and write their
purpose. Put your answers in the table below provided below.

Tool	Definition

What else can I do?

Learning Task 3: Process and Understanding

Task: using your answers in Learning Task 2: **More Tools, More Fun!** Segregate the tools according to their classification whether it is an Electro-Static Discharge (ESD) Tool, Cleaning Tool, Hand Tool, or Diagnostic Tool.

Cleaning tools	**Hand tools**
Tool	Tool

ESD (Electro-Static Discharge) tools

Tool

Diagnostic tools

Tool

A *What I have learned?*

Learning Task 4: Do the Talk

Now, in order to for you to better understand the topics under planning and preparing for the tasks to be undertaken, dig deep into your mind and answer these questions correctly:

1. What is your observation to the topic presented?
2. Are those tools essential in computer systems servicing? Explain your answer.

CRITERIA	PERCENTAGE	SCORE
Accuracy (Accurate function and information of the device was accurately included)	**30%**	
Presentation (Organization and sequence of the paragraph was shown and included)	**30%**	
Clarity (Clearly delivered each topic)	**30%**	
Neatness	**10%**	
Performance Rating		

I *What I need to know?*

 You are now in the learning outcome 2 of Lesson 5 which is **prepare hand tools**. In this module you are able to understand more on checking of hand tools done in Computer Systems Servicing.
All is set! Let's Go.

Lesson 5 Using Hand Tools
       Plan and prepare for tasks to be undertaken
       Prepare hand tools
       Use appropriate hand tools and test equipment
       Maintain hand tools
After going through this module, you are expected to:
    1. Checking of hand tools
    2. Identifying unsafe or faulty tools

I *What is new?*

Hi! You are about to start this module. Before anything else,
take this SELF-ASSESSMENT survey questionnaire. Take time to answer
 the table below.

Learning Outcome 2: Prepare hand tools	YES	NO
Check appropriate hand tools for proper operation and safety		
Identify and mark unsafe or faulty tools for repair according to standard company procedure		

D *What I know?*

Hi! You are about to start this module. Before anything else, let us talk about how to identify an appropriate hand tools, we all know that hand tools are used to produce desired outcomes to job specifications which may include finish, tension, size or shape.

Hand tools are stored safely in appropriate location according to standard operational procedures and manufacturers' recommendations.

D *What is it?*

Hand tools are selected appropriate to the task requirements
Know how computer memory is measured; (bit, byte, KB, MB, GB). Relate computer memory measurements to characters, fields, records, files and directories/folders.

This provides information about the context in which the unit of competency is carried out. The variables [in bold] and scope [dot points] cater for different work requirements, work practices and knowledge between States, Territories and the Commonwealth, and between organizations and workplaces. The range statement relates to the unit as a whole and provides a focus for assessment. Text in italics in the performance criteria is explained here. The following variables may be present and may include, but are not limited to, the examples listed under the scope. All work is undertaken to relevant legislative requirements, where applicable. Hand tools • hacksaws, hammers, punches, screwdrivers, sockets, wrenches, scrapers, chisels, gouges, wood planes and files of all cross-sectional shapes and types.

A basic knowledge of a range of hand tools including:
- name
- characteristics
- use

- limitations
- hazard controls
- maintenance

Hand tools including:
- saw
- hammer
- punch
- screwdriver
- socket
- wrench
- scraper

- chisel
- file
- spanner
- pliers
- tap and die
  tension wrench

Considerations for the selection of hand tools including:
- skills/training
- time
- cost
- occupational health and safety (OHS) requirements
- appropriateness for purpose

E *What is more?*

Now that you are familiar with the topic/lesson given, take this **SELF-ASSESSMENT** survey questionnaire. Answer the table below.

Learning Outcome 2: Prepare hand tools	YES	NO
Check appropriate hand tools for proper operation and safety		
Identify and mark unsafe or faulty tools for repair according to standard company procedure		

E *What else can I do?*

Learning Task 1: **Summarize ME**
Show that you learned something by doing this activity.

Direction: Write down in a separate sheet of paper what you have learned in this lesson. Make sure to include the correct information needed.

CRITERIA	PERCENTAGE	SCORE
Accuracy (Accurate function and information of the device was accurately included)	**30%**	
Presentation (Organization and sequence of the paragraph was shown and included)	**30%**	
Clarity (Clearly delivered each topic)	**30%**	
Neatness	**10%**	
Performance Rating		

A *What I have learned?*

Learning Task 2: Process Your Knowledge
Now, in order to for you to better understand the topics / lesson given, dig deep into your mind and answer the following essential questions correctly:
1. In your point of view, how are you going to check appropriate hand tools in computer systems servicing? Give 5 sentences only.
2. How to identify unsafe or faulty tools? Give at least 5 examples.

I *What I need to know?*

You are now in the Learning Outcome 3 of Lesson 5 which is **use appropriate hand tools and test equipment.**

Quality refers to the characteristics of a product or service that bear on its ability to satisfy stated or implied needs. It also refers to a product or service free of deficiencies. The quality of a product or service refers to the perception of the degree to which the product or service meets the customer's expectations. Quality has no specific meaning unless related to a specific function and/or object. Quality is a perceptual, conditional and somewhat subjective attribute.

Lesson 5 Using Hand Tools
    Plan and prepare for tasks to be undertaken
    Prepare hand tools
    Use appropriate hand tools and test equipment
    Maintain hand tools

After going through this module, you are expected to:
1. Operate hand tools;
2. Understand safety procedures using handling tools; and
3. Familiarize PPE or Personal Protective Equipment

I *What is new?*

Hi! You are about to start this module. Before anything else, take this **SELF-ASSESSMENT** survey questionnaire.

Learning Outcome 3: Use appropriate hand tools and test equipment	YES	NO
Use tools according to tasks undertaken.		
Observe all safety procedures in using tools at all times and use appropriate PPE		
Report malfunctions, unplanned or unusual events to the supervisor		

D *What I know?*

All tools and equipment must be properly maintained so that workers are not endangered. Regulations requires inspections of tools, machines and equipment before use.

Advantages of maintaining tools and equipment:
1. Well organized
2. Exact purpose; and
3. Defines operational procedures.

D *What is in?*
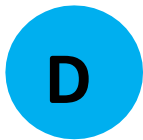
Learning Task 1: Do You Still Remember?
Instruction: Identify the appropriate tool to use for each of the following:

_____1. Equalize the electrical charge between you and the equipment.

_____2. Tighten / loosen screw

_____3. Tighten / loses bold with a hexagonal head

_____4. Retrieve parts that may be hard to reach by your fingers

_____5. Tighten / loosen a slotted screw.

PROPER USE OF TOOLS

Proper Use of Hand Tools
A technician needs to be able to properly use each tool in the toolkit. This topic covers many of the various hand tools used when repairing computers.
Screws
Match each screw with the proper screwdriver. Place the tip of the screwdriver on the head of the screw. Turn the screwdriver clockwise to tighten the screw and counterclockwise to loosen the screw.
Screws can become stripped if you over-tighten them with a screwdriver. A stripped screw, may get stuck in the screw hole, or it may not tighten firmly. Discard stripped screws.

Flat head screwdriver
Use a flat head screwdriver when you are working with a slotted screw. Do not use a flat head screwdriver to remove a Phillips head screw. Never use a screwdriver as a pry bar. If you cannot remove a component, check to see if there is a clip or latch that is securing the component in place.
CAUTION: If excessive force is needed to remove or add a component, something is probably wrong. Take a second look to make sure that you have not missed a screw or a locking clip that is holding the component in place. Refer to the device manual or diagram for additional information.

Phillips head screwdriver
Use a Phillips head screwdriver with crosshead screws. Do not use this type of screwdriver to puncture anything. This will damage the head of the screwdriver.

Hex driver
Use a hex driver to loosen and tighten bolts that have a hexagonal (six-sided) head. Hex bolts should not be over-tightened because the threads of the bolts can be stripped. Do not use a hex driver that is too large for the bolt that you are using.
CAUTION: Some tools are magnetized. When working around electronic devices, be sure that the tools you are using have not been magnetized. Magnetic fields can be harmful to data stored on magnetic media. Test your tool by touching the tool with a screw. If the screw is attracted to the tool, do not use the tool.

Part retriever, Needle-nose pliers, or tweezers
The part retriever, needle-nose pliers, and tweezers can be used to place and retrieve parts that may be hard to reach with your fingers. Do not scratch or hit any components when using these tools.

CAUTION: Pencils should not be used inside the computer to change the setting of switches or to pry off jumpers. The pencil lead can act as a conductor and may damage the computer components.

Proper Use of ESD Tools

The purpose of an antistatic wrist strap is to equalize the electrical charge between you and the equipment. The antistatic wrist strap is a conductor that connects your body to the equipment that you are working on. When static electricity builds up in your body, the connection made by the wrist strap to the equipment, or ground, channels the electricity through the wire that connects the strap.

The wrist strap has two parts and is easy to wear:
1. Wrap the strap around your wrist and secure it using the snap or Velcro. The metal on the back of the wrist strap must remain in contact with your skin at all times.
2. Snap the connector at the end of the wire to the wrist strap, and connect the other end either to the equipment or to the same grounding point that the antistatic mat is connected to. The metal skeleton of the case is a good place to connect the wire. When connecting the wire to equipment that you are working on, choose an unpainted metal surface. A painted surface does not conduct the electricity as well as unpainted metal.

An antistatic mat is slightly conductive. It works by drawing static electricity away from a component and transferring it safely from equipment to a grounding point:
1. Lay the mat on the workspace next to or under the computer case.
2. Clip the mat to the case to provide a grounded surface on which you can place parts as you remove them from the system.

Reducing the potential for ESD reduces the likelihood of damage to delicate circuits or components.

Proper Use of Cleaning Materials

Keeping computers clean inside and out is a vital part of a maintenance program. Dirt can cause problems with the physical operation of fans, buttons, and other mechanical components. On electrical components, an excessive buildup of dust will act like an insulator and trap the heat. This insulation will impair the ability of heat sinks and cooling fans to keep components cool, causing chips and circuits to overheat and fail.

CAUTION: When compressed air is used to clean inside the computer, the air should be blown around the components with a minimum distance of four inches from the nozzle.

The power supply and the fan should be cleaned from the back of the case.
CAUTION: Before cleaning any device, turn it off and unplug the device from the power source.

Computer Cases and Monitors
Clean computer cases and the outside of monitors with a mild cleaning solution on a damp, lint-free cloth. Mix one drop of dishwashing liquid with four ounces of water to create the cleaning solution. If any water drips inside the case, allow enough time for the liquid to dry before powering on the computer.

LCD Screens
Do not use ammoniated glass cleaners or any other solution on an LCD screen, unless the cleaner is specifically designed for the purpose. Harsh chemicals will damage the coating on the screen. There is no glass protecting these screens, so be gentle when cleaning them and do not press firmly on the screen.

CRT Screens
To clean the screens of CRT monitors, dampen a soft, clean, lint-free cloth with distilled water and wipe the screen from top to bottom. Then use a soft, dry cloth to wipe the screen and remove any streaking after you have cleaned the monitor.

Clean dusty components with a can of compressed air. Compressed air does not cause electrostatic buildup on components. Make sure that you are in a well-ventilated area before blowing the dust out of the computer. A best practice is to wear a dust mask to make sure that you do not breathe in the dust particles.

Blow out the dust using short bursts from the can. Never tip the can or use the compressed air can upside down. Do not allow the fan blades to spin from the force of the compressed air. Hold the fan in place. Fan motors can be ruined from spinning when the motor is not turned on.

Component Contacts
Clean the contacts on components with isopropyl alcohol. Do not use rubbing alcohol. Rubbing alcohol contains impurities that can damage contacts. Make sure that the contacts do not collect any lint from the cloth or cotton swab. Blow any lint off the contacts with compressed air before reinstallation.
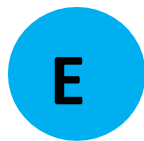
Keyboard
Clean a desktop keyboard with compressed air or a small, hand-held vacuum cleaner with a brush attachment.
CAUTION: Never use a standard vacuum cleaner inside a computer case.

The plastic parts of the vacuum cleaner can build up static electricity and discharge to the components. Use only a vacuum approved for electronic components.

Mouse

Use glass cleaner and a soft cloth to clean the outside of the mouse. Do not spray glass cleaner directly on the mouse. If cleaning a ball mouse, you can remove the ball and clean it with glass cleaner and a soft cloth. Wipe the rollers clean inside the mouse with the same cloth. Do not spray any liquids inside the mouse.

E *What is more?*

Now that you are familiar with the lesson, take this **SELF-ASSESSMENT** survey questionnaire. Answer the table below.

Learning Outcome 3: Use appropriate hand tools and test equipment	YES	NO
Use tools according to tasks undertaken.		
Observe all safety procedures in using tools at all times and use appropriate PPE		
Report malfunctions, unplanned or unusual events to the supervisor		

Well done! Let's us proceed to other activities.

E *What I can do?*

COMPUTER MAINTENANCE

COMPONENTS TO CLEAN	CLEAN WITH:
Example: Computer case and outside monitor	Mild cleaning solution and lint free cloth (sample)
Keyboard	
Mouse	
LCD screen	
CRT screen	
Heat sink	
RAM	

E *What else can I do?*

Learning Task 3: Apply and Learn!
Directions: Use the appropriate tools to do each of the following tasks. Write down the correct answer.

1. Loosen computer casing screws
   Answer: _____
2. Blow away dust from keyboard
   Answer: _____
3. Tighten screws of a laptop
   Answer: _____
4. Bundle cables inside the computer
   Answer: _____
5. Test functionality of the printer port
   Answer: _____
6. Remove insulation of wires
   Answer: _____

7. Loosen nuts
   Answer: _____
8. Prevent from ESD effects
   Answer: _____

A *What I have learned?*

Learning Task 4: True or False
Direction. Fill in the blanks. Write your answers on a separate sheet of paper.

1. The purpose of an antistatic wrist strap is to _____ the electrical charge between you and the equipment.
2. Turn the screwdriver _____ to tighten the screw
3. Turn the screwdriver _____ to loosen the screw.
4. Use a _____ head screwdriver with crosshead screws.
5. On electrical components, an excessive buildup of dust will act like an _____ and trap the heat.
6. When compressed air is used to clean inside the computer, the air should be blown around the components with a minimum distance of _____ inches from the nozzle.
7. Pencils should not be used inside the computer to change the setting of switches or to pry off jumpers because the tip contains _____ which can act as a conductor and may damage the computer components.
8. To clean the screens of CRT monitors, dampen a soft, clean, lint-free cloth with _____ water and wipe the screen from top to bottom.
9. Clean the contacts on components with _____ alcohol.
10. Use a _____ to loosen and tighten bolts that have a hexagonal (six-sided) head.

I *What I need to know?*

You are now in the Learning Outcome 4 of Lesson 5 which is **maintain hand tools.**

Lesson 5 Using Hand Tools
      Plan and prepare for tasks to be undertaken
      Prepare hand tools
      Use appropriate hand tools and test equipment
      Maintain hand tools
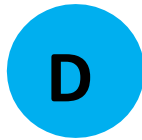After going through this module, you are expected to:

    4. Maintain hand tools.

I *What is new?*

Hi! You are about to start this module. Before anything else, take this **SELF-ASSESSMENT** survey questionnaire.

| **Learning Outcome 4: Use maintain hand tools**	**YES**	**NO**
Do not drop tools to avoid damage; carry out routine maintenance of tools according to standard operational procedures, principles, and techniques		
Store tools safely in appropriate locations in accordance with manufacturer's specifications or standard operating procedures		

D *What I know?*

The degree of detail to include regarding tools and equipment maintenance will depend on the kind to tools/ equipment used.
Some construction equipment may have very specific inspection and maintenance requirements. Electronic equipment may have different maintenance requirements.

Hand tools may require only basic maintenance. Power tools should be maintained in good working order. This may be limited to ensuring that blades/ bits are replaced when needed and those guard or other safety devices are operable and any damaged electrical cord/ plugs are repaired or replaced. Damaged or defective tools should be tagged and removed from service.
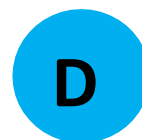
D *What is in?*

Let us determine how much you already know about the maintenance of hand tools. Take this test.

Learning Task 1: Challenge yourself
Direction. Write TRUE if the statement is correct and FALSE if it is wrong. Write your answers on a separate sheet of paper.

1. All tools and equipment must be properly maintained so that workers are not endangered.
2. Preventive maintenance is the systematic care and protection of tools, equipment and machines in order to keep them in a safe, usable condition, limit downtime and extend productivity.
3. The degree of detail to include regarding tools and equipment maintenance will depend on the kinds of tools/equipment used.
4. Damaged or defective equipment/tools should be tagged and removed from service.
5. Most manufacturers can provide maintenance schedules for their equipment.
6. Properly stored tools and equipment will be easy to find when needed and are less likely to be lost.
7. Use bins for storing small parts is a good practice on proper storage.
8. Productivity is increased because time is not lost looking for tools, parts and equipment is one of the benefits of proper storage.

TOOL AND EQUIPMENT MAINTENANCE

All tools and equipment must be properly maintained so that workers are not endangered. Regulations require inspections of tools, machines and equipment before use.

Preventive maintenance is the systematic care and protection of tools, equipment and machines in order to keep them in a safe, usable condition, limit downtime and extend productivity. We must always be aware that maintenance tasks themselves are potentially hazardous and can result in injury. The successful maintenance program is:
- well organized and scheduled,
- controls hazards,
- defines operational procedures, and ☐ trains key personnel.

The degree of detail to include regarding tools and equipment maintenance will depend on the kinds of tools/equipment used. Some construction equipment may have very specific inspection and maintenance requirements. Electronic equipment may have different maintenance requirements. Hand tools may require only basic maintenance. Power tools should be maintained in good working order. This may be limited to ensuring that blades/bits are replaced when needed and those guards or other safety devices are operable and any damaged electrical cords/plugs are repaired or replaced. Damaged or defective equipment/tools should be tagged and removed from service.

Most manufacturers can provide maintenance schedules for their equipment. Large companies typically have a comprehensive maintenance program due to the capital investment and/or leasing agreements. Smaller companies may lease equipment and maintenance services may be included in the leasing agreement.

General requirements for tools and equipment maintenance include:
- Obtaining a copy of the maintenance schedule recommended by the manufacturer
- Ensuring that maintenance is performed as required
- Ensuring that the person(s) performing the maintenance are competent (e.g. licensed mechanic)

- Retaining records of maintenance/service conducted
- Specifying who is responsible for overseeing equipment maintenance and where the records are kept
- Set up a system for removal and tagging of damaged or defective tools and equipment

PROPER STORAGE OF TOOLS, PARTS, AND EQUIPMENT

To ensure that tools and equipment remain in good condition and last for a long time, store them properly. Properly stored tools and equipment will be easy to find when needed and are less likely to be lost.

Good practices include:

- Parts should be properly stored and labeled (Figure 1).
- Tools should be properly placed on the board, and labeled (Figure 2). Consider drawing the shapes of the tools on the board so that they always get put back in the same position.
- Use bins for storing small parts (Figure 3).
- Consider making an individual (or individuals) responsible for the good maintenance of tools and parts.

| Figure 1. | Figure 2. | Figure 3. |

Benefits:
- Tools and parts are kept in good condition and are easy to find ☐ Costs are reduced.
- Productivity is increased because time is not wasted looking for tools, parts and equipment.
- Workshop staff develop a sense of responsibility and pride in their work.

E   *What is more?*

Now that you are familiar with the lesson, take this **SELF-ASSESSMENT** survey questionnaire. Answer the table below.

Learning Outcome 4: Use maintain hand tools	YES	NO
Do not drop tools to avoid damage; carry out routine maintenance of tools according to standard operational procedures, principles, and techniques		
Store tools safely in appropriate locations in accordance with manufacturer's specifications or standard operating procedures		

Well done! Let's us proceed to other activities.

E   *What I can do?*

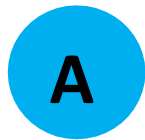**Learning Task 2: ENUMERATION**
Instruction: Enumerate the following;

Enumerate the following.

Good practices in the proper storage of tools: (at least 2)

1.
2.

Benefits of proper storage of tools: (at least 2)

1.

2.

A *What I have learned?*

Show that you learned something by doing this activity.

Learning Task 3: Learn and Understand More
Direction: Conduct a maintenance activity on the given hand tools.

TOOLS	MAINTENANCE ACTIVITY
1. Flat Head Screwdriver	Clean and Magnetize
2. Philips Head Screwdriver	Clean and Magnetize
3. Torx Screwdriver	Clean and Magnetize
4. Hex Driver	Clean and Magnetize
5. Needle-Nose Plier	Clean and Lubricate
6. Wire Cutter	Clean, Lubricate and Sharpen, if necessary
7. Tweezer	Clean
8. Part Retriever	Clean
9. Flashlight	Clean and Change batteries if drained

Score Card

Activity	Excellent	Very satisfactory	Satisfactory	Score
Cleaning hand tools	**5**	**3**	**1**	
Magnetizing hand tools				
Calibrating hand tools				
Changing batteries				
Lubricating hand tools				
Sharpening hand tools				
Storing hand tools				

Explain and summarize what you have done in this activity. Include your observation.
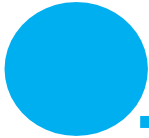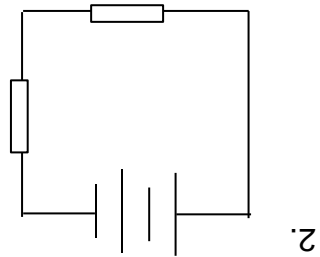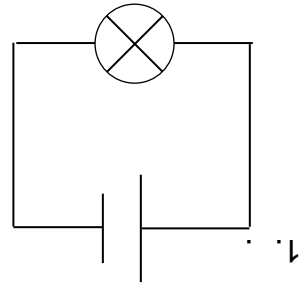
Answer Key

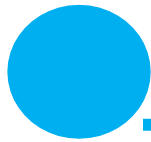**Learning Task 1: Four Pics, One Word**
1. Terminator
2. Connector
3. Process
4. Decision
5. Flowchart

Learning Task 2: Matching Type
1. C
2. I
3. K
4. H
5. G
6. E
7. D
8. B
9. A
10. F

Learning Task 3: Challenge your Understanding

1.

2.

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