Lesson Plan

Course Title: Computer Maintenance

Session Title: Motherboards

Lesson Duration: 180 minutes

Performance Objective:
Upon completion of this assignment, the student will understand the importance of the motherboard, how it functions, and the many types of motherboards in the market today.

Specific Objectives:

- Describe the function of the motherboard.
- Identify the different types of motherboards and their functions.
- Identify the main components of the motherboard
- Determine the capabilities and limitations of the system.
- Identify the considerations when purchasing a motherboard.
- Recognize Expansion Card Architecture
- Recognize the relationship between CPU and Bus speeds and how to control them.
- Recognize the hardware configuration using DIP switches, jumpers, and CMOS.
- Identify the components of a typical board system layout.
- Identify the characteristics of various other motherboard layout types.
- Describe troubleshooting techniques and maintenance tips.
- Remove and install a motherboard in a PC.
- Sketch and label the components of a motherboard in a PC.

Preparation

TEKS Correlations:
This lesson, as published, correlates to the following TEKS. Any changes/alterations to the activities may result in the elimination of any or all of the TEKS listed.

130.273(c)(1)
The student demonstrates the necessary skills for career development, employability, and successful completion of course outcomes. The student is expected to:
(A) identify and demonstrate positive work behaviors that enhance employability and job advancement such as regular attendance, promptness, attention to proper attire, maintenance of a clean and safe work environment, appropriate voice, and pride in work;
(B) identify and demonstrate positive personal qualities such as flexibility, open-mindedness, initiative, listening attentively to speakers, and willingness to learn new knowledge and skills;
(C) employ effective reading and writing skills;
(G) identify and implement proper safety procedures;

130.273(c)(3)
The student applies academic skills to the requirements of computer technologies. The student is expected to:
(D) interpret appropriate documentation such as schematics, drawings, charts, diagrams,

technical manuals, and bulletins.

130.273(c)(4)
The student acquires an understanding of computer technologies. The student is expected to:
(A) explain the fundamentals of microprocessor theory;
(D) explain proper troubleshooting techniques as related to computer hardware;
(F) explain the relationships relative to data-communications theory;
(G) describe the architecture of various computer systems;
(H) describe the function of computer components such as central processing units, storage devices, and peripheral devices; and
(I) explain computer system environmental requirements and related control devices.

130.273(c)(5)
The student knows the proper function and application of the tools, equipment, and materials used in computer technologies. The student is expected to:
(A) demonstrate safe use of equipment in computer technologies such as hand and power tools;
(B) employ available reference documentation such as tools, materials, and Internet sources to access information as needed;

130.273(c)(6)
The student applies the concepts and skills of the trade in simulated work situations. The student is expected to:
(C) identify the operational features and proper terminology related to computer systems;
(D) identify the various components of a computer system such as the central processor, basic input and output system, read-only memory, and random access memory; and

130.273(c)(7)
The student uses hardware design, operation, and maintenance knowledge and skills to provide computer support. The student is expected to:
(A) identify the purpose and function of computer components in the operation of the computer system such as central processing unit, mother board, sockets, chipsets, basic input and output system and their drivers, memory, hard drive technologies, video cards, input and output devices and ports, and modem and network interface cards (NIC);
(D) assemble and install a basic computer system; and
(E) install and configure computer components and peripherals.

125.46(c)(8)
The student uses troubleshooting skills with hardware knowledge to solve client problems. The student is expected to:
(A) understand the rationale behind error messages and symptoms of hardware failures;
(D) test system using diagnostic tools and software;
(J) repair malfunctioning hardware systems;

Instructor/Trainer

References:
Peter Norton's Introduction to Computers 4th Edition, Lesson 2: Standard Methods of Input
PC Upgrade and Repair Simplified 2nd Edition
Comp TIA's A+ Certification Handbook
www.Intel.com

Instructional Aids:

1. Motherboard PowerPoint Presentation
2. Motherboard PowerPoint Presentation – Handouts
3. Motherboard Organizer
4. Motherboard Exam
5. Motherboard Exam Key
6. Motherboard – Lab
7. Motherboard – Lab Scoring Rubric

Materials Needed:

1. Copies of the Organizer (1 per student)
2. Copies of the Lab Assignment (1 per student)

Equipment Needed:

1. A projection system to play the PowerPoint presentation
2. Computers that the student can take apart and work with

Learner

Students should read the appropriate curriculum material on motherboards, depending on the text/ curriculum being used for this course. This lesson can be taught with only the PowerPoint presentation, and the equipment outlined above.

Introduction

MI	Introduction (LSI Quadrant I):
	**SAY:** The motherboard houses the CPU and allows all other devices to communicate within the PC. **SAY:** The motherboard is also called the system board and is the most complex component in the computer. **ASK:** Has anyone ever seen the motherboard inside the computer? It is the single largest printed circuit board inside the computer and is either green or gold. **SAY:** There are several factors that should be considered when selecting a motherboard, such as the form factor, power management, processor socket, chipsets, memory, buses, and BIOS. We will go over these factors in further detail.

Outline

MI	Outline (LSI Quadrant II):	Instructor Notes:
	Lesson Introduction and Overview (PPT Slides 1-4) I. Describe the function of the motherboard (PPT Slide 5). II. Identify the different types of motherboards and their characteristics (PPT Slide 6). III. Identify the main components of the motherboard (PPT Slide 7).	**Note:** Instructors can use the PowerPoint slides, handouts, and note pages in conjunction with the following outline.

	IV. Determine the capabilities and limitations of the motherboard system (PPT Slide 8). V. Identify considerations when purchasing a motherboard (PPT Slide 9). 1. Information provided on the system clock and chipset (PPT Slides 10-14). 2. Information provided on the bus systems and expansion slots (PPT Slides 15-17). VI. Recognize Expansion Card Architecture (PPT Slides 19-23). VII. Recognize the relationship between the CPU and Bus speeds and how to control them (PPT Slides 24-26). VIII. Recognize hardware configuration using DIP switches, jumpers, and CMOS (PPT Slides 27-29). IX. Identify the components of the typical board system layout (PPT Slide 30). X. Identify the characteristics of other types of motherboard layouts (PPT Slides 31-36). XI. Describe troubleshooting techniques and maintenance tips (PPT Slides 37-38).	**Note:** The teacher should handout 1 Motherboards Organizer per student. Display the PowerPoint presentation, Motherboards, using a computer and projector. Students will fill in the organizer during the presentation.
	XII. The students remove and install a motherboard on a PC (refer to the lab assignment sheet for the steps). XIII. Sketch and label the components of a motherboard in a PC (refer to the lab assignment sheet for the steps).	The teacher should hand out the Lab Assignment 1 sheet to the students and review the instructions. Using a PC, the teacher should now demonstrate how to properly remove and install a motherboard by following the steps listed on the lab assignment sheet. Allow the students to make notes that will help them during the lab activity on the lab sheets.
Application		
MI	**Guided Practice (LSI Quadrant III):**	
	1. The teacher demonstrates each lab principle. 2. The teacher maintains direct supervision in the lab, providing guidance when warranted.	

MI	Independent Practice (LSI Quadrant III):
	1. Students work individually on lab assignments, demonstrating their skills in identifying and discussing the various lab requirements and results.
Summary	
MI	**Review (LSI Quadrants I and IV):**
	Checking for understanding (Q&A Session) **Q:** What is the main function of the motherboard? **A:** *The motherboard houses the CPU and allows all other devices to communicate within the PC.* **Q:** What is another name for the motherboard? **A:** *System board.* **Q:** Name the four types of motherboards? **A:** *ATX, Baby ATX, AT, and mini AT.* **Q:** What are some of the components found on the motherboard? **A:** *CPU, system clock, buses, expansion slots, BIOS, memory, CMOS.* **Q:** What are some of the things you should look for when choosing a motherboard? **A:** *Form factor, Power management, processor socket, chipset, memory, buses, and BIOS.*
Evaluation	
MI	**Informal Assessment (LSI Quadrant III):**
	Monitor student progress during independent practice and provide independent re-teach/redirection as needed.
MI	**Formal Assessment (LSI Quadrant III, IV):**
	Use the Lab Assignment Scoring Rubric Use the Motherboard Exam and Exam Key.
Extension	
MI	**Extension/Enrichment (LSI Quadrant IV):**
	▪ Students that have mastered the lab assignments can peer-tutor students (one-on-one) that are having difficulty performing the lab. ▪ Students demonstrating mastery of the lab assignments may also be called upon to apply learning by assisting the Campus Technologist in maintaining, repairing, or upgrading campus equipment.

Icon	MI	Teaching Strategies	Personal Development Strategies
	**Verbal/ Linguistic**	Lecture, discussion, journal writing, cooperative learning, word origins	Reading, highlighting, outlining, teaching others, reciting information
	**Logical/ Mathematical**	Problem-solving, number games, critical thinking, classifying and organizing, Socratic questioning	Organizing material logically, explaining things sequentially, finding patterns, developing systems, outlining, charting, graphing, analyzing information
	**Visual/Spatial**	Mind-mapping, reflective time, graphic organizers, color-coding systems, drawings, designs, video, DVD, charts, maps	Developing graphic organizers, mind-mapping, charting, graphing, organizing with color, mental imagery (drawing in the mind's eye)
	**Musical/ Rhythmic**	Use music, compose songs or raps, use musical language or metaphors	Creating rhythms out of words, creating rhythms with instruments, playing an instrument, putting words to existing songs
	**Bodily/ Kinesthetic**	Use manipulatives, hand signals, pantomime, real life situations, puzzles and board games, activities, role-playing, action problems	Moving while learning, pacing while reciting, acting out scripts of material, designing games, moving fingers under words while reading
	**Intrapersonal**	Reflective teaching, interviews, reflective listening, KWL charts	Reflecting on personal meaning of information, studying in quiet settings, imagining experiments, visualizing information, journaling
	**Interpersonal**	Cooperative learning, role-playing, group brainstorming, cross-cultural interactions	Studying in a group, discussing information, using flash cards with others, teaching others
	**Naturalist**	Natural objects as manipulatives and as a background for learning	Connecting with nature, forming study groups with like-minded people
	**Existentialist**	Socratic questions, real life situations, global problems/questions	Considering the personal relationship to the larger context

Motherboards PowerPoint Outline

Objectives

- Describe the function of the motherboard.
- Identify the different types of motherboards and their functions.
- Identify the main components of the motherboard.
- Determine the capabilities and limitations of the system.
- List the considerations when purchasing a motherboard.
- Identify the typical board system layout and variations in layout of other motherboard types.
- Identify motherboard troubleshooting techniques and maintenance tips.

I. Function of a Motherboard

A. Houses the _____

B. Allows all devices to _____ with the motherboard and with _____ _____

C. Determines the _____ and _____ of the system

II. 4 Types of Motherboards

Type of Motherboard	Description
_____	• Oldest type of motherboard • UsesP8 and P9 _____ • Measures _____ inches X _____ inches
_____	• Smaller version of above • UsesP8 and P9 _____ • Measures _____ inches X _____ inches
_____	• Developed by Intel for _____ systems, and more convenient than above • Includes a power-on switch that can be _____ • Uses a _____ connector • Measures _____ inches X _____ inches
_____	• More compact than above • Measures _____ inches X _____ inches

III. Main Components on a Motherboard

1.	2.	3.	4.	5.
6.	7.	8.	9.	10.

IV. Selection of a Motherboard Determines

A. CPU _____ and speeds

B. Chip ____ on the board

C. Memory cache _____ and _____

D. Types and number of _____ _____

E. Type of _____. Examples: _____, _____, _____, _____, or _____

F. Type of _____. What _____ and how _____ _____ and _____

G. Type of _____

H. ROM _____

I. Type of _____ connector

J. Presence/absence of proprietary _____, local _____ _____, _____ adapters and _____ controller, _____ports, LPT _____, and _____ port

V. Considerations when Selecting a system board

A. Circle only the letters A-J in section IV above that you need to consider when choosing a motherboard.

VI. The System Clock

A. Keeps the _____ for motherboard activities

B. Frequency is measured in _____

C. Wait state occurs when

_____.

VII. The Chip Set

A. Set of chips on the motherboard that collectively _____ the memory

_____, external _____, and some _____

VIII. Buses Types

Bus Type	**Description**
	This is a ____-directional pathway, which means that information can flow _____ _____.
	This is a ____-directional pathway, which means that information can flow _____ _____.
	This carries the _____ and _____ signals needed to coordinate the activities of the entire computer.

IX. Buses and Expansion Slots

A. Today's PCs have _____ or ____ buses.

B. A bus carries _____ _____, _____ signals,

_____ addresses, and data.

C. On-board ports.

X. Relationship of CPU Speed to Bus Speed

A. When the multiplier is large, overall performance of system is _____ than when it is small.

B. Change the speed of a computer by changing _____ of the system _____, or by changing _____ that determines _____ of _____.

XI. CPU and Bus Speeds

A. CPU speed is determined by _____ X _____.

1. Typical speeds are _____, _____ and _____.
2. Controlled by _____, _____, _____

B. Memory or system bus speed is based on _____

1. Typical values are _____ to _____
2. Controlled by: _____, _____, _____

C. PCI bus speed: _____ by 2

1. Setting the speed of _____ sets the speed of the PCI bus.

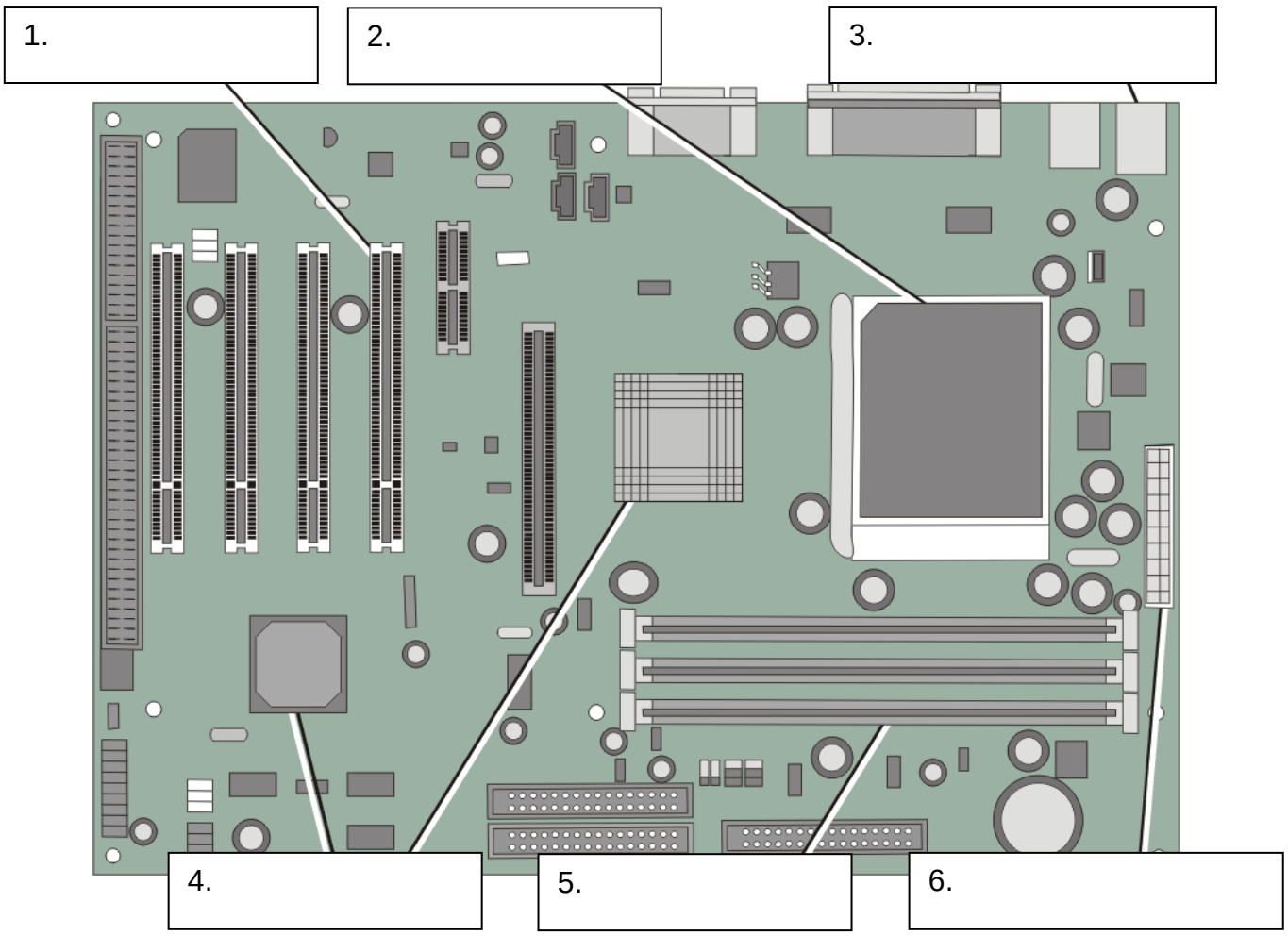
D. ISA bus: runs as _____ speed: _____.

XII. Hardware configuration

A. Tells the CPU what hardware _____ are present and how they are _____ to interface with the CPU.

B. Provided on the motherboard by _____, _____, and _____

XIII. A Typical System Board Layout:



XIV. How does the Dual Processor Motherboard differ from the typical layout?

_____

XV. On the typical system board layout above, mark the ISA slot and the battery.

XVI. Troubleshooting and Maintenance

A. If the motherboard is not working properly, the problem is often caused by:

_____.

B. What should you do first in the troubleshooting process?

_____

_____.

C. If this doesn't work, what should you do next?

_____.

D. What should you do if no components are found to be faulty?

_____ _____ or a _____

_____.

E. What type of software can be purchased to test the motherboard?

_____

F. Always check the _____ that is included with your motherboard to determine the proper _____.

G. To prevent the computer from overheating check the _____ for proper function.

H. Many motherboards have built-in _____ that will shut down the computer before it overheats.

I. To clean your motherboard, you can use a can of _____ _____ to blow away the dust.

Additional Notes:

Student Name:

Computer Maintenance - Motherboards Lab

Part 1 – Replacing a Motherboard

Step 1
Before replacing a motherboard, turn off the computer and unplug the power cable. Remove the cover from the computer case and ground yourself.

Step 2
Disconnect the cables from the back of the computer and remove the expansion cards from the expansion slots.

Step 3
Disconnect all cables from the motherboard.

Step 4
Remove the screws that are holding the motherboard to the computer case.

Step 5
Slide the motherboard a bit sideways to release the small plastic spacers, and lift the board out of the computer case.

Step 6
If necessary, add the plastic spacers from the old motherboard to the new motherboard.

Step 7
Place the new motherboard into the computer case, slide the board into position, and secure it with the screws. Reconnect all the cables, re-install the expansion cards, and place the cover on the computer case.

Part 2 – Identifying the Components on a Motherboard

Step 1
Look carefully at the motherboard you removed from the PC.

Step 2
Sketch the layout of the major components of the motherboard onto the grid sheet provided.

Step 3
Label the major components listed as 1-9 on your sketch.

Step 4
Identify the type of motherboard in your layout sketch: _____

Step 5
Justify your answer to step 4 above: _____

_____

_____

1. Power Supply connections
2. System clock
3. CPU / chip set
4. Jumpers and DIP switches
5. ROM BIOS
6. System bus with expansion slots
7. CMOS chip and battery
8. Ram
9. Ports mounted on the board/ list type

Computer Maintenance

Name _____ Date _____

Motherboards Exam

Multiple Choice

1. The motherboard does all of the following EXCEPT
    a. Houses the CPU
    b. Allow all devices to communicate with each other
    c. Determine capabilities and limitation of the system
    d. Converts AC power to DC power

2. What are the four different types of motherboards?
    a. AT, Baby AT, ATX, and Mini ATX
    b. AT, ATM, ATX and Mini ATX
    c. ATV, ATX, AT, and Baby AT
    d. None of the above

3. All of the following are main components of the motherboard EXCEPT
    a. CPU
    b. System Clock
    c. Hard drive
    d. RAM

4. When choosing a motherboard, the following should be considered
    a. Form Factor
    b. Memory
    c. Processor Socket
    d. All of the above

5. The following are Bus types in a computer EXCEPT
    a. Address bus
    b. Data bus
    c. Control bus
    d. Tether bus

True/False

6. _____ When a motherboard is not working properly, a malfunctioning component may be causing the problem.

7. _____ Diagnostic software allows you to test your motherboard.

8. _____ Checking the documentation included with your motherboard could determine how much space is available in your hard drive.

9. _____ To prevent your computer from overheating, remove the cover while using the computer.

10. _____ A can of compressed air can be used to blow away the dust and dirt on the mother board.

Short Answer

11. Briefly describe the function of the motherboard.

12. List at least 5 components found on the motherboard.

13. What can be done if the motherboard is not working properly? Explain.

14. How can you prevent your computer from overheating?

15. List at least five things that should be considered when choosing a motherboard.

Computer Maintenance

Motherboards Exam - KEY

Multiple Choice

1. The motherboard does all of the following EXCEPT
   a. Houses the CPU
   b. Allow all devices to communicate with each other
   c. Determine capabilities and limitation of the system
   d. Converts AC power to DC power

2. What are the four different types of motherboards?
   a. AT, Baby AT, ATX, and Mini ATX
   b. AT, ATM, ATX and Mini ATX
   c. ATV, ATX, AT, and Baby AT
   d. None of the above

3. All of the following are main components of the motherboard EXCEPT
   a. CPU
   b. System Clock
   c. Hard drive
   d. RAM

4. When choosing a motherboard, the following should be considered
   a. Form Factor
   b. Memory
   c. Processor Socket
   d. All of the above

5. The following are Bus types in a computer EXCEPT
   a. Address bus
   b. Data bus
   c. Control bus
   d. Tether bus

True/False

6. _____ When a motherboard is not working properly, a malfunctioning component may be causing the problem. **T**

7. _____ Diagnostic software allows you to test your motherboard. **T**

8. _____ Checking the documentation included with your motherboard could determine how much space is available in your hard drive. **F**

9. _____ To prevent your computer from overheating, remove the cover while using the computer. **F**

10. _____ A can of compressed air can be used to blow away the dust and dirt on the mother board. **T**

Short Answer

11. Briefly describe the function of the motherboard.
- Houses the CPU
- Allow all devices to communicate with the motherboard and with each other
- Determine capabilities and limitations of the system

12. List at least 5 components found on the motherboard.
- System clock
- CPU and its chip set
- System bus with expansion slots
- Jumpers and DIP switches
- ROM BIOS
- CMOS configuration chip and its battery
- RAM
- RAM cache (L2) (optional)
- Ports directly on the board
- Power supply connections

13. What can be done if the motherboard is not working properly? Explain
- If the motherboard is not working properly, the problem is often caused by a component that is not functioning properly.
- One should remove a component not required for basic operation and then start the computer to see if the problem is still exists. Repeat this with different components until you find the one that is causing the error.
- If no components are found to be faulty, the computer may have a loss of power or a computer virus.
- Diagnostic software may be purchased at most computer stores to test your motherboard.
- Always check the documentation that is included with your system board to determine proper settings.

14. How can you prevent your computer from overheating?

To prevent the computer from overheating, verify that the fan is working properly. Many motherboards have built-in thermometers that will shut down the computer before it overheats

15. List at least five things that should be considered when choosing a motherboard.
- Type of case
- ROM BIOS
- Type of keyboard connector
- Presence/absence of proprietary video and/or proprietary local bus slots
- Presence/absence of IDE adapters and SCSI controller
- Presence/absence of COM ports, LPT ports, and mouse port
- Form factor
- Power factor
- Processor

Motherboards Lab Assignment Scoring Rubric

Total possible points: 80

	9-10 Points	6-8 Points	4-5 Points	0-3 Points	Awarded
TECHNICAL					
LAB REPORT SKETCH: DRAW the LOCATION OF the components	ALL COMPONENTS	4-5 COMPONENTS	2-3 COMPONENTS	0-1 COMPONENTS	
LAB REPORT SKETCH: Identify THE components	ALL COMPONENTS	4-5 COMPONENTS	2-3 COMPONENTS	0-1 COMPONENTS	
DISCONNECTED ALL COMPONENTS	ALL COMPONENTS	4-5 COMPONENTS	2-3 COMPONENTS	0-1 COMPONENTS	
REMOVED MOTHERBOARD	REMOVED WITHOUT ASSISTANCE	REMOVED WITH VERBAL ASSISTANCE	REMOVED WITH PHYSICAL ASSISTANCE	DID NOT REMOVE	
REPLACED MOTHERBOARD	REPLACED WITHOUT ASSISTANCE	REPLACED WITH VERBAL ASSISTANCE	REPLACED WITH PHYSICAL ASSISTANCE	DID NOT REPLACE	
RETURNED ALL COMPONENTS TO THE PC IN PROPER LOCATION	ALL COMPONENTS	4-5 COMPONENTS	2-3 COMPONENTS	0-1 COMPONENTS	
WORK AREA CLEAN	SUPERIOR	SUITABLE	MEDIOCRE	INADEQUATE	
FOLLOWED SAFETY GUIDELINES	SUPERIOR	SUITABLE	MEDIOCRE	INADEQUATE	
Total points awarded					