



# IT SUPPORT SERVICE LEVEL II

## Learning Guide #40

<b>Unit of Competence:</b>	Apply Problem Solving Techniques to Routine Malfunctions
<b>Module Title:</b>	Applying Problem Solving Techniques to Routine Malfunctions
<b>LG Code:</b>	EIS ITS2 M11 1019 LO2
<b>TTLM Code:</b>	EIS ITS2 M11 TTLM 1019v2

**LO2: Determine fundamental/root causes of the problem**

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Identifying possible causes
- Developing possible cause statement
- Identifying fundamental causes and conducting investigation

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to:

- Identifying possible causes based on experience and the use of diagnostic tools and analytical techniques.
- Developing possible cause statements based on findings
- Identifying fundamental causes per results of diagnosis and investigation conducted.

### **Learning Activities**

1. Read the specific objectives of this Learning Guide.
  2. Read the information written in the “Information Sheets 1” in pages 3-6.
  3. Accomplish the “Self-check 1” in page 7.
  4. Read the information written in the “Information Sheets 2” in pages 8-13.
  5. Accomplish the “Self-check 2” in page 14.
  6. Read the information written in the “Information Sheets 3” in page 15-18.
  7. Accomplish the “Self-check 3” in page 19.
  8. If you earned a satisfactory evaluation proceed to “Operation Sheet 1”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity # 1.
  9. Perform the “Operation Sheet 1” in pages 20-21.
  10. If you earned a satisfactory evaluation proceed to “Lap Test”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Operation Sheet.
  11. Do the “LAP test” on page 22 (if you are ready) and show your output to your teacher. Your teacher will evaluate your output either satisfactory or unsatisfactory. If unsatisfactory, your teacher shall advice you on additional work. But if satisfactory you can proceed to Learning Guide 41.
- Your teacher will evaluate your output either satisfactory or unsatisfactory. If unsatisfactory, your teacher shall advice you on additional work. But if satisfactory you can proceed to the next topic.

### 1.1. Determining the fundamental causes of the problems

You have seen that how to identify problems whether it is related to hardware, software, user related or procedural problems in learning guide no. 39 and now you will be introduced how to determine the root causes of the problem you identified in learning guide no. 39.

The most frequently used method of identifying causes of computer problems are still gathering additional information. You may achieve it by:

- ❖ Getting input from other people who notice the problem and who are affected by it.
- ❖ Collect input from other individuals one at a time
- ❖ Use diagnostic tools
- ❖ Write down what your opinions and what you've heard from others.
- ❖ Seek advice from a peer or your supervisor in order to verify your impression of the problem.
- ❖ Write down a description of the cause of the problem and in terms of what is happening, where, when, how, with whom and why.
- ❖ Search Microsoft Knowledgebase databases for common computer problem causes
- ❖ Search Internet

## 1.2. Potential causes of damage to computer hardware and software

There are a number of common causes of damage to a computer or its components. These are:

Cause	Description	Damage	Recommendation
<p><b>1. Temperature variations</b></p>	<p>Temperature variations (expansion and contraction of components from temperature change) can lead to serious problems.</p>	<ul style="list-style-type: none"> <li>• Chip creep — where the heating and cooling of components can cause movement, usually out of the socket that holds the component.</li> <li>• Signal traces on circuit boards can be cracked and separated.</li> <li>• Solder joints can be broken.</li> <li>• Contacts undergo accelerated corrosion.</li> <li>• Solid-state components can be damaged.</li> <li>• Read and write problems on hard disk drive (due to expansion and contraction of the platter of hard disk the data may be written at a different location relative to the track centre).</li> </ul>	<ul style="list-style-type: none"> <li>• Ensure a computer operates in correct ambient temperature Refer to the computer User's Manual for this information.</li> <li>• Ensure the ambient temperature when the:               <ul style="list-style-type: none"> <li>✓ System is <b>on</b> it is in the range of <b>15-32 °C</b>.</li> <li>✓ System is <b>off</b> it is in the range of <b>10-40 °C</b>.</li> </ul> </li> </ul>
<p><b>2. Power cycling</b></p>	<p>Turning on a cold computer subjects it to the greatest possible internal temperature variation.</p>	<ul style="list-style-type: none"> <li>• Same as for temperature variation</li> </ul>	<ul style="list-style-type: none"> <li>• Power on a computer only once daily if there is stable power line. Don't turn a computer on and off several times every day.</li> </ul>

<p><b>3. Static electricity</b></p>	<p>This problem usually appears during winter months when humidity is low, or in extremely dry climates where the humidity is low year-round.</p> <p>Some static-sensitivity problems are caused by improper grounding of computer power.</p>	<ul style="list-style-type: none"> <li>• Electronic components</li> </ul>	<ul style="list-style-type: none"> <li>• Always use a three-prong, grounded power cord plugged into a properly grounded outlet. You could use an outlet tester to check that it is properly grounded, but today, OH&amp;S requires that all power equipment be properly tested and certified. This includes the outlets, cables and connectors.</li> <li>• Use a grounded static mat underneath a computer, or an antistatic wrist-strap, before touching internal components of the computer.</li> </ul>
<p><b>4. Power line noise</b></p>	<p>This problem is caused by poor quality power being supplied to a computer system, which creates some spikes and transients (short transient signals of sometimes 1000 volts or more). It can also be caused by sharing</p>	<ul style="list-style-type: none"> <li>• All system components</li> </ul>	<ul style="list-style-type: none"> <li>• A computer system should be on its own circuit with its own circuit breaker.</li> <li>• A three-wire circuit is a necessity.</li> <li>• To decrease resistance, avoid extension cords unless absolutely necessary and then use only</li> </ul>

	<p>a power source with other higher power consuming equipment, such as coffee makers, copy machines or a laser printer.</p> <p>The wire size and length will affect the resistance of a power circuit.</p>		<p>heavy-duty extension cords.</p> <ul style="list-style-type: none"> <li>• Avoid using too many items on a single outlet.</li> <li>• Add an Uninterruptible Power Supply (UPS) as a power conditioner.</li> </ul>
<b>5. Radio frequency interference</b>	<p>Mobile phones, cordless phones, fax machines and any radio transmission equipment.</p>	<ul style="list-style-type: none"> <li>• Sporadic random keystrokes will appear, as though an invisible entity were typing on the keyboard</li> <li>• White spots and lines appear on the screen</li> </ul>	<ul style="list-style-type: none"> <li>• Install specially shielded cables (built-in toroid core cables) outside a system unit.</li> </ul>
<b>6. Phosphor burn on a monitor</b>	<p>The phosphor on a cathode ray tube can be burned if a stationary image is left on a screen continuously for long time.</p>	<ul style="list-style-type: none"> <li>• Reduces the life of monitor (cathode ray tube)</li> </ul>	<ul style="list-style-type: none"> <li>• Turn both brightness and contrast levels to the minimum.</li> <li>• Use a screensaver that displays different patterns on a screen.</li> </ul>
<b>7. Dust and pollutants</b>	<p>A power supply fan carries airborne particles through a computer.</p> <p>Food crumbs are attracted by magnetic media, while cigarette ash and smoke are drawn toward disk drives.</p>	<ul style="list-style-type: none"> <li>• Floppy disk heads and media</li> <li>• Electronic components (dust on the surface of components prevents necessary heat loss)</li> </ul>	<ul style="list-style-type: none"> <li>• Use power supply unit with air filter (the filter must be cleaned and changed periodically).</li> <li>• Don't operate an unprotected computer in a dusty environment, eg. an industrial workshop.</li> </ul>
<b>8. Water</b>	<p>On a desktop, coffee or tea spills over a keyboard or into a monitor.</p>	<ul style="list-style-type: none"> <li>• Keyboard malfunction</li> <li>• Monitor explosion (if a monitor is on)</li> </ul>	<ul style="list-style-type: none"> <li>• Never eat, drink or smoke inside a computer room.</li> </ul>

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Instruction:** Answer all the questions listed below, if you have some difficulty doing this self check; feel free to ask your teacher for clarifications.

**True/False:** Write True or False.

- \_\_\_\_\_ 1. The most frequently used method of identifying causes of computer problems are gathering additional information.
- \_\_\_\_\_ 2. 'Getting input from other people who notice the problem and who are affected by it' is one the way to causes of computer problems.
- \_\_\_\_\_ 3. Using diagnostic tools causes of computer problems can be identified.
- \_\_\_\_\_ 4. 'White spots and lines appear on the screen' is a damage caused by Temperature Variation.
- \_\_\_\_\_ 5. Power Line Noise is a problem caused by poor quality power being supplied to a computer system, which creates some spikes and transients.

## 2.1. Introduction

Problem solving is the act of defining a problem; determining the cause of the problem; identifying, prioritizing, and selecting alternatives for a solution; and implementing a solution.

## 2.2. The Six Step Problem Solving Model

Problem solving models are used to address the many challenges that arise in the workplace. While many people regularly solve problems, there are a range of different approaches that can be used to find a solution.

Complex challenges for teams, working groups and boards etc., are usually solved more quickly by using a shared, collaborative, and systematic approach to problem solving.

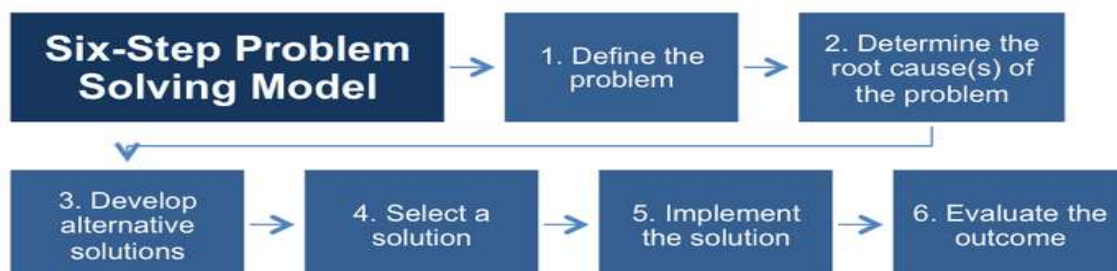
### Advantages

The Six-Step method provides a focused procedure for the problem solving (PS) group.

- It ensures consistency, as everyone understands the approach to be used.
- By using data, it helps eliminate bias and preconceptions, leading to greater objectivity.
- It helps to remove divisions and encourages collaborative working.
- It stops PS groups diverging into different problems.
- It also helps PS groups reach consensus
- It eliminates the confusion caused when people use different problem solving techniques on the same issue.
- It makes the decision making process easier.
- It provides a justifiable solution.

All six steps are followed in order – as a cycle, beginning with “1. Identify the Problem.” Each step must be completed before moving on to the next step.

The steps are repeatable. At any point the group can return to an earlier step, and proceed from there. For example, once the real problem is identified – using “2. Determine the Root Cause(s) of the Problem”, the group may return to the first step to redefine the problem.



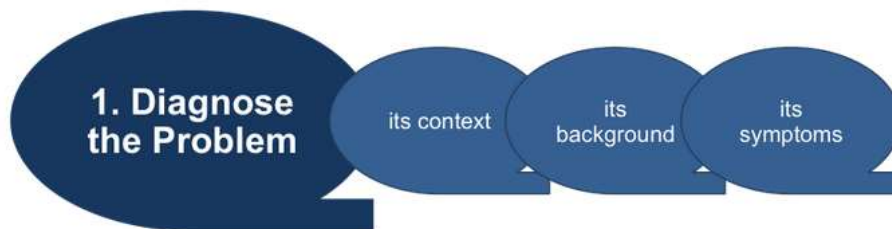


## The Six Steps

1. Define the Problem
2. Determine the Root Cause(s) of the Problem
3. Develop Alternative Solutions
4. Select a Solution
5. Implement the Solution
6. Evaluate the Outcome

### Step One: Define the Problem

Step one is about diagnosing the problem – the context, background and symptoms of the issue. Once the group has a clear understanding of what the problem is, they investigate the wider symptoms to discover the implications of the problem, who it affects, and how urgent/important it is to resolve the symptoms.



At this stage groups will use techniques such as:

- Brainstorming
- Interviewing
- Questionnaires

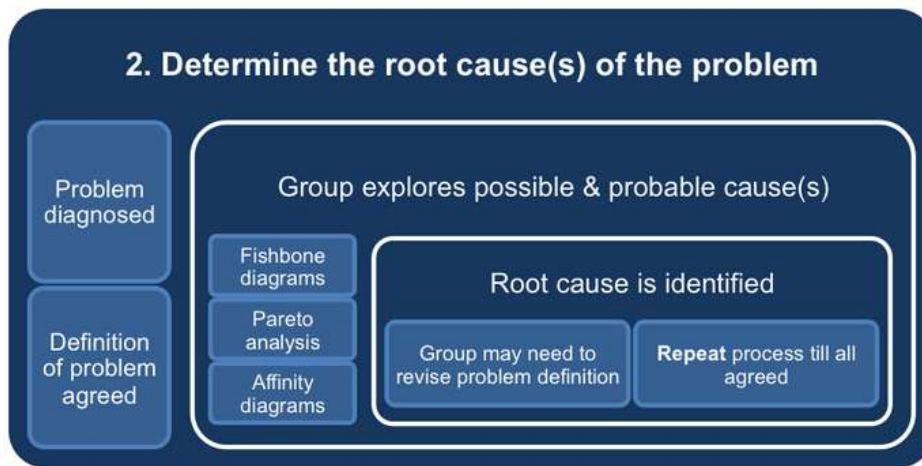
As this step continues, the PS group will constantly revise the definition of the problem. As more symptoms are found, it clarifies what the real problem is.

### Step Two: Determine the Root Cause(s) of the Problem

Once all the symptoms are found and the problem diagnosed and an initial definition agreed, the PS group begins to explore what has caused the problem. In this step the problem solving team will use tools such as:

- Fishbone diagrams
- Pareto analysis
- Affinity diagrams

These techniques help collect the information in a structured way, and focus in on the underlying causes of the problem. This is called the root cause.



At this stage, the group may return to step one to revise the definition of the problem.

### Step Three: Develop Alternative Solutions

Analytical, creative problem solving is about creating a variety of solutions, not just one. Often the most obvious answer is not the most effective solution to the problem. The PS group focuses on:

- Finding as many solutions to the problem, no matter how outlandish they may seem.
- Looking at how each solution relates to the root cause and symptoms of the problem.
- Deciding if different solutions can be merged to give a better answer to the problem.

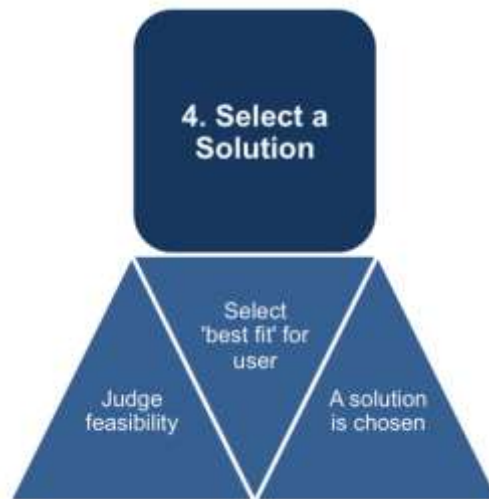


At this stage it is not about finding one solution, but eliminating the options that will prove less effective at dealing with both the symptoms and the root cause.

### Step Four: Select a Solution

In the fourth step, groups evaluate all the selected, potential solutions, and narrow it down to one. This step applies two key questions.

1. *Which solution is most feasible?*
2. *Which solution is favored by those who will implement and use it?*



Feasibility is ascertained by deciding if a solution:

- Can be implemented within an acceptable timeframe?
- Is cost effective, reliable and realistic?
- Will make resource usage more effective?
- Can adapt to conditions as they evolve and change?
- Its risks are manageable?
- Will benefit the organization?

Which solution is favored?

**Acceptance by the people who will use and implement the solution is the key to success.**

This is where the previous steps come into play. To users and implementers, a solution may seem too radical, complex or unrealistic. The previous two steps help justify the choices made by the PS group, and offer a series of different, viable solutions for users and implementers to discuss and select from.

### **Step Five: Implement the Solution**

Once the solution has been chosen, initial project planning begins and establishes:

- The project manager.
- Who else needs to be involved to implement the solution.
- When the project will start.
- The key milestones
- What actions need to be taken before implementing the solution
- What actions need to be taken during the implementing the solution
- Why are these actions necessary?



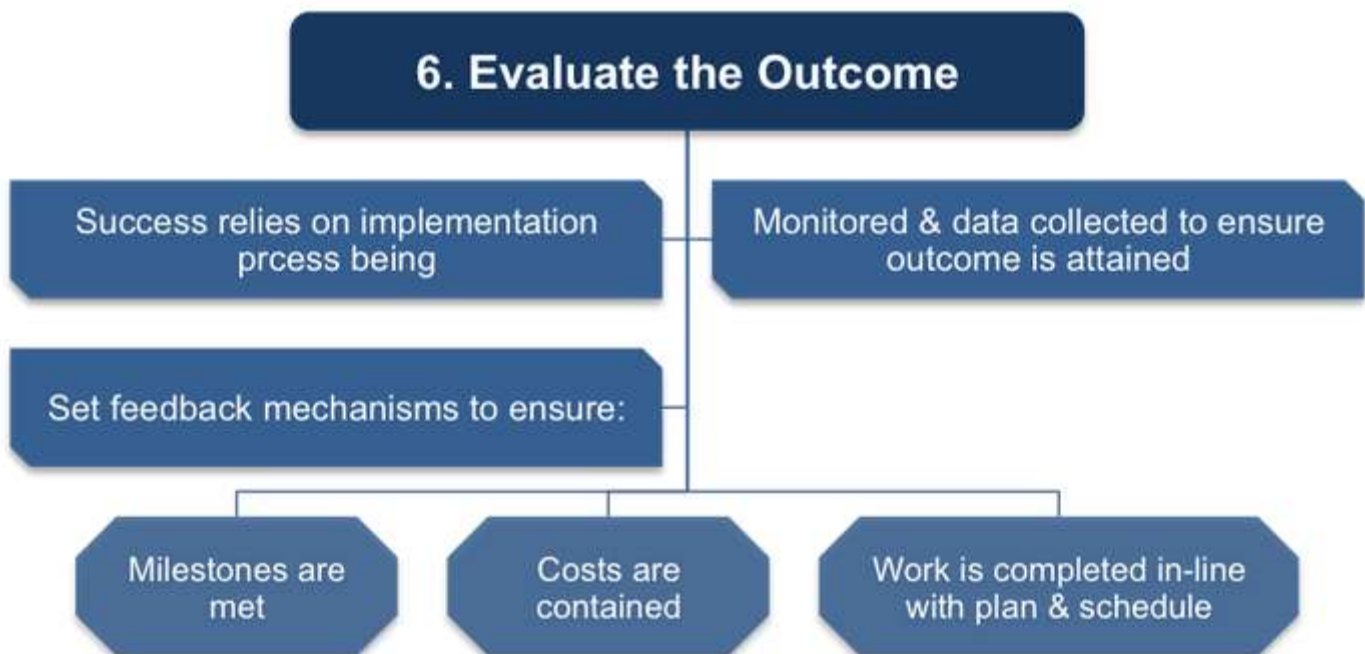
The group may use tools, such as a Gantt chart, timeline or log frame. Between Steps Five and during Step Six the operational/technical implementation of the chosen solution takes place.

**Step Six: Evaluate the Outcome**

The project implementation now needs to be monitored by the group to ensure their recommendations are followed. Monitoring includes checking:

- Milestones are met
- Costs are contained
- Necessary work is completed

Many working groups skip Step Six as they believe that the project itself will cover the issues above, but this often results in the desired outcome not being achieved.



Effective groups designate feedback mechanisms to detect if the project is going off course. They also ensure the project is not introducing new problems. This step relies on:

- The collection of data
- Accurate, defined reporting mechanisms
- Regular updates from the Project Manager
- Challenging progress and actions when necessary

In Step Six, as the results of the project emerge, evaluation helps the group decide if they need to return to a previous step or continue with the implementation. Once the solution goes live, the PS group should continue to monitor the solutions progress, and be prepared to re-initiate the Six Step process when it is required.

Overall, the Six Step method is a simple and reliable way to solve a problem. Using a creative, analytical approach to problem solving is an intuitive and reliable process.



It helps keep groups on track, and enables a thorough investigation of the problem and solution search. It involves implementers and users, and finds a justifiable, monitorable solution based on data.

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Instruction:** Answer all the questions listed below, if you have some difficulty doing this self check; feel free to ask your teacher for clarifications.

**True/False:** Write True or False.

- \_\_\_\_\_ 1. The six steps problem solving model eliminates the confusion caused when people use different problem solving techniques on the same issue.
- \_\_\_\_\_ 2. Brainstorming, Interviewing, and Questionnaires are techniques used to collect the information in a structured way, and focus in on the underlying causes of the problem.
- \_\_\_\_\_ 3. Problem solving group will not focus 'Looking at how each solution relates to the root cause and symptoms of the problem'.
- \_\_\_\_\_ 4. Acceptance by the people who will use and implement the solution is the key to success.
- \_\_\_\_\_ 5. In Step Six, evaluation helps the group to decide if they need to return to a previous step or continue with the implementation.

**Troubleshooting** is the process of figuring out how to solve a computer problem. Even with the most updated software and hardware, occasionally computers can malfunction.

In order to solve a problem, you must figure out which part of the system is malfunctioning. You will need to check each component of the computer, unless it is obvious where the problem is coming from. Isolating the problem will help you solve the problem quickly. Knowing how to solve these problems with a shortcut perhaps using only a few keys on the keyboard can save time and effort.

Backing up your important computer files to another source will ensure that if your problem cannot be corrected, you will still have a safe copy of your information.

Below we describe some of the most commonly encountered technology Problems.

- The printer is not working.
- The computer is frozen. A program is not responding.
- The keyboard is not working.
- New hardware or software is working incorrectly.
- The mouse is not working.
- The computer is slow.
- The browser's homepage suddenly changed.

### **Common Solutions for common problems**

**Problem:** The printer is not working.

- Check if the printer is turned on. If not, turn it on and try again.
- Check if the printer has paper. If not, put paper in the paper tray and try printing again.
- Check if the printer has a paper jam. If so, remove the paper, close the printer, and try printing again.
- Ensure that all printer cables are properly connected.
- Turn off the printer and turn on again.
- Check to see if a new printer driver is needed. Do this by going to the manufacturer's website to search for your printer model and checking for any updated driver. Seek assistance from your system administrator before installing any drivers.

**Problem:** The computer is frozen. A program is not responding.

- Use the Task Manager to end the program not responding.
- Perform a hard reboot by simply pressing the on/off button to turn off the computer manually. This action should only be done as a last resort if you have an unresponsive program or critical error. This process could cause data loss or corruption.
- Once the computer is responding again, run a virus check.

**Problem:** The keyboard is not working.

- Make sure the keyboard is connected to the computer. If not, connect it to the computer.
- If you are using a wireless keyboard, try changing the batteries.
- If one of the keys on your keyboard gets stuck, turn the computer off and clean with a damp cloth.
- Use the mouse to restart the computer.

**Problem:** New hardware or software is working incorrectly.

- Verify your computer meets the requirements of the program or utility.
- Uninstall and install the program.
- There could be a conflict with another installed program and you should contact your system administrator.

**Problem:** The mouse is not working correctly.

- Check if the mouse is securely plugged into the computer. If not, plug it in completely.
- Check to see if the cord has been damaged. If so, the mouse may need replacing.
- If you are using a cordless mouse, try pushing the connection button on the underside of the mouse to reestablish a connection.
- Clean the mouse, especially on the bottom.

**Problem:** The computer is slow.

- **Restart** your computer.
- Verify that there is at least 200-500 MB of free hard drive space. To do so, select Start and click on My Computer or Computer. Then highlight the local C drive by clicking on it once. Select the Properties button at the top left-hand corner of the window; this will display a window showing how much free and used space you have. If you need to recapture space:
  - ✓ **Empty your recycle** bin by right-clicking on the Recycle Bin icon (usually on the desktop), then selecting Empty Recycle Bin.
  - ✓ Check your **mail files**. Remove any large attachments and delete unused mail. - Images and videos take up a lot of space, so consider moving those to an external drive.



- ✓ **Remove temporary files** from the Internet. To do so:
  - Click Start button | My Computer or Computer.
  - Click Open Control Panel at the top of the window.
  - Click Network | Internet | Internet Options.
  - Select the General tab and click Delete under Browsing History.
- ✓ Perform a **disk cleanup**. To do so:
  - Click Start button | My Computer or Computer.
  - Highlight the local C drive by clicking on it once.
  - Select the properties button at the top left of the window.
  - Go to the General tab and select Disk Cleanup.
  - Once the Disk Cleanup finishes running, click on Clean up System Files; this will delete any unnecessary system-related files from your local disk.
- ✓ Information in computer files changes often, resulting in gaps or spaces within the file. This takes up more space on the computer and can cause the computer to slow down. To reclaim these gaps in space, run **disk defrag**. To do so:
  - Click start | My Computer or Computer.
  - Highlight the local C drive by clicking on it once.
  - Select the properties button at the top left of the window.
  - Go to the Tools tab and select Run Defragmentation.
- Old or unused programs that aren't being used may still have components running behind the scenes when you start your computer, which can slow down the system. You can prevent these programs from running when you start your computer by removing unused shortcuts and turning off unused program services.
  - ✓ Remove unused shortcuts from Windows startup
    - Click Start button | Select All Programs | Click Startup
    - Right-click the shortcuts that you do not use and click delete
  - ✓ Disable unused program services
    - Click Start button | Control Panel | Administrative Tools | Services
    - For each program/service that you are certain that you do not need, click on the Service to highlight it, click the Stop link to stop the service from running, then double-click the service, choose Startup Type of Disabled, and click OK.
- Run a virus scan to remove potential viruses that can slow down your computer.

**Problem:** The browser's homepage suddenly changed.

- This is a common symptom that a virus or browser hijacker may have infected the computer.

- Try re-setting the home page to the default:
  - ✓ In Internet Explorer:
    - On the Tools menu, click Internet Options.
    - Click the General tab.
    - In the Address box, type the Web address you want for your home page.
    - Click OK.
  - ✓ In Mozilla Firefox:
    - Open the web site you want to set as your home page.
    - Click the icon to the left of the web address and drag it to the Home button.
    - Click Yes.
- If the home page still reverts back to the “new” page, do an Internet search using keywords that include the name of the “new” homepage and the word “virus.” If there is a virus, this search may reveal more information on the virus and how it can be safely removed.
- Run a virus scan.

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Instruction:** Answer all the questions listed below, if you have some difficulty doing this self check; feel free to ask your teacher for clarifications.

**Choice:** Choose the correct answer.

1. \_\_\_\_\_ is the process of figuring out how to solve a computer problem.  
A. Troubleshooting      B. Problem      C. Maintenance      D. None
2. The first thing to do in the case of Printer Problem is to check if the printer is turned on.  
A. True      B. False
3. Which of the followings the correct action if keyboard is not working?  
A. Make sure the keyboard is connected to the computer. If not, connect it to the computer.  
B. If you are using a wireless keyboard, try changing the batteries.  
C. If one of the keys on your keyboard gets stuck, turn the computer off and clean with a damp cloth.  
D. All
4. What will you do if Information in computer files changes often, resulting in gaps or spaces within the file?  
A. Remove Temporary Files      B. Run Disk Defrag      C. Disc Cleanup      D. None
5. Which of the followings can be considered as a common solution for a slow computer?  
A. Restarting the computer  
B. Verify that there is enough free hard drive space.  
C. Uninstalling unused programs  
D. All

**Activity 1: Task Manager**

- The first Option: Push the **Ctrl, Alt, and Delete keys** at the same time. Then, start the Task Manager, highlight the program’s name, and hit the **End Task** button.
- Second Option: Right Click the **Taskbar** from your desktop → Click **Task Manager** Then, highlight the program’s name, and hit the **End Task** button.

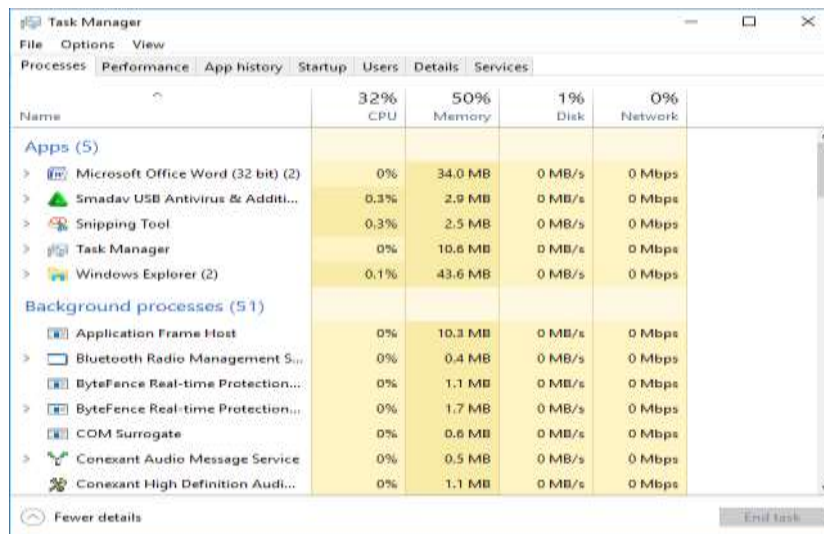


Fig. 1.1 Task Manager Window.

**Activity 2: Remove Temporary Files**

- ➔ Click Start button
- ➔ Click Control Panel
- ➔ Click Network | Internet |Internet Options.
- ➔ Select the General tab and click Delete under Browsing History.

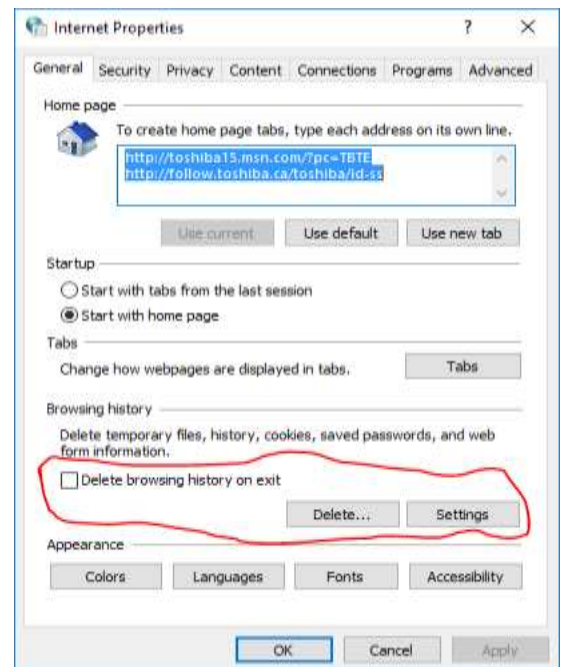


Fig. 1.2 Internet Option

### Activity 3: Disk cleanup.

- Click **Start button | My Computer or Computer.**
- Highlight the local **C** drive by clicking on it once.
- Select the **properties** button at the top left of the window.
- Go to the **General tab** and select **Disk Cleanup.**
- Once the Disk Cleanup finishes running, click on Clean up System Files; this will delete any unnecessary system-related files from your local disk.

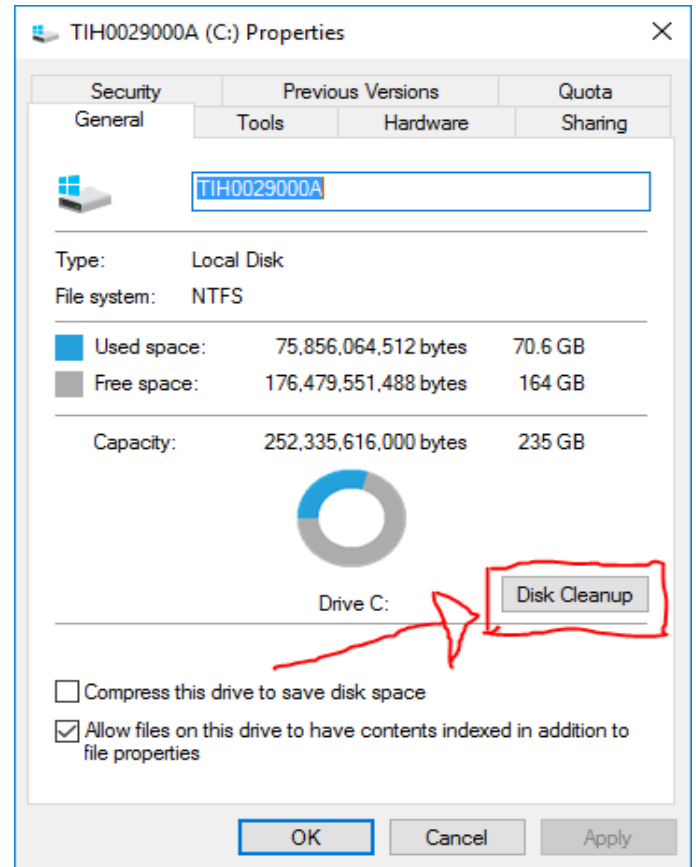


Fig. 1.3 Disk Cleanup

### Activity 4: Disc Defragmentation/Optimization

- Click **start | My Computer or Computer.**
- Highlight the local **C** drive by clicking on it once.
- Click the **properties** button at the top left of the window.
- Go to the Tools tab and click **Optimize** button.
- Then the disk and click **Optimize** button.

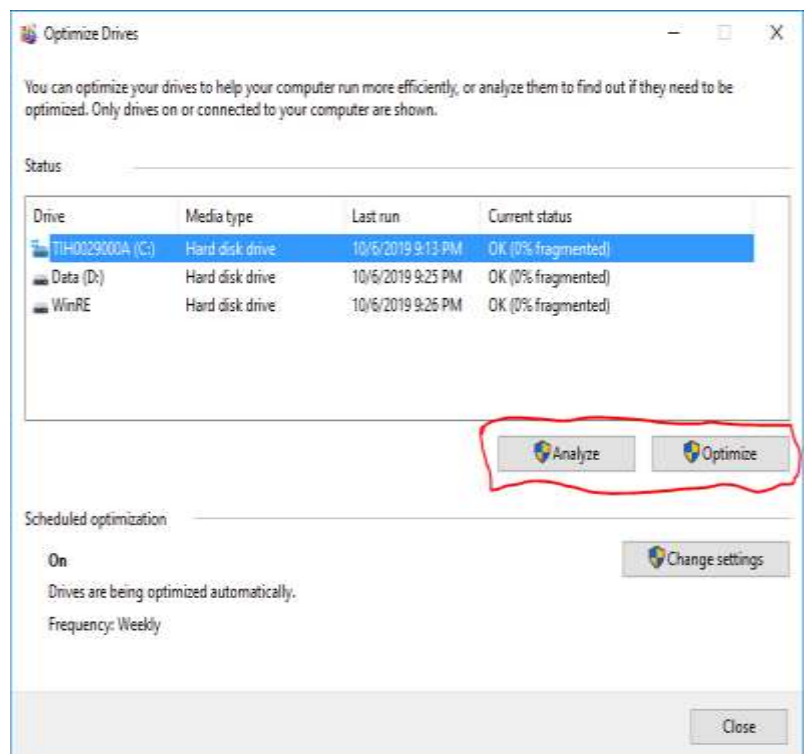


Fig. 1.4 Optimize Drive

**Lap Test****Practical Demonstration**

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Time started: \_\_\_\_\_

Time finished: \_\_\_\_\_

**Instructions:** You are required to perform the following individually with the presence of your teacher.

Please ask your trainer for the instructions for this lap test.

**Activity 1:** Follow the steps showed in “operation sheet 1, **Activity 1 Task Manager**” to forcefully close programs that are currently running.

**Activity 2:** Follow the steps showed in “operation sheet 1, **Activity 2 Remove Temporary Files**” to remove temporary Data using Internet Options.

**Activity 3:** Follow the steps showed in “operation sheet 1, **Activity 3 Disk Cleanup**” to delete any unnecessary system-related files from your local disk.

**Activity 4:** Follow the steps showed in “operation sheet 1, **Activity 4 Disc Defragmentation/Optimization**” to optimize the hard disk.

## Answer Key

### Self Check 1

1. True
2. True
3. True
4. False
5. True

### Self Check 2

1. True
2. True
3. False
4. True
5. True

### Self Check 3

1. A
2. A
3. D
4. B
5. D