TELECOM
Customer Care Executive
(Repair Centre)
(Facilitator's Guide)

REFERENCE ID: TEL/Q2200

The Session in Perspective

Program Overview:

This program is aimed at training candidates for the job of a "Customer Care Executive – Repair Centre", in the "Telecom" Sector/Industry and aims at building the following key competencies amongst the learner.

Terminal Objectives:

- The necessary skills needed by the participants to be a successful Customer Care Executive at the Repair Centre
- Explains functionalities and features of mobile phones
- Explores use of measuring tools for measurement of voltage, register and diode
- Describes common types of components used in mobile phones
- Identifies types of faults occurring in a mobile phone handset due to faulty components
- Describes various types of Operating Systems used in mobile phones
- Manages store activities and attends walk-in customers
- Identifies issues and troubleshoots the handset on arrival
- Classifies handset/accessories issues as per company policy
- Assigns repair to relevant repair engineer/specialist
- Installs basic operating system/software in mobile handset
- Roles and Responsibilities of a Customer Care Executive Repair Centre
- Describe organizational standards and policies
- Demonstrates team work

Participants will be able to learn about various Roles and Responsibilities of a Customer Care Executive and will be able to demonstrate these skills successfully at a telecom company's repair/service centre outlet to assist customer in getting the hardware & software issues in mobile handsets resolved to their satisfaction. They will also have a better understanding of types of components used in mobile phones, identify type of faults and who will repair them.

Duration: 1 Hour

Introduction to the Facilitator Guide

1. Preface and Purpose of the Guide

This guide is designed to help you (the facilitator) to plan and conduct the course.

2. What will I find in the guide?

This facilitator's guide is a comprehensive package that contains:

- Presentation scripts and key points to cover
- Key points at a glance
- Facilitation tips
- Sampling of potential questions
- Checklist of necessary materials and equipment

3. Program Preparation

Programs require a significant amount of preparation. It is crucial that program facilitators familiarize themselves with the material they designed or are expected to deliver and have adequate time to adapt the content to the specific audience.

4. The Role of the Facilitator

Who is a facilitator?

A facilitator is someone who is present to assist a group reach its objectives; the group, not the facilitator, may determine the objectives.

The facilitator's role:

When adopting the role of a facilitator, the facilitator needs to:

- Ensure the mere verbose do not take over and encourage contributions, particularly from those who may be less confident
- Devise non-aggressive, friendly ways to deal with difficult participants
- Control conflict by stepping in if necessary to help participants learn to deal with conflict positively
- From time to time get the participants to summarize what has been discussed
- Assist 'weaker' participants by rephrasing their arguments for them so that these do not get lost just because they are not forcefully put across
- Provide feedback to the group as a whole as to its performance
- Provide the information and resources for the group to function effectively

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Session Preparation:

A. Questions

What

- What is the subject I have been asked to present on/lead/arrange

Why

- Why have they asked me to do it?
- What is the purpose of the session or the training course?
- To communicate information and knowledge.
- To make a proposition.
- To test existing knowledge.
- To practice skills.
- To inspire and motivate.
- The first thing to get clear in your mind is the objectives of the entire course or one session.

When

- What time of day will my session(s) take place? After lunch is known as the graveyard slot; you should therefore consider making it more active than, say, a morning session.
- How long have I got?

How

- How am I going to present my subject?
- Straight talk
- Talk with overheads
- Talk with PowerPoint presentation
- Talk with video
- Give the participants a period in which to discuss aspects of the subject, e.g. by using a case study.
- Combination of any of these.
- Am I going to allow questions during the session?
- Always leave time at the end for questions and discussion.

Where

- Where is the presentation due to take place?
- How do the windows open/air conditioning work? If using PowerPoint or video, how do we darken the room?
- What equipment have they got, e.g. video, computer, projector, overhead projector, etc.?
- Decide on seating arrangements
- Are there likely to be any distractions, e.g. loud air-conditioning; things happening outside the window, etc.
- Can I be heard at the back of the room?

Who

- Who are they? How senior/junior are they?
- How many will be present?
- What is the extent of their existing knowledge of the subject I am going to present?
- What will be of interest to them?
- *What will their attitudes, preconceptions or expectations?
- Is there a gender balance within the group?
- Could you foresee or expect any kind of dynamics or potential resistant due to group composition?
- What can you glean overall from the participants list and profile without making too many assumptions?

Icons Used In This Guide

Icon	Description/guidelines
	Trainer Led Discussion
	Show a slide < Used to denote the slide to be shown>. Even better paste the image of the slide being discussed.
	Show a video <mention video/clip name>
	Evaluate – administer assessment <mention name and guidelines for assessment>
	Narrate/Share a story or valid examples
	Share insights or ask participants to share insights about current topic
	Distribute Hand-outs
	Transition from one subject/topic/objective/story, etc to another (also could indicate flow)
	Derive objective/key point

		Materials required
		Ask following Questions
		Group Discussion <mention guidelines (number in each group, whether team leader is required in each group, etc.) and duration>
		Play music < mention file names and duration>
		Capture on flipchart and put up in the class to be reference at a later point during the class or to summarize the learning of the session
		Summarize the session/day
		Activity – describe activity
		Debrief to bring out relevant learning

"Unit 1: Introduction to the Programme"

The Session in Perspective

Unit 1: Introduction to Programme/Industry

Module Learning Goals

This module covers the overview of the programme/course, with a focus on basic elements of a telecommunication system. It also throws an insight into history of mobile evolution with arising new trends/technology in the global and local mobile/telecommunication market segment. The module also briefs participants on their role with tips to enhance personal attributes to become a successful handset repair engineer.

Enabling objectives:

Upon completion of this module, the participant will be able to:

- Explain overview of the program
- Define basic elements of a telecommunication system
- Explain the job description and personal attributes of a customer care executive repair centre

Methodology

Trainer Led Discussion, Skill Practice, Individual Reflection, Assessment

Instructions to the Trainees:

The students should participate while the trainer discusses about each topic to make the class more interesting.

Equipment /Tools Required:

Computer, Projector, White Board, Participants Manual, Markers, Flipcharts, Notes, Handout & PPT

Duration: 6 Hours

Objectives of the Programme   120 minutes

Upon completion of this course, you will be able to:

- Explain functionalities and features of mobile phones
- Explore use of measuring tools used in mobile repair
- Identifies types of faults occurring in a mobile phone handset due to faulty components
- Manages store activities and attends walk-in customers
- Identifies issues and troubleshoots the handset on arrival
- Classifies handset/accessories issues as per company policy
- Assigns repair to relevant repair engineer/specialist
- Installs basic operating system/software in mobile handset
- Work Effectively in a Team

Instructions for the facilitator:

Discuss about various sectors like banking, IT & ITES, Insurance Sector etc. where customer care executives play an important role. Ask the participants to prepare a chart of job responsibilities of customer care executives working in various sectors.

- Chart Paper
- Sketch Pens
- Marker Pens
- Highlighters
- Old Magazines, Newspapers (For images etc.)

Introduction to Telecom Industry   120 minutes

Major sectors of the Indian telecommunication industry are telephony (includes mobile telephony), internet (includes broadband data) and television broadcasting. India's telecommunication network is the second largest in the world based on the total number of telephone users (both fixed and mobile phone).

The Telecom sector in the country, which is in an ongoing process of transforming into next generation network, employs an extensive system of modern network elements such as digital telephone exchanges, mobile switching centres, media gateways and signalling gateways at the core, interconnected by a wide variety of transmission systems using fibre-optics or Microwave radio relay networks.

The access network, which connects the subscriber to the core, is highly diversified with different copper-pair, optic-fibre and wireless technologies. Direct to Home (DTH), a relatively new broadcasting technology has attained significant popularity in the Television segment. The introduction of private FM has given a fillip to the radio broadcasting in India.

Telecommunication in India has greatly been supported by the INSAT system of the country, one of the largest domestic satellite systems in the world. India possesses a diversified communications system, which links all parts of the country by telephone, Internet, radio, television and satellite.

Market Size

Driven by strong adoption of data consumption on handheld devices, the total mobile services market revenue in India is expected to touch US$ 37 billion in 2017, registering a Compound Annual Growth Rate (CAGR) of 5.2 per cent between 2014 and 2017, according to research firm IDC.

According to a study by GSMA, smartphones are expected to account for two out of every three mobile connections globally by 2020 making India the fourth largest smartphone market.

The broadband services user-base in India is expected to grow to 250 million connections by 2017, according to GSMA.

International Data Corporation (IDC) predicts India to overtake US as the second-largest smartphone market globally by 2017 and to maintain high growth rate over the next few years as people switch to smartphones and gradually upgrade to 4G.

In spite of only 5 per cent increase in mobile connections in 2015, overall expenditure on mobile services in India is expected to increase to US$ 21.4 billion in 2016, led by 15 per cent growth in data services expenditure, as per research firm Gartner.

The Indian telecom sector is expected to generate four million direct and indirect jobs over the next five years according to estimates by Randstad India. The employment opportunities are

expected to be created due to combination of government's efforts to increase penetration in rural areas and the rapid increase in smartphone sales and rising internet usage.

Government Initiatives

The government has fast-tracked reforms in the telecom sector and continues to be proactive in providing room for growth for telecom companies. Some of the other major initiatives taken by the government are as follows:

- With a view to encourage consolidation in the telecom sector, the Government of India has approved the rules for spectrum trading that will allow telecom companies to buy and sell rights to unused spectrum among themselves, aimed to improve spectral efficiency and quality of service, based on the recommendations of the Telecom Regulatory Authority of India (TRAI).
- The Government of India plans to roll out free high-speed wi-fi in 2,500 cities and towns across the country over the next three years. The program entails an investment of up to Rs 7,000 crore (US$ 1.06 billion) and will be implemented by state-owned Bharat Sanchar Nigam Ltd (BSNL).

Road Ahead

India will emerge as a leading player in the virtual world by having 700 million internet users of the 4.7 billion global users by 2025, as per a Microsoft report. With the government's favourable regulation policies and 4G services hitting the market, the Indian telecommunication sector is expected to witness fast growth in the next few years.

References: Media Reports and Press Releases, Cellular Operators Authority of India (COAI), Telecom Regulatory Authority of India (TRAI),

Department of Telecommunication (DoT), Department of Industrial Policy and Promotion (DIPP)

Analysing the Trends of Business in Telecom Industry

1) India is among the Fastest Growing Mobile Markets in the World: India is the second largest mobile market in the world, is also among the fastest growing mobile markets globally. The total number of mobile subscribers in India (i.e., the subscriber base) has increased from 6.4 million in March 2002 to around 350 million in December 2008, at a compounded annual growth rate (CAGR) of 81%, aided by a significant increase in network coverage and a continual decline in tariffs and handset prices.

India, a relatively late entrant into mobile services, has benefited from a significant decline in mobile network costs during the last few years. Low cost advantage and the added benefit of mobility have led to stagnation in the total fixed line subscriber base, which along with the significant growth in the mobile base has translated into India having one of the highest ratios globally of mobile subscribers to total telecom subscribers.

Chart 1: Growth in Indian Mobile Subscriber Base
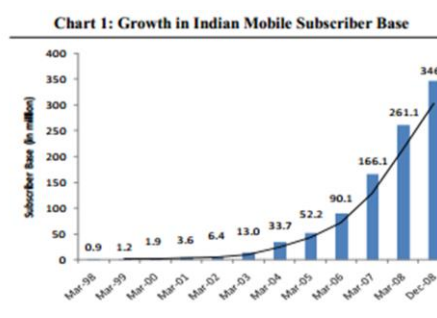
Source: Telecom Regulatory Authority of India (TRAI) Database

2) Despite the Growth, Mobile Penetration Remains Moderate: As on end September 2008, India had a mobile penetration of around 27%, which is relatively lower as compared to other countries.

Given the moderate penetration levels at present, mobile growth in India is expected to continue in the short to medium term albeit at a lower level because of the larger base effect.

3) **Growth expected to be led by B and C Class circle** industry has largely been concentrated in the Metros with coverage reaching around 90% and 35%, respect and Class C cities is still low at 15-25%. Moreover, been concentrated in the urban areas while penetra Thus future growth is likely to come largely from Cla

Chart 2: Mobile Penetration Levels: India vis-à-vis World
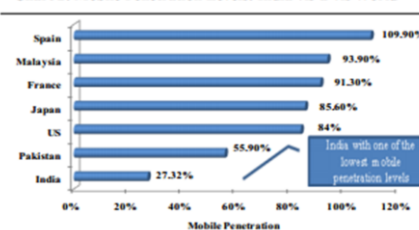
Source: Market Sources
Note: Mobile penetration data for US pertains to June 2008

Keeping this in view, larger players like Bharti Airtel Limit and Bharat Sanchar Nigam Limited (BSNL) are largely focusing on increasing their geographical coverage in Class B and C circles.

Chart 3: Circle-wise Mobile Penetration (Dec'08)
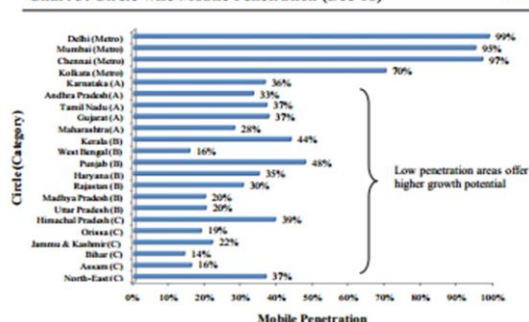
Source: TRAI Database, ICRA's estimates
Note: Mobile penetration does not account for one person having more than one connection

Chart 4: Circle-wise Population vs. Mobile Subscriber Base
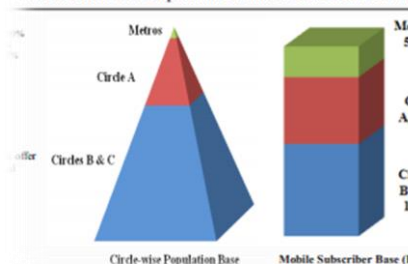
Job Description and Personal Attributes of a Customer Care Executive (Repair Centre)   60 minutes

Individuals at this job provide customer service by interacting with walk-in customers. They also handle, follow-up and resolve customer's queries, requests and complaints, in a timely manner.

This job requires the individual to have:-
* good communication skills with a clear diction;
* ability to construct simple and rational sentences;
* ability to comprehend simple English sentences;
* regional language proficiency;
* strong customer service focus;
* pleasant personality;
* should be self motivated and a team player
* ability to work under pressure.

Discuss in class - What is the learning from this module/unit?

Summarize the Lesson

Ask Questions/Solve the Exercise

"Unit 2: Introduction to Mobile Phone Technology"

The Session in Perspective

Unit 2: Introduction to Mobile Phone Technology

Module Learning Goals

This module covers introduction to different types of mobile phone technology, difference between GSM/CDMA technologies, identification of various parts of a mobile phone handset with their basic functionalities and features. It also covers meaning and significance of IMEI number, difference between different types of mobile phone operating systems and list of accessories used with mobile phones along with their utility.

Enabling objectives:

Upon completion of this module, the participant will be able to:

- Distinguish between different types of Mobile Phones (GSM/CDMA)
- Explore Various Parts of a Mobile Phone
- Explore Basic Functionalities and Features of Mobile Phones
- Define a Mobile Handset's IMEI number
- Distinguish between various mobile phone operating systems
- List Various Mobile Phone Accessories with their usage

Methodology

Trainer Led Discussion, Skill Practice, Individual Reflection, Assessment

Instructions to the Trainees:

The students should participate while the trainer discusses about each topic to make the class more interesting.

Equipment /Tools Required:

Computer, Projector, White Board, Participants Manual, Markers, Flipcharts, Notes, Handout & PPT

Duration: 12 Hours

What is a Mobile Phone?

A mobile phone is a handheld device that allows you to make and receive telephone calls while you move around a wide geographical area. A mobile phone also supports several other functions, such as text messaging, email and internet access, photography, money transfer, banking, and so on.

Mobile Evolution   60 minutes

- G - 1/2/3/4 G
- G refers to the different generations of mobile devices.
- First generation (1G) cell phones were analog devices. Second generation (2G) devices were digital, and third generation (3G) allows for voice, data and advanced services.

0G (1946-1980's): - Early Mobile Phones

- Expensive
- In cars/trucks/briefcases
- Voice only

1G (1980's – Now)

- First generation cellular networks
- Radio signals = analog
- Technologies - AMPS / DataTac
- First Blackberry (850)
- Voice + Limited data

2G (1990's – Now)

- Second generation cellular networks
- Digital.Voice + SMS + Circuit switched data
- GSM, iDEN, CDMA,TDMA

2.5 G (1990's – Now)

- Marketing term
- GPRS, HSCSD, WiDEN
- Also EDGE, CDMA2000 1x-RTT

GSM (Global System for Mobile Communications)

GSM is the most popular standard for mobile phones worldwide used by 2.2 billion people on over 210 networks.

GPRS (General Packet Radio Services)

A mobile data service for use on GSM networks. It's a part of the 2.5G standards family.

iDEN (Integrated Digital Enhanced Network)

A second generation (2G) mobile telecommunications standard developed entirely by Motorola.

CDMA Code Division Multiple Access

A second generation (2G) standard for mobile phones.

3G (2004 – Now)

- Third generation cellular networks
- Broadband data + voice, streaming video
- W-CDMA (UMTS, FOMA), 1xEV-DO

4G (The Future)

- "high-speed broadband for data- and visual- centric information"
- Transmits data at 100mbps while moving and 1Gbs while standing still

Types of Mobile Phone   120 minutes

There are many different types of mobile phones available in the market:

- Bar
- Brick
- Touch screen

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- Flip
- Slider
- Swivel watch
- Taco Mixed flip and swivel

There is no general rule used to classify mobile cell phones. However, in most cases they are classified on the basis of their form factor.

What is a form factor?

A form factor refers to the size, style, and shape of a mobile phone, as well as to the layout and position of the phone's major components. There are four major forms of mobile phones, namely:

- The bar phone
- The touch screen phone
- The flip phone
- The slider phone

Let us look at each form in further detail starting with the bar phone.

1) **Bar phone:** A bar phone is also known as the slab, block, or slate phone. It takes the shape of a cuboid, usually with rounded corners and/or edges. The name is derived from the rough resemblance to a candy bar in size and shape.

2) **Brick Phone**

3) **Touch screen Phone:** A touch screen, or slate phone is a subset of the bar form. Like the tablet computer, a touchscreen phone has minimal buttons and instead relies on an electronic visual display known as a touch screen. It also has an onscreen QWERTY keyboard.

QWERTY refers to the arrangement of keys or buttons on an English computer keyboard.

4) **Flip Phone:** A flip or clamshell phone consists of two or more sections that are connected by hinges, as shown in figure 3. The hinges allow the phone to flip open and fold to close in order to become more compact. When flipped open, the phone's speaker and microphone are placed closer to the operator's ear and mouth, thereby improving usability.

5) **Slider Phone:** A slider or slide phone is composed of usually two, but sometimes more, sections that slide past each other on rails. It usually has a display segment which houses the speaker and screen, while the segment that slides in and out contains the keypad or keyboard. The sliding form factor allows the owner to take advantage of a full key board without sacrificing portability. Figure 4 shows a picture of a slider phone.

6) Swivel Watch Phone

7) Taco Phone

8) Mixed flip and swivel Phone

Instructions for the facilitator:

- Distribute hand-outs among participants.
- Ask the participants to write at least 4 types of mobile phones.

Difference between (GSM/CDMA) Technologies
120 minutes

Two basic technologies in mobile phones are CDMA and GSM.

CDMA (Code Division Multiple Access) and GSM (Global System for Mobiles) are shorthand for the two major radio systems used in cell phones. Both acronyms tend to group together a bunch of technologies run by the same entities. Most of the world uses GSM.
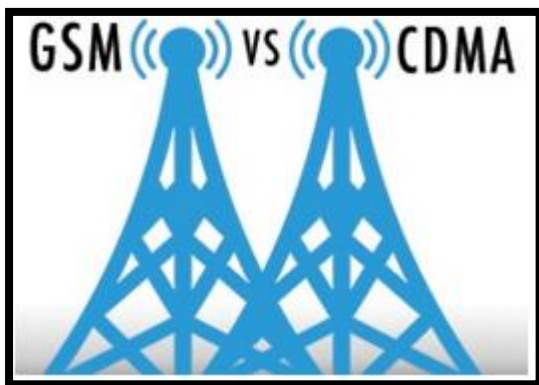
The GSM Association is an international organization founded in 1987, dedicated to providing, developing, and overseeing the worldwide wireless standard of GSM. CDMA, a proprietary standard designed by Qualcomm in the United States, has been the dominant network standard for North America and parts of Asia. However, GSM networks continue to make inroads in the United States, as CDMA networks make progress in other parts of the world. There are camps on both sides that firmly believe either GSM or CDMA architecture is superior to the other. The following considerations may be helpful in making a choice of network:

1) Coverage: The most important factor is getting service in the areas you will be using your phone. Upon viewing competitors' coverage maps you may discover that only GSM or CDMA carriers offer cellular service in your area. If so, there is no decision to be made, but most people will find that they do have a choice.

2) Data Transfer Speed: With the advent of cellular phones doing double and triple duty as streaming video devices, podcast receivers and email devices, speed is important to those who use the phone for more than making calls. CDMA has been traditionally faster than GSM, though both technologies continue to rapidly leapfrog along this path. Both boast "3G" standards, or 3rd generation technologies.

3) Subscriber Identity Module (SIM) cards: GSM phones use SIM cards. The removable SIM card allows phones to be instantly activated, interchanged, swapped out and upgraded, all without carrier intervention. The SIM itself is tied to the network, rather than the actual phone. Phones that are card-enabled can be used with any GSM carrier.

4) Roaming: For the most part, both networks have fairly concentrated coverage in major cities and along major highways. GSM carriers, however, have roaming contracts with other GSM carriers, allowing wider coverage of more rural areas, generally speaking, often without roaming charges to the customer. CDMA networks may not cover rural areas as well as GSM carriers, and though they

may contract with other CDMA carries for roaming in more rural areas, the charge to the customer will generally be significantly higher.

5) International Roaming: If you need to make calls to other countries, a GSM carrier can offer international roaming, as GSM networks dominate the world market. If you travel to other countries you can even use your GSM cell phone abroad, providing it is a quad-band phone (850/900/1800/1900 MHz). By purchasing a SIM card with minutes and a local number in the country you are visiting, you can make calls against the card to save yourself international roaming charges from your carrier back home. CDMA phones that are not card-enabled do not have this capability, however there are several countries that use CDMA networks.

According CDG.org, CDMA networks support over 270 million subscribers worldwide, while GSM.org tallies up their score at over 1 billion. As CDMA phones become R-UIM enabled and roaming contracts between networks improve, integration of the standards might eventually make differences all but transparent to the consumer.

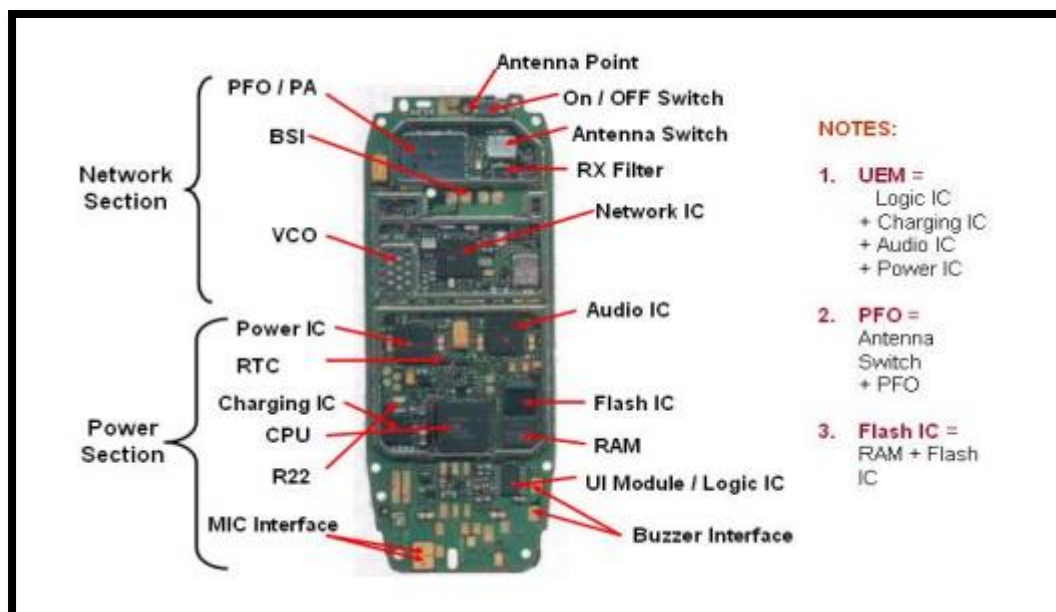## Parts of a Mobile Phone   120 minutes

A mobile phone has several parts or components. It is important for you to know the parts and understand their functions so that you can easily diagnose and solve problems.

A conventional mobile phone is made up of many parts.

How many parts of a mobile phone do you know? Take a minute to think about it and then complete the following activity.

Parts of Mobile Phone	Functions
Keypads	Used for inputting or entering data into the phone. It is connected directly to the CPU
Ear Piece	Converts the electric signal to a sound signal
Mouth piece	Transmits sound from one phone to another
Battery	Source of power supply to a mobile phone
Power switch	Switches the phone on and off
Power IC	It takes power from the battery and supplies to all other parts of a mobile phone
Screen or display	Displays data. It is connected to the CPU to receive following signals : LCD Data Signal, LCD Reset Signal, LCD WR Signal, LCD RD Signal, LCD FLM Signal, LCD HSYN Signal etc.
Flash IC	Stores the software and other programs installed in the mobile phone
Charging IC	Takes the current from the charger and charges the battery
CPU	Controls all sections of a mobile phone
Antenna	Receives and transmit radio frequencies and helps the phone to connect to the cellular network

Following figure shows a printed circuit board (PCB) of a mobile phone showing the different internal parts. As you can see from this diagram the PCB is divided into two parts, the network section and the power section. The network section controls the incoming and outgoing phone calls, while the power section controls the memory and power related functions of the phone.

Instructions for the facilitator:

- Dismantle a mobile handset for demonstration purpose
- Ask the participants to identify parts of a mobile phone.

Features of Mobile Phones   120 minutes

All mobile phones have many features in common, but manufacturers also try to differentiate their own products by implementing additional functions to make them more attractive to consumers. This has paved the way for great innovation in mobile phone development over the past 20 years.

The common components found on all phones are:

- A battery, providing the power source for the phone functions.
- An input mechanism to allow the user to interact with the phone. The most common input mechanism is a keypad, but touch screens are also found in some high-end smartphones.
- Basic mobile phone services to allow users to make calls and send text messages.
- All GSM phones use a SIM card to allow an account to be swapped among devices. Some CDMA devices also have a similar card called a R-UIM.

- Individual GSM, WCDMA, iDEN and some satellite phone devices are uniquely identified by an **International Mobile Equipment Identity (IMEI) number.**

All mobile phones are designed to work on cellular networks and contain a standard set of services that allow phones of different types and in different countries to communicate with each other. However, they can also support other features added by various manufacturers over the years:

- roaming which permits the same phone to be used in multiple countries, providing that the operators of both countries have a roaming agreement.
- send and receive data and faxes (if a computer is attached), access WAP services, and provide full Internet access using technologies such as GPRS.
- applications like a clock, alarm, calendar and calculator and a few games.
- Sending and receiving pictures and videos (by without internet) through MMS, and for short distances with e.g. Bluetooth.
- In Multimedia phones Bluetooth is commonly but important Feature.
- GPS receivers integrated or connected (i.e. using Bluetooth) to cell phones, primarily to aid in dispatching emergency responders and road tow truck services. This feature is generally referred to as E911.
- Push to talk, available on some mobile phones, is a feature that allows the user to be heard only while the talk button is held, similar to a walkie-talkie.

Features of Operating Systems (OS) used in Mobile Phones
120 minutes

1) **Android:** Available on a wide range of device sizes, weights and from a broad array of manufacturers. Android offers flexibility, personalisation and a super slick tie in with Google's services like Gmail or Google Plus. Perhaps best of all, Android offers Widgets as well.
The Android OS is managed by the Open Handset Alliance and is based on open-source software coded in Java. It's the most popular OS in the world by volume, according to TechRepublic, due to its ubiquity on a range of devices and the large number of manufacturers offering different feature sets and price points. Samsung, HTC, and Motorola devices all use Android, and the Google Play store rivals Apple's in terms of sheer volume. Using Android gives you control over almost every function of your smartphone, but the OS won't stop you from doing something irrevocable and "bricking" your phone (breaking the device, thus making it as usable as a brick), so proceed with caution. The most recent version of Android is Lollipop 5.0, though many older models still use KitKat, Jelly Bean, Honeycomb, or even Gingerbread.

2) **Apple's iOS:** Simple, reliable and consistent across Apple's range of products including iPads, Apple's IOS is familiar to almost everyone. You'll find compatible accessories everywhere you go, if you choose it. If you're new to 'smart' mobile phones or already have some Apple products in your home, Apple's iOS just could be right for you.

If you're considering an Apple product, iOS is the backbone. Any iPhone 4s, iPad 2, or newer device can run iOS 8, but don't be surprised if a refurbished smartphone comes with iOS 7 pre-loaded, especially if it doesn't have much memory. Apple's operating system is coded in Objective-C and is known for being user-friendly. It's also the most tightly guarded of any OS, meaning you won't be able to make high-level changes to the way your device functions. Apple offers access to more content and applications than any other OS via the App Store, but it may not be a great choice for business users or others who need the freedom to customize their device.

3) **Windows Phone 8:** Underrated, simple, stable, both personalisable and innovative, Windows Phone 8 is only let down by the number of apps which are available for it. If you love Nokia phones, have a family or run your own corporate IT team, Windows Phone 8 could be your ideal OS.

Microsoft's OS is coded in Visual C#/C++ and is used primarily in newer Nokia phones. The Samsung Focus and HTC Titan 2 also run Windows Mobile. The biggest benefit to running Windows on your smartphone? Easy integration with common Microsoft programs such as Office, PowerPoint, and other productivity tools.

4) **BlackBerry OS:** Last in the comparison of mobile operating systems is BlackBerry. Just like Apple's offering, this is a closed-source OS that is only available on phones with the BlackBerry name, including the BlackBerry Bold, Curve, and Torch. Coded in Java, this OS was originally released in 1999 and it was one of the first designed to support a trackball for navigation and full QWERTY keyboard. It's reliable and stable, but is geared more toward business users than everyday consumers.

Which mobile OS is best for your pre-owned smartphone? It depends. Apple offers a seamless consumer experience, while Android offers flexibility. You may prefer the familiarity of Windows, or be a die-hard Blackberry fan. No matter what you're looking for, however, chances are at least one OS has what you need.

Mobile Phone Accessories   60 minutes

Mobile phone accessories include any hardware or software that is not integral to the operation of a mobile phone as designed by the manufacturer.

1) Cases

Cases, which are designed to attach to, support, or otherwise hold a mobile phone, are popular accessories for many phones, particularly mainstream smartphones. Case measures are based on the display inches (e.g. 5 inch display). There are different types:

- Pouches and sleeves
- Holsters
- Shells
- Skins
- Bumpers
- Flip cases and wallets
- Screen protection and body films
- Drop and shock protection
- Leather Case

2) Holsters

Holsters are commonly used alone for devices that include rubberized padding, or are made of plastic and without exposed rigid corners.

3) Standing Case

A Standing case improves user experience, being specially recommended for multimedia, videos and audio. Folio case is a combination case and stand, and may include a keyboard (USB for OTG smartphones or bluetooth keyboard).

Heavy duty cases are designed to protect from drops and scratches.

4) Skins and Design Covers

Skins and design covers can serve for protection and personalization. These are the result of the relatively "naked" designs produced by manufacturers such as Apple, where the metal and glass components of the device are exposed and vulnerable to damage. They are distinct from holsters, in allowing use of the device while in the case, but in many instances include a belt clip or other device giving it the functionality of a holster. They are made of hard plastic, rubber, or in the newer market adhesive-backed vinyl pieces.

Vinyl skins can be ordered on many websites and come pre-cut to fit your cell phone or another electronic device. Vinyl material may be calendared or cast, with the latter being more expensive. Calendared vinyl is expected to only be used for short durations while cast vinyl is used on a more long term basis. Calendered vinyl also tends to shrink in the heat, and fade. Cast vinyl avoids these problems, but costs up to 250% more (which still is not high). 3M has manufactured a cast vinyl product that they call "Controltac". This vinyl cover maintains a more glossy look and provides an air release channel that prevents bubbles during placement. The more popular is the cast vinyl because of the range of designs.

5) Customized Phone Cases

Customized phone cases use custom printing. Different companies have different methods of printing on cases, some utilize sublimation for printing on mobile phone cases, other methods include inkjet printed skins and Dye-Sublimation 3D printing methods.

Some phones have a replaceable cover. A release button on the cover lets it pop off to be replaced with the new cell cover. Phones that lack a replaceable cover can accept a slip on or snap on cover. These come in leather, vinyl, silicone, or hard plastic.

Functional cases can integrate an external battery, a USB, Bluetooth, WiFi keyboard and touchpad mouse in a similar way to tablets.

6) Anti-lost and Selfies Wireless Companions:

Antilost keychain can easily locate the cellphone through the GPS and Bluetooth low energy features of the smartphone. Once the user is out of range, both phone and companion will alert him / her. It also can be used to take selfie.

7) Mass Storage:

Some smartphones feature SD card slots (Usually the smaller Micro-SD variant). These, in combination with a compatible SD card, can be used to transfer files from one device to another, or simply to increase the storage capacity of the phone.

Wi-Fi SDs are Wi-Fi communication devices on a special SD card inserted into the SD card slot. They can move pictures to a local computer or an online photo sharing service.

8) Chargers and external batteries

Cell phone chargers have gone through a diverse evolution that included cradles, plug-in cords and obscure connectors. However, more recent devices generally use micro-USB. (Apple devices still use proprietary cables, though the form-factor of their 30-pin plug used on older devices has shown up elsewhere.)

External batteries can be included in the case (power case). Also external batteries can include rubber suction.

9) Photo accessories

Smart lenses are larger and more capable than the phone's camera, having optical zoom and other features. They connect to the smartphone by Wi-Fi and an app. They are compatible with most smartphones.

Smart flash can be used also for selfies.

10) HDMI and Projector

Micro USB to HDMI cables are used in smartphones with MHL.

11) Bluetooth

- Wireless control of and communication between a mobile phone and a handsfree headset. This was one of the earliest applications to become popular.
- Wireless control of and communication between a mobile phone and a Bluetooth compatible car stereo system.
- Wireless control of and communication with tablets and speakers such as iOS and Android devices.
- Wireless Bluetooth headset and Intercom. Idiomatically, a headset is sometimes called "a Bluetooth".
- Wireless streaming of audio to headphones with or without communication capabilities.
- Wireless networking between PCs in a confined space and where little bandwidth is required.
- Wireless communication with PC input and output devices, the most common being the

mouse, keyboard and printer.
- For controls where infrared was often used.
- For low bandwidth applications where higher USB bandwidth is not required and cable-free connection desired.

Discuss in class - What is the learning from this module/unit?

summary

Summarize the Lesson

?

Ask Questions/Solve the Exercise

"Unit 3: Diagnose/Repair Mobile Phone Faults"

The Session in Perspective

Unit 3: Diagnose/Repair Mobile Phone Faults

Module Learning Goals

This module covers basic mobile phone repair operations including soldering, de-soldering and jumpering, testing a mobile phone, using measuring tools to identify and repair mobile phones, use of multimeter for measurement of resistance, voltage and current etc.

Enabling objectives:

Upon completion of this module, the participant will be able to:

- Perform Soldering
- Perform De-solering
- Testing a Mobile Phone using a Multimeter
- Measuring Resistance, Voltage and Current using a Multimeter
- Perform Jumpering
- Illustrate how to use measuring tools (multi meter) for mobile phone testing/repairs

Methodology

Trainer Led Discussion, Skill Practice, Individual Reflection, Assessment

Instructions to the Trainees:

The students should participate while the trainer discusses about each topic to make the class more interesting.

Equipment /Tools Required:

Computer, Projector, White Board, Participants Manual, Markers, Flipcharts, Notes, Handout & PPT

Duration: **8 Hours**

Introduction

Before you can diagnose and repair a phone, there are some skills that you need to learn. These skills are:
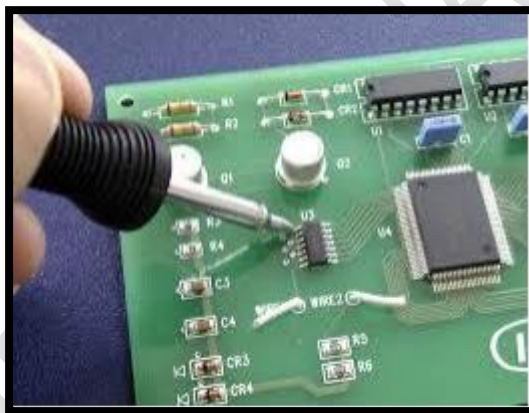
- Soldering
- Desoldering
- Testing using a multimeter
- Jumper setting

Soldering   120 minutes

Soldering is a process in which two or more metal items are joined together by melting and flowing a filler metal into the joint. The filler metal has a relatively lower melting point.

Steps in Soldering

1) Prepare the following materials:
- Soldering Iron
- Solder paste
- Long Nose Pliers
- PCB holder
- Electronic Components (Resistors, Diode etc.)

2) Plug and pre-heat the soldering iron.

3) Heat both items at the same time by applying the soldering iron to the copper pad and the component lead.

4) Continue heating and apply a few millimeters of solder. Remove the iron and allow the solder joint to cool naturally.

5) It only takes a second or two to make the perfect joint, which should appear shiny.

https://www.youtube.com/watch?v=PwrMiqKZsoU

https://www.youtube.com/watch?v=DQ-TglQX83A

De-soldering   120 minutes

Desoldering is the removal of solder and components from a printed circuit board for troubleshooting, repair, replacement, and salvage.

Steps in Desoldering

1) Use a solder wick (finely braided copper) to wick away excess solder from a desoldered connection.
2) Apply the solder wick and use the soldering iron to the de-soldered connection.
3) The solder wick will draw the excess solder off the PCB pad.

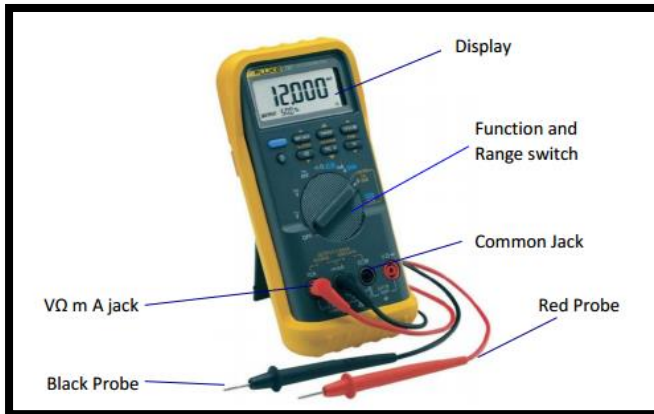https://www.youtube.com/watch?v=kRAThsDjHAo

Testing a Mobile Phone using a Multimeter 120 minutes

A multimeter is a device that is used to measure the voltage, current and resistance of various components of a mobile phone. Following figure shows the various parts of a multimeter:

Measure Resistance, Voltage and Current using a Multimeter

a) Measuring Resistance

To measure resistance follow these steps:

1) Plug your red and black probes into the appropriate sockets on your multimeter.
2) Choose the appropriate resistance measurement setting on your millimeter's
3) Hold the probes against the resistor.
4) Check the resistor value on the display.

Note: Always turn off power supply to your circuit before measuring resistance.

b) Measuring voltage

Testing for proper supply voltage is usually the first step when troubleshooting a circuit. To measure voltage you should follow these steps:

1) Select V~ (ac) or V (dc), as desired.
2) Plug the black test probe into the COM input jack. Plug the red test probe into the V input jack.
3) If the DMM has a manual range only, select the highest range so as not to overload the input.
4) Touch the circuit with the tips of the probes
5) Read the number in the display window and take note of the unit of measurement.

c) Measuring Current

1) Turn off power to the circuit.
2) Cut or unsolder the circuit, creating a place where the meter probes can be inserted.
3) Select A~ (ac) or A (dc) as desired.
4) Plug the black test probe into the COM input jack. Plug the red test probe into the amp or milliamp input jack, depending on the expected value of the reading.
5) Connect the probe tips to the circuit across the break so that all current will flow through the DMM (a series connection).
6) Turn the circuit power back on.

Jumper Setting   120 minutes

Jumpering means to temporarily complete a circuit or to bypass a break in a circuit by making a connection from one point to another.

A good conductor wire is used to make a jumper which by-passes the components and passes on a signal or supply line for further uses.

When wire is used as a jumper, it must have some special specifications as required. These jumper wires can mainly be of two types i.e. insulated and non-insulated. In the mobile phone insulated wires are used for jumpers. The length of a jumper depends on the two points connected in between.

Why do Jumpering

While repairing mobile phones, we find that certain faulty components are very difficult to get from the market. To repair such mobile phones the only immediate option is the use of jumpers. By use of jumpers we will bypass the faulty components specifically.

How to Jumper

1) Disassemble mobile phone and place it on a PCB holder.
2) Using a multimeter, check track and find the fault or the missing track that need jumper.
3) Apply liquid soldering flux to the points where you need to solder jumper wire.
4) Cut jumper wire to desired length and remove its lamination using blade cutter.
5) Hold one end of the jumper wire and solder it to one point of the faulty circuit track. Use a good quality tweezers to hold the wire and good quality of soldering iron and solder wire to solder.
6) Now hold the other end of the jumper wire and solder to the other point of the track
7) Using a multimeter check the jumper.

The following figure shows jumper settings in of the jumpers may look like on your motherboard. In this example, the jumper is the white block covering two of the three gold pins. Also, next to the pins is a silkscreen description of what the pins do, in this case when pins 1-2 are jumped the computer is operating normal, when 2-3 are jumped it is set into configuration mode, and when open the computer will be in recovery mode.
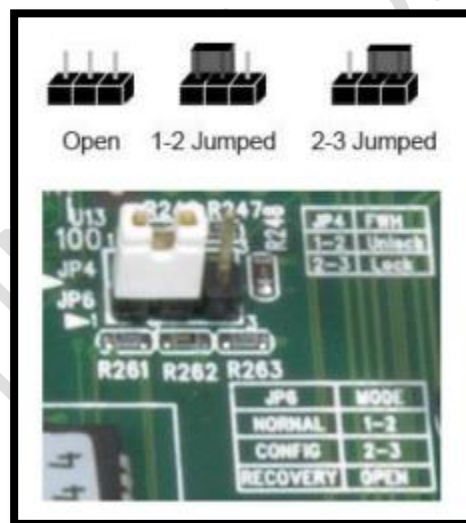
Using Measuring Tools (multi meter) for Mobile Phone Testing/Repairs   120 minutes

Mobile Phone Diagnosis There are two methods that you can use to find out faulty or damaged components in a mobile phone. These are:

1) The cold testing method
2) The hot testing method

Cold Testing

Cold testing is when we use a multimeter to check the value of resistance at the time of repairing a fault in a mobile phone. During cold testing do not power the phone from any equipment. Use the diode range and beep sound from the multimeter to find fault in the mobile phone. During cold testing, you should connect the RED probe of the multimeter to the ground of the mobile phone PCB, and use the BLACK probe to touch the testing points of the mobile phone. During the fault-finding and repairing process of each part, component or section, you should receive the following correct values:

1. Ear Phone Connector Tip (+ , -): .500 to .700
2. Loud Speaker / Ringer Connector Tip (+,-): .300 to .600
3. Battery Connector Tip (+): .400 to .500 Mobile Phone Repair and Maintenance Page 28
4. Battery Connector Tip (Sense): above .800
5. Display Connector Supply Pins: .250 to .400
6. Display Connector Signal Pins: .500 to .800
7. Camera Connector Supply Pins: .250 to .400
8. Camera Connector Signal Pins: .600 to .900
9. Key Tip (Row and Column): .400 to .800
10. Charger Connector Tip: .600 to .700
11. Vibrator Motor Connector: .40 to .500
12. Power ON / OFF Switch Point (+): .600 to .900
13. MIC Connector Tip (Analog MIC) (+,-): .700 to .900
14. Battery Charging Out Point (+,-): .300 to .400
15. SIM Card Connector Pin 1 (VSim): .500 to .700
16. SIM Card Connector Pin 2,3,6: .400 to .800
17. SIM Card Connector Pin 4 (GND): .00 (Beep)
18. Micro SD Card Connector Pin 4: .500 to .600
19. Micro Card Connector Pin 6 (GND): .00 (Beep)
20. Micro Card Connector Pin 1,2,3,5,7,8: .600 to .800
21. RTC: .400 to .500
22. Data RX and TX Pins: .600 to .700

Hot Testing

The hot testing method is adopted when the fault cannot be found or when the cell phone cannot be repaired using the cold testing method. In this method, the VOLTAGE of the damaged part or component is checked. The fault is found by powering the mobile phone with a battery which has a DC power supply. Once you power the phone, you should select the DCV (DC Volt) range of the Multimeter. Then you should connect the BLACK probe of the Multimeter to the ground of the phone's PCB and ensure the RED Probe touches the Testing Points. During hot testing, the voltage of different part or sections should be as follows (all values in Volt):

1. Ear Phone Connector Tip (+ , -) when working: .0 to 2.5
2. Loud Speaker / Ringer Connector Tip (+,-) when working: .0 to 2.5
3. Battery Connector Tip (+): 3.7
4. Display Connector Supply Pins: 1.8 to 2.9
5. Display Connector Signal Pins when working: .0 to 1.8
6. Camera Connector Supply Pins: 1.8 to 2.9
7. Camera Connector Signal Pins when working: .0 to 1.8
8. Key Tip (Row and Column) One Side: 1.8 to 2.8
=9. Charger Connector Tip: 5 to 6
10. Vibrator Motor Connector Tip when Working: 1.9 to 3.6
11. Power ON / OFF Switch Point (+): 3 to 3.6
12. MIC Connector Tip (Analog MIC) (+,-): 1.8 to 3.0
13. Battery Charging Out Point (+,-): 3.7 to 4.2
14. SIM Card Connector Pin 1 (VSim) when SIM Connected: 1.8 to 3.0

15. SIM Card Connector Pin 2,3,6 when working: 0 to 2.8
16. Micro SD Card Connector Pin: 2.8
17. Micro Card Connector Pin 1,2,3,5,7,8: 0 to 2.8
18. Data RX and TX Pins: 1.8 to 2.8

The following statements describe either the cold testing or hot testing methods used for diagnosing mobile phone problems. Participants have to write the correct diagnosis method against the statement that best describes it.

Instructions for the facilitator:
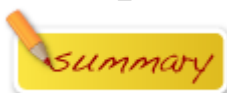
Conduct an assessment for this activity.

Description of diagnosis method	Name of Diagnosis method
Checks the value of resistance using a multimeter to diagnose a problem	
Checks the voltage of damaged part by giving power to the mobile phone using a batter of DC power	
The phone is not powered during testing	
Fault is found by powering the mobile phone with a battery	

https://www.youtube.com/watch?v=A5SQXiHBm7Q

Discuss in class – What is the learning from this module/unit?

Summarize the Lesson

Ask Questions/Solve the Exercise