Title: Tools of **Medical Residency** Exams

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   I am Dr. Rafiq Ullah, currently getting trained in Internal Medicine, in Khyber Teaching Hospital under the College of Physicians and Surgeons Pakistan training program. Into the past, I am a graduate of Khyber Medical College, Peshawar. To the date, I have been through a lot of exams including Aga Khan Residency exams, Post graduate Medical Institute Peshawar Induction test, etc. Glory to the God, I have excelled in all these exams. After commencing my post-graduate training, my colleague Dr. Muhammad Yasir and I started working on publishing this book to make it straight for the yound doctor, how to tackle residency exams. Into the future, I am aspiring for training in the NHS – United Kingdoms. On my way, I have been granted GMC registration through Plab – 2 pathway.

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بسم الله الرحمن الرحيم
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Dedicated to our parents, teachers, and mates who supported us through this journey.

Preface

Glory to the Almighty, Who bequeathed us with the fortitude to compile this book. After an arduous struggle and persistent motivations from colleagues and the readers, we achieved this book to acquaint the pathway we often seeked guidance for.

After witnessing and probing the situation, we - the team decided to come up with a consolidated source of study and guidance for the young graduates who are working hard to commence their careers in the specialty of their choice. We understand better the uncertainty of the situation, as we have experienced it and have excellently handled it. With the continuous support of our colleagues, we completed the task in a very professional way, involving the toppers, searching the online databases, abstracting the wide and wast sources etc. We have tried to bring the relevant knowledge, explain and simplify every concept that will help you in your exams and beyond.

Now, that we have stepped in, we will continue to guide and lead the juniors, no matter how hard it could be. We want the help of every reader, to improve this resource into a more effective and concise one.

We are available for your help anytime.

Dr. Rafiq Ullah
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Dr. Muhammad Yasir
(Medicine Trainee – KTH Peshawar)

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- Waleed Sarfaraz – TMO Medical "B" Ward, KTH
- Zubair Ahmed – TMO Medical "A" Ward, HMC
- Shehzad Zafar – TMO Medical "C" Ward, LRH
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- Rafaqat Hussain – TMO Surgical "C" Ward, KTH
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- Sulaiman Munair – TMO Surgical "B" Ward, STH

In the Dentistry portion:

- Atizaz Khan – TMO Orthodontics Ward, KCD
- Basit Khan – TMO Maxillofacial surgery, KCD

How to use this book for residency exams?

- First of all, find out what you need to study for your exam.
- Remember! This book is not an alternative of your text books. However, it can help you to revise the major concepts of medicine which are tested frequently, master the non-medical (minor) subjects and provides handy tips to excel in your residency exams country wide.
- Start with communication skills notes, and then solve the MCQs of this portion. Come back to the notes and revise what you got wrong.
- Then come to the biostatistics notes, and solve the MCQs. Revise after solving all the MCQs.
- Now, come to the English portion, study the notes and go deep into the meaning of each term in grammar. If you can't pick the concept, search that part in google. Don't skip the tables, the examples. Don't skip any portion in the given sequence, because each consecutive portion is connected to the prior one.
- When you find a mistake, a deficiency, or a suggestion for improvement, you note that on the first page of this book, and convey us as soon as possible, so that our upcoming juniors are facilitated as much as possible.

TIPS AND TRICKS FOR PGMI EXAM

As we all know that PGMI induction test is extremely important and considered a chance to work hard and get the chance to choose our career. It is important to know what does PGMI includes?

1. Clinical 50%
2. English 20%
3. Basics 10%
4. Ethics 10%
5. Biostatistics 5%
6. Communication skills 5%

Now, keep in mind that roughly 75% of the MCQs/bcqs are medium level (easy) and 25% are hard to solve. For clinical questions, it is advisable that you go for MCQs books that include an explanation, this way you can study maximum topics in a short duration of time. The recommended books are listed below in a separate topic. The rest of the minor subjects are covered in this book with comprehensive notes and MCQs bank.

For Medicine candidates, it is recommended that on must grab the major concepts of medicine from a text book or online resources. if a person cannot do it all, the least they can do is to go through MCQs banks available for MRCP-1. Some say, if you can't cover all the subjects completely, just do those questions which are related to diagnosis, fixed treatment, and common diseases. Besides the MCQs bank, if time allows, “Master The Board by Conrad Fischer” is another good source that can be utilized.

For Surgery Candidates, “A Comprehensive Approach to the Principles of General Surgery and Systemic Surgery by Abdul Wahab Dogar” are recommended before practicing MCQs. After finishing the text portion in about 10 – 15 days, come to the MCQs bank for MRCS (Pre-test for MRCS, MCQs and SEQs in Surgery by Baily&Love revision). Read the common and important MCQs with the explanation. You don't need to do the whole bank,

but you do need to be smart enough to find out the common concepts and skip the others.

For Dentistry candidates, it is recommended to study at least one month for the clinical subjects. One should start with Oxford clinical dentistry and Dentogist MCQs by Bhatia 6th & 8th Edition. If time allows, “MCQs in Dentistry by Vijay Partap” and “Dental Pulse series” can enhance your score in the clinical portion.. If you are studying textbooks, then skip the discussion with the MCQs in the Dentogists. After finishing the clinical and basics portions, utilize the this book to get the minors done. The minor subjects will take about two weeks minimum.

The time required to prepare for the exam depends on the specialty, person to person, and background. The conclusion of recommendations on duration of the study, from most of the excellencies, is that you have to divide your time into three portions. The first two portions should be utilized to study for the medical portion and one portion should be used to study for the minor subjects of your exam. If you prepare the medical portion and leave the minor subjects untouched or vice versa, you are deliberately putting yourself on the bottom of the list. One other suggestion is that in times of boredom from clinical subjects, use this book for the minor subjects. The minimum duration of time recommended is three months.

TOPPERS RECOMMENDATIONS FOR PGMI EXAM

Medicine:

- MRCP 1 Question Banks (Prometric > Passmedicine > Pretest)
- Master the board (MTB)
- Oxford handbook of clinical medicine 10th edition

Dental:

- Oxford handbook of Clinical Dentistry
- Dentogist MCQs by Bhatia 6th / 8th Edition
- MCQs in Dentistry by Vijay Partap – Optional
- Oral pathology by Soames book – Optional

Surgery:

- Dogar's General Surgery
- Dogar's Specials Surgery (GIT and Urology)
- MRCS Q-Bank (Pretest)
- SBA for MRCS (Baily & love revision)

Minors: (Biostatistics, English and Communication skills)

- *This* Book in your hand

FORMAT OF PGMI ENTRY TEST FCPS-II

PAPER DISTRIBUTION			
FCPS (MBBS) **Medical specialties applicants.** **Anesthesia, Community Medicine, Medicine & Allied, Pathology, Psychiatry, Pharmacology, Biochemistry and Physiology**		FCPS (MBBS) **Surgical specialties applicants.** **Anatomy, Diagnostic Radiology, ENT, Obs & Gynae, Surgery & Allied, Ophthalmology**	
Basic medical subjects: Applied Physiology, applied Pharmacology, applied Pathology and applied anatomy.	10%	Basic medical subjects: Applied Physiology, applied Pharmacology, applied Pathology and applied anatomy.	10%
General Principle of Medicine	50%	General Principle of Surgery	50%
English Language	20%	English Language	20%
Bioethics	10%	Bioethics	10%
Basic Biostatistics	05%	Basic Biostatistics	05%
Communication skills	05%	Communication skills	05%

FCPS (BDS)	
Basic medical subjects: Applied Physiology, applied Dental materials, applied Oral Biology, Community Dentistry, oral Pathology.	30%
Clinical subjects of final year BDS: Oral & Maxillofacial Surgery, Prosthodontics, Orthodontics Operative dentistry, Periodontology / oral medicine.	30%
English Language	20%
Bioethics	10%
Basic Bio-statistics	05%
Communication skills	05%

DIFFICULTY LEVEL: 75% questions should have medium difficulty level and 25% should have a hard difficulty level. It should cover all important parts of the course.

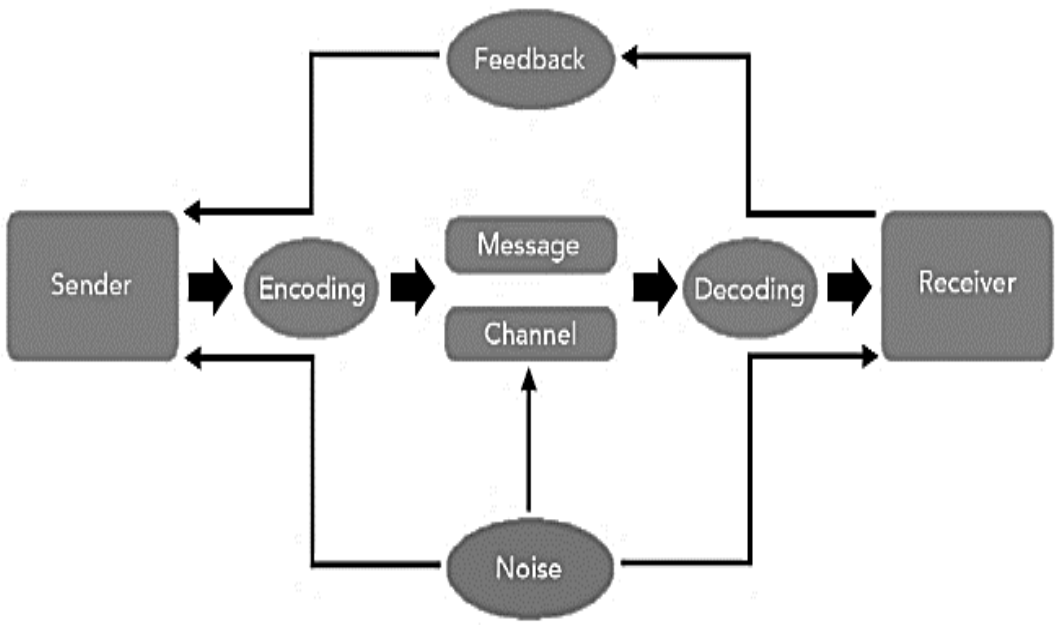
CATEGORY OF TEST: There will be three categories of test: Medical Specialties, Surgical Specialties and Dentistry.

COMMUNICATION SKILLS

COMMUNICATION SKILLS

INTRODUCTION

Communication is a derivation of Latin word, communis or commūnicāre, which means ‘to make common’ or ‘to share’. Communication is the act of conveying your message to another person through a mutually understood signs and language.The basic steps of communication are: message composition, encoding, and transmission of encoded message, reception of the encoded message, message decoding and finally its interpretation by the recipient.



TERMINOLOGY OF COMMUNICATION:

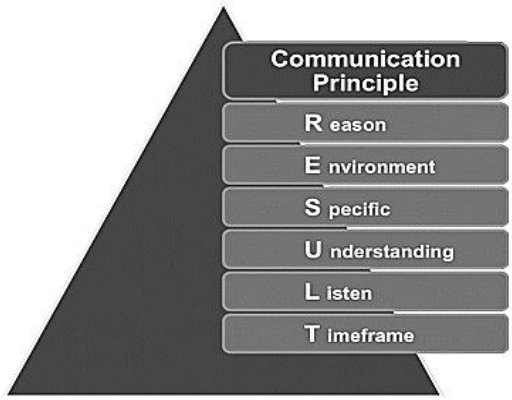
Terminology	Description
Sender (source, encoder)	The speaker or the writer
Message	The content which is intended to be conveyed. (thoughts, ideas, information, instructions, etc.)
Recipient (receiver, decoder)	The listener, reader, viewer
Medium (channel of communication)	The means used to carry the message from sender to recipient (email, telephone, etc.)
Context	The setting in which the communication takes place
Feedback	The response of the recipient
Communication barriers (noise)	Whatever causes problems during the communication process

THE 7 Cs OF COMMUNICATION

The 7 Cs is actually a checklist ensuring that the your message is well constructed and clear so the recipient gets your message clearly. These are:

Clear	Should indicate the purpose of communication
Concise	Stick to the point and keep it brief.
Concrete	The reciever has a clear picture about what you want to convey.
Correct	Should be error free.
Coherent	The content of your message is connected and fluent.
Complete	The message should make a complete meaning to the receiver.
Courteous	The message should be open, honest and polite.

MODEL OF EFFECTIVE COMMUNICATION (RESULT):



1. Reason

Communication must have a purpose that the sender wants to achieve. It may include multiple steps but the overall focus should on a single objective.

2. Environment

Communication can be in a variety of environments - for example, with colleagues, seniors, administration, etc. For an effective communication, it is essential that communication is adopted according to the nature of the environment.
The example includes, communication in breaking a bad news and in a joyful situation of breaking news of pregnancy to a couple. You can gather the necessary intelligence by asking a few questions in the beginning of coomunication.

3. Specific

After the reason and environment, now you need to specify the content of your message. You will need supporting information that guarantees that your message is clear and specific.

- Consultant wants to hear about the progress of your patient.
- Your patient wants to know about the surgical procedure.

Being specific is not just the content of your message; it is also about who you are conveying the message.

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4. Understanding

The next step is ensuring that your audience understand correctly what you want to convey. You need to get confirmed about the level of your audience understanding about a situation. For example, your patient doesn't know about his condition, you can't start explaining the surgical procedure.

5. Listen

Active listening to what is being said and observing the behaviour of those involved in the communication, is essential for an effective communication. Communication is always a two way process, therefore, actively listening make the loop of communication intact.

6. Timeframe

The "T" of the RESULT principle is about the amount of time you have for a communication. Frequently, you will find yourself in a timelimit for a communication. Make sure, you utilize your time effectively

TYPES OF COMMUNICATION:

1. Verbal Communication:

When the message is transmitted verbally, it is called verbal communication. It is done by either written or spoken words.

I) Oral communication, like in face-to-face, telephonic, video, radio, television, etc, is influence by the tone, volume and speed.

II) Written communication like text message, email, letter, report, memo etc, is influenced by the vocabulary, writing style and clarity of the language used.

2 Non-verbal Communication:

Types Of Non-Verbal Communication

I) Kinesics (Body language):

This includes Facial expression, Gestures, Postures, Eye contact/ gaze, and hand movements.

Gestures	Messages
Yawning	I'm tired, bored
Frowning	I don't like you
Slouching in a chair	I'm not interested
Frequently looking at your watch	I want leave
Arms crossed	I've had enough of this

II) Haptics (Touch):
Taping on the back, Kissing at the forehead etc.

III) Proxemics (Space distancing):
Keeping a distance while communicating is called proxemics.

IV) Chronemics:
The language of time. For example, a call at 12 am means some kind of emergency. Alternatively, if you reach to ward at time, it means you are punctual.

V) Sign language:
Communication using certain signs and symbols.

VI) Para language:

Paralinguistic or paralanguage are vocal signs used additional to the verbal message that do not include words. For example, pitch, speed, quality of voice and amplitude. we can understand mood and the situation by paralanguage expressions. ***Prosody***, which is the rhythm, pattern, stress of words.

FORMS OF COMMUNICATION

1. **Interpersonal communication:**
   Communication occuring between two or more persons is called interpersonal communication.

2. **Intrapersonal Communication:**
   This is communication that occurs in your own mind. Examples are when you make any kind of decision – where to go and how to go. When you think about about another person. It mostly depends upon your belief and spirituality.

3. **Small Group communication:**
   It is group interaction that results in an outcome on mutual understanding. For example, Residents case based discussion, discussion within board of governers for change of policy.

4. **One-to-group communication:**
   This involves an interaction between a speaker and a group of audience. Example is a teacher and a class of students.

5. **Mass communication:**
   Communication through TV, social media, books, newspapers etc.

COMMUNICATION BARRIERS

1. **Physiological Barriers**
   Physiological barriers result from individuals' personal shorcomings. For example, by ill health, poor eye sight, or hearing difficulties.

2. **Physical Barriers:**
   - → Illegible documents, blurred photos, Unclear Photocopies
   - → People moving in & out of the room
   - → Mumbling or speaking too Fast
   - → Environmental noise such as ringing phone, baby cries.
   - → Inadequate Lighting

3. **Cultural Barrier:**
   These refer to the rejection of the message by the community according their customs and norms.

4. **Language Barriers**
   These refer to complex terms, expressions, buzz-words, and jargon which may present barriers to the audience who are not familiar with. For example using medical jorgans in a conversation with a patient.

5. **Interpersonal Barriers**
   These refer to withdrawal of sender or receiver from a communication process.

6. **Stereotypes**
   These refer to some assumptions and negative attitudes towards a particular group which people use to justify discrimination against others.

7. **Psychological Barriers**
   There are two types of psychological barriers:
   - Perceptual barriers
   - Experiential barriers

LISTENING SKILLS

Active listening for both the sender and receiver is essential for an effective communication. Effective listening is hearing and understanding what a speaker is saying and how it applies to you, and then remembering it for future use and evaluation.The following are stages of listening:

- Receiving
- Understanding
- Remembering
- Evaluating
- Feedback

TYPES OF LISTENING:

1. **Discriminative listening**
   This basic type of listening involves understanding the tones and sounds, even prior to the understanding of words to find out the meaning and analyze what is going on. It enables us to pick what emotions they are trying to express. It gets more clear with the example, when you are trying to understand when people around you are speaking a foreign language that you don't understand.

2. **Comprehension listening**
   This type of listening requires vocabulary and language skills to analyze what is being conveyed. Let us say your colleague is explaining a research project to you. You need to use comprehensive listening to analyze the words and understand the message.

3. **Critical listening**
   Critical listening is used when you are trying to analyze and judge complex information. Here you don't just get the meaning of words, but corelate the information and analyze what the sender want to convey in order to make your judgement or opinion.
   - For example, you are attending a journal club presentation on an article, the speaker presents his conclusion about the article, you uses the criticle listening to decide weather you agree with the conclusion or not.

4. **Biased listening**
   Biased or selective listening is a type of listening when you are just listening

for information that you want to hear. You are not honestly evaluating the all aspects of the message, but rather looking to confirm your biased opinion. it can lead to a distortion of facts a speaker intends to communicate.
Here's an example:

- Let's say your supervoiser briefs on the effects of steroids injections on COVID-19 severity. You hold the opinion that steroids are dangerous to use. Your supervoiser explains how the benefits outweight the harm, but you focus on the harmful effects of steroids only. You may or may not know, about the biased listening but your pre-determined mind has compelled your behavior to biased listening.

5. **Informational listening:**
Informational or informative listening is the type of listening that you use when you are trying to learn. It requires a high level of concentration to understand the new information the speaker want to convery. When you try to learn important skills that are being taught to you, it's vital that you pay attention and use informational listening skills.

6. **Appreciative listening**
In appreciative listening, you give full attention to certain auditory information which you personally enjoy. For example we use appreciative listening when we are listening to good music, poetry or maybe great quotes of philosphers.

7. **Sympathetic listening**
Here you try to understand the feelings and emotions of a speaker and in return you provide support. For example you are using sympathetic listening you're your younger brother is telling you about trouble he had at school. In this case you use a sympathetic listening style to make the him feel heard and give him comfort. Sympathetic listening is an important type of listening to use when you are communicating with a patient in adversity. For example, let's say a House Officer listening to a ptient in the ER after wheat pill poisoning, the patient tells him how much disappointed he is with his life. The House Officer sets back on his chair, appreciates how bad his situation is and shares how bad he feels about his situation.

8. **Empathetic listening**
This is similar to sympathetic listening but more than just feeling bad for the other person. Listening empathetically to someone means putting yourself in their shoes (as if they were your own) to understand what they're saying and

feeling. With sympathetic listening, you try to understand someone's feelings to provide support.

Here's an example:

- Let us say you are observing your supervisor breaking bad news to a patient, your supervisor politely ask the patient that he has a bad news for him and then takes a break. You are observing that, his voice tone is low. After breaking the bad news, the patient starts asking questions randomly and desperately. Your supervisor is listening to the patient, nodding his head, provides a glass of water and tissue paper to the patient.

9. Therapeutic listening

Empathetic listening is sometimes called therapeutic when the listener has a purpose of not only empathizing but also to help the speaker with a something. This not only to find out the problems from listening but also to help the speaker cure themselves.

NOTE TAKING

Effective note taking from lectures and readings is an essential skill that allows a permanent record for revision.
Note taking is the practice of writing down pieces of information in a systematic way. It includes the following:

- Taking notes in a lecture or a discussion
- Taking notes in a lecture after processing the content and rewriting them.

The Five R's of Note Taking:
Professor Walter Pauk of the Study Center at Cornell University describes five essential aspects of note taking. He characterized these as the five R's of note taking. Here they are:

1) **RECORDING:**
   Wirte down the main points.

2) **REDUCING:**
   To reduce is to pick out key terms and concepts and summarize.

3) **RECITING:**
   Recite the lecture notes after the lecture as soon as possible and revise them from time to time to keep them fresh in your mind.

4) **REFLECTING:**
   Think about the ideas in different ways. You will find out the ideas in a more understandable and practical form.

5) **REVIEWING:**
   Review your notes again and again. Each time you will find new budding ideas. This is the professional way to master knowledge.

Note Taking System
The following is a chart with a brief explanation of the main note-taking system.

METHOD	DESCRIPTION	WHEN TO USE
LISTS	A list of ideas as they are presented. Each idea is described in detail.	This method is most widely used by the students but this method requires a lot of writing, and it is usually hard to keep up with the speaker. ideas in this method.
OUTLINES	Write the important ideas on the left margin, which are numbered in Roman. Supporting ideas to these main concepts are written with indentation and are noted with capital letters. Further details are written in lower case and numbered in arabic.	This a good way when the speaker has an organized lecture and you are taking nores on a computer.
CONCEPT MAPS	Write the main idea in the center and small ideas in the periphery of the page. Connect them with arrow lines.	This method is good when the speaker jumps from on idea to another and then back.
CORNELL METHOD	This method uses a two-column approach. The left column takes almost a third of the page called the “cue” or “recall” column. The right one is used for taking notes using any of the methods described above. In the end review your notes and write the key concepts in the left column. You can include a summary box at the bottom in your own words.	The Cornell methodis the best way of note taking. Most colleges recommend using some form of the Cornell method.

READING SKILLS

Reading is a process that includes getting new information, processing and analyzing for meaning. It must be structured and goal oriented to avoid wasting time on irrelevant information.

The SQ4R Method Of Reading Effectively:

Readers preview manuscript to set the goal of the reading by developing questions about the topic. Then they read the text actively, write the answers, recite them, and evaluate their comprehension through REVIEW (4R) activities.

1. **Survey:**
   Survey what you are about to read by going through the title, headings, subheadings and the summary.
2. **Question:**
   Turn the title and sub-titles into questions.
3. **Read:**
   Read actively through the stem and search for answers and generate more questions.
4. **Recite:**
   Look away from the text, recite your answers loudly and then re-start reading for answers of remaining questions.
5. **wRite:**
   Summarize the key ideas and write them down.
6. **Review:**
   Summarize your information in flow charts, diagrams and "Concept Maps".

Another is method is SQ3R Technique of reading which stands for: SURVEY, QUESTION, READ, RECALL, REVIEW.

Techniques of Reading

The ability to read is an important task to comprehend written information in a short duration of time. There exist four main types of reading techniques:

- Skimming
- Scanning
- Intensive
- Extensive

I) <u>Skimming – Reading for the gist of a text</u>

This reading technique is used getting out the main theme of a lengthy text. Under this technique, we read quickly, and skip over the detail. Reader read the text quickly to get the gist of the text, then read the text in details for the answers to the questions they have. This technique gives a good idea about what information lies where in the text.

II) Scanning – Reading for specific information

This technique is used by the reader to scan the text for a specific piece of information. This involes a quick read sentence by sentence, skipping or ignoring the irrelevant text and looking for key words, phrases or information. For example, This technique is used for looking up a name from the telephone guide book.

III) Intensive Reading

This kind of reading requires the reader to read text in depth from word to word with full attention. It focuses more on the comprehension and indeed beneficial to language learners. It moreover, helps with long term memory of newly learnt information.

IV) Extensive reading

This kind of reading is mostly done for pleasure and joy. It is a long term reading of text to get the pleasure. It doesn't requires look for the meaning of every single word. If a student doesn't like a subject, he can do extensive reading of that subject.

REPORT TYPES:

A report is a written document that carries a clear purpose and is meant for specific audience. It includes information that is presented, analyzed and applied to a specific situation or problem. Different reports have different formats. The top 8 Types of Reports are given below:

Format of the Formal Report

Formal reports are generally designed in following format.

i) Cover Page
ii) Title Page
iii) Acknowledgements
iv) Abstract
v) Introduction
vi) Executive Summary
vii) Background and Inception of Case
viii) Methodology
ix) Detail Study and Analysis
x) Results and Findings
xi) Conclusions
xii) Recommendations
xiii) Suggestions
xiv) Bibliography
xv) Annexure

→ **Type # 1. Formal or Informal Reports:**

Formal reports are well structured and fluent toward single objective. It is written in a way to eliminate personal pronouns. Informal reports contain information in a causual language. The internal memorandum can generally be described as an informal report.

→ **Type # 2. Short or Long Reports:**

→ **Type # 3. Informational or Analytical Reports:**

Informational reports carry simple information one department to another department. For example annual financial reports, personal absentees report. Analytical reports contains analyzed information toward the solution of a problem. For example: Clinical audit report, feasibility report, etc.

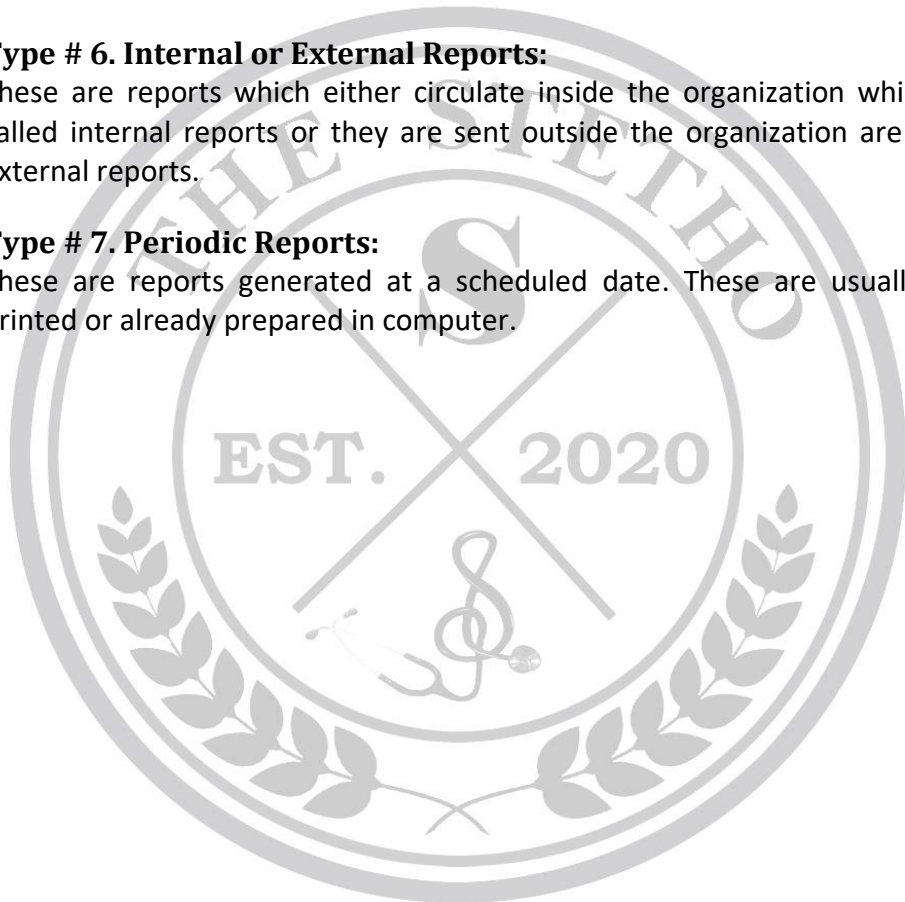
→ **Type # 4. Proposal Report:**

This proposes about the solution to a problem, or suggestion about improvement. Proposal reports are prepared telling how an organisation can meet a need.

→ **Type # 5. Vertical or Lateral Reports:**
Reports which run from upward to downward or vice versa of the hierarchy of the organization are termed as verticle. Those reports which circulate among departments of same caliber are termed as lateral reports.

→ **Type # 6. Internal or External Reports:**
These are reports which either circulate inside the organization which are called internal reports or they are sent outside the organization are called external reports.

→ **Type # 7. Periodic Reports:**
These are reports generated at a scheduled date. These are usually pre-printed or already prepared in computer.



SOME IMPORTANT TERMS:

1. **Agenda**. List of all topics to be discussed during a meeting.
2. **Ad hominem**. A fallacy that attacks a person rather than the argument itself. This is also referred to as "name calling."
3. **Campaign.** In advertising, a large number of ads that stress the same theme and appear over a specified length of time.
4. **Code**. Set of rules or symbols used to translate a message from one form to another.
5. **Decentralization.** The extent to which authority and decision making are spread throughout all levels of an organization rather than being reserved for top management (centralization).
6. **Decoding**. Process of translating a message into the thoughts or feelings that were communicated.
7. **Encoding.** Process by which the source expresses thoughts or feelings in words, sounds, and physical expressions, which together make up the actual message that is sent.
8. **Feedback.** Any message that aids a communicator in evaluating the success of previous message(s). [AR] The responses of the receiver that shape and alter subsequent messages from the source.
9. **Hawthorne effect.** An increase in worker productivity that does not result from any objective change in working conditions or work organization, but seems to arise from workers having more positive psychological feelings about the workplace.
10. **Interview.** Carefully planned and executed question-and-answer session designed to exchange desired information between two parties. [SB] Intrapersonal communication. Communication with oneself, including selftalk, planning, and reflections.
11. **Leadership.** The process whereby one individual influences other group members toward the attainment of defined group or organizational goals. [GB] An influence process that includes any behavior that helps clarify or guide the group to achieve its goals.
12. **Message**. A stimulus to which meanings are attributed in communication. [AR] Set of verbal and/or nonverbal symbols sent to a receiver.
13. **Perception**. The process by which an organism assimilates, interprets, and uses sensory data.
14. **Plagiarism**. Use of another person's information, language, or ideas without citing the originator and making it appear that the user is the

originator.

15. **Xenophobia**. An individual's irrational and obsessive hatred of people perceived as different and foreign. Related to the concepts of racism and ethnocentrism. All of these can be overcome by the study of the social sciences and coming to appreciate the ideas of culture and social structure as tools for understanding ourselves and others.
16. **Symposium:** A Symposium is a formal gathering in an academic setting where participants are experts in their fields. These experts present or deliver their opinions or viewpoints on a chosen topic of discussion. It would be correct to label a symposium as a small scale conference as the number of delegates is smaller. There are the usual discussions on the chosen topic after the experts have presented their speeches. The chief characteristic of a symposium is that it covers a single topic or subject and all the lectures given by experts are completed in a single day. A Symposium - prestigious conferences, generally leading venues in their respective fields.
17. **A conference:** Refers to a formal meeting where participants exchange their views on various topics. Conference can take place in different fields, and it need not be academic in nature all the time. Thus, we have parent teacher conferences, sport conferences, a trade conference, a conference of journalists, conference of doctors, a conference of research scholars, and so on. A conference is a meeting that has been prearranged and involves consultation and discussion on a number of topics by the delegates.Conference and symposium are similar events where speakers come together and give their opinions on a chosen subject. Symposium can be described as a smaller conference that gets over in a single day with a lesser number of delegates.
18. **A Seminar** is a form of academic instruction, either at a university or offered by a commercial or professional organization. It has the function of bringing together small groups for recurring meetings, focusing each time on some particular subject, in which everyone present is requested to actively participate. The Instructor has prepared the concepts and techniques they will present and discuss through a combination of visual materials, interactive tools or equipment, and demonstrations. It includes some take home material for the participants that relates to the lecture. A full laboratory phase is not a requirement.
19. **A Workshop** includes all the elements of the Seminar, but with the largest portion being emphasized on “hand-on-practice” or laboratory work which is designed to reinforce and bring forward an immediate functioning dimension to the participant’s eye and hands by implementing and practicing the actual technique that was taught

through the lecture and demonstration process."

BIOMEDICAL COMMUNICATION SKILLS

INTRODUCTION:

Communication skills are indeed challenging to explain. We have tried to explain them from the widely-agreed resources to give the reader an appreciation of how a condition may be tackled. A Doctor must:

- Listen to patients, ask for their thoughts, and retort to their worries.
- Share with patients, in a way they can comprehend, the information they want.
- Respond to patients' queries and brief them about their care.
- Ensure that patients are briefed about how information is communicated among teams and who will be taking care of them.

In addition, For a good communication:

- Information should be provided in an empathic way that allows patients to take care of their health in the longer term.
- The doctor should not only advise the patient but also facilitate them as much as possible and involve them in decision making. Doctors should therefore be sensitive to patients' information needs.
- All health care providers should be able to deliver unwelcoming news in an honest and supportive way.

Since age-old times, a concept called the biomedical model had been in practice. However, recently, there has been a significant change in healthcare communication. The biomedical model is no more relevant.

- **Biomedical Model:**
  - Doctor is in charge of the consultation.
  - Focus is on disease management.
- **Patient Centered Approach:**
  - Power and decision-making is shared.
  - Address and treat the whole patient.

VERBAL COMMUNICATION PROCESS

- ✓ Introductory communication: Greet the patient with a smiling face and a hand shake. Maintain eye contact and introduce yourself.

- ✓ Reinforcement: Facilitate the patient to confer their concerns and illness. Listen actively, nod your head while the patient speaking with friendly facial expressions and show curiousness in his/her concern.

- ✓ Effective listening: Listne with full attention with an open mind, and concentrate on his/her concerns.

- ✓ Questioning: Ask questions to gather relevant information which will help you to reach the diagnosis. Ask only one question at a time and wait for his/her response before asking the next question. Questioning may be:

    1) Open-ended questions: Always start with open questions.
    2) Leading or "loaded" questions: A leading question, usually dictates your patient towards a particular answer. These are usually discouraged to be asked.
    3) Recall and process questions: Some questions require your patient to remember something or think deep before answer. Recall' example, — For how long have you been experiencing headache?. Process' example, — what might be exacerbating your headache?
    4) Closed-ended questions: Closed questions require the patient to chose between two answers (usually simply 'yes' or 'no'). These questions limit the consultation. They may be beneficial for seeking a clear and concise information.
    5) Funnelling: This type of questioning includes a series of questions that becomes more and more specific. This technique is usually used to encourage a shy patient to communicate freely.

- ✓ Reflecting and clarifying: Reflecting is clarifying what you understood from the consultation. This shows that you were listening to the patient queries.

- ✓ Closing communication: At this stage thank the patient and give your provisional diagnosis.

NON-VERBAL COMMUNICATION

I. Body language:

Body language is essential for effective communication. The physician should take into account a patient body language to find more about the patient situation and in the mean time, should use an appropriate body language in order to deliver holistic care in the most effective manner possible. Body language includes:.

1) Facial expression; Face can express a warming welcome, empathy or boredom and displeasure etc, during a consultation. Therefore, it is important to take into account facial expressions during a consultation.
2) Body postures: The body postures can show openness or rejection. For example, sitting quietly with hands loose in the lap, creats a feeling of openness. While arms crossed on the chest portrays a feeling of rigidness.
3) Gestures: Gestures are overt and noticeable movements or actions using various body parts. Gestures are integral part of our lives without thinking about them.
4) Eye contact: Appropriate eye contact is a sign of respect, and lack of eye contact shows the presence of anxiety, lack of security, confidence as well as negligence and disrespect. Changing eye contact during a conversation can be deemed a meaningful cue. When you finish speaking and look at the patient, it indicates that your patient needs to speak about the issue now.

II. Appearance:

The appearance of your patient tells you a lot about your patient's background for example, social class, mood, beliefs, attitude, etc.

It is also important how the physician looks. Clothing can influence the perceptions of credibility, likeability, magnificence, and domination.

III. Closeness and personal space:

Although, touch and closeness are considered signigicant in an effective communication, the value differs in different societies and cultures. A close personal interest in the patient can be communicated by the appropriate use of touch. The most socially acceptable method is a handshake, which enables a physician to establish early contact with his/her patient.

The following are four universal proxemics:

- Intimate Distance (touching to 45 cm): Up to 45cm of distance around us, is considered intimate distance. Usually, a close family member or friend can get into this space.

- Personal Distance (45 cm to 1.2 m): We maintain this distance when we interact with our friends at social events.
- Social Distance (1.2 m to 3.6 m): It's the distance over which we interact with new people.
- Public Distance (3.7 m to 4.5 m): It is a comfortable distance to maintain between strangers in public.

IV. Paralanguage:

Paralanguage includes pitch and tone of the voice, the speed of conversation, and breaks between words.

- Volume:
- Pitch: A monotone speech may be perceived as apathy or boredom. Try to fluctuate your pitch according the content and emotions.
- Pace: A slow pace of speech may frustrate the patient. A fast pace may be perceived as nervousness. It is advised to maintain a medium pace and go back and forth on pace according to the content of the message.
- Rhythm: Talking with good rhythm makes you sound more confident or dominant.
- Articulation/Pronunciation: Speaking fluently, completely pronouncing each word would help the listener to better understand what is said, and also a certain amount of lip-reading will be possible. Poor pronunciation may give the impression of ignorance or incompetence.

V. Environment:

The environment of the consultation room should be welcoming and relaxing. The furniture should be appropriately placed to put the patient easy during consultation.

TYPES OF DOCTOR-PATIENT RELATIONSHIPS

Here, we will briefly discuss four types of doctor-patient relationships.

1. Default - Patient and doctor have low control

   This type of relationship is difficult to progress in certain direction because the patient is reluctant to participate even when the physician reduces some of his/her control.
2. Paternalism - Doctor has high control (Disease Model)

   In this type of relationship, the physician acts as a custodian, because the physician independently protects and promotes the patient's health condition. This authoritarian model is usually advocated in emergencies, where saving the patient life is a priority and the patient autonomy is limited for the short term.

3. Consumerism - Patient has high control
   Also called an informative relationship in which the patient acts as in charge of decision making and the physician plays an expert role to provide factual information to inform the patient decision, agreeing to the patient's requests for selected intervention like a referral to hospital, a sick note, etc. This relationship is more practical in patient-centered locations like private setups.
4. Mutuality (Partnership) - Patient and doctor have high control (Illness Model)
   This kind of relationship is characterized by active participation of both physician and patient, where both patient and physician exchange of ideas and agree on a mutually agreed intervention.

HOW TO IMPROVE COMMUNICATION

1) Learn to listen.
2) Select words appropriately.
3) Relax
4) Be optimistic.
5) Empathise.
6) Learn to be assertive. Avoid being aggressive, stubborn and a know-it-all.
7) Reflect and improve. Learn from your past mistakes and successes.

COMMON BARRIERS TO EFFECTIVE COMMUNICATION

1) Use of jargon.
2) Give knowledge without a feedback.
3) Emotional barriers, cultural differences and taboos.
4) Lack of interest.
5) Passive listening.
6) Blocking. When the physician redirects the consultation in a way other than the patient wants.
7) Collision. When the patient cant bring up a querry and the physician doesn't ask for it.
8) Physical barriers to nonverbal communication.
9) Language differences and the difficulty in understanding unfamiliar accents.
10) Premature reassurance.

ESSENTIAL CONSIDERATIONS

→ **Attitudes**

You need to be confident, friendly, competent, and above all, reliable, when

your patient is entrusting his/her health and confidential information to you.

→ Personal appearance

Your appearance affects your patient trust and confidence in you. Part of that intangible 'professionalism' comes from your image. The era of white coat is now long gone. The hospitals have now introduced uniform for their different staff. A universal dresscode can be as follows:

- A good personal hygiene.
- Use scent/perfume that is not overpowering
- A clean-shaven otherwise facial hair should be tidy.
- A 'bare below the elbow' dress code with no jewellery. For men it is a shirt and women may wear skirts or trousers with length of the skirts should not elicit eye brow response. The belly should and shoulders should usually be covered. Shoes should be polished and clean. Surgical scrubs can also be worn.
- Hair should be tidy, combed and long hair tied up.
- Your name badge should be worn at the belt or on a lanyard around the neck to be clearly visible.
- Stethoscopes need to be carried and mostly worn at the neck.
- For your personal stuff use pockets or belt-holders.

→ Timing

Your discussion with your patient should be at appropriate time, make sure that it is not during quiet time, sleep time, meal time or the patient's long-lost relative has just come to visit.

→ Setting

Most of the time, your discussion with your patient happens in a busy ward and it is not feasible to acquire an ideal setting. However, if you are want to discuss something important that requires attention on both your parts, consider the following conditions:

- A quiet, private room that is free from disturbances.
- Enough room for those involved in the discussion.
- Setting should be comfortable in terms of soft seats, good lightening and optimum temperature.
- Arrange seats with no intervening furniture.

→ Avoid medical jargon

Use simple language in your consultation. Avoid using jargons, even if they are commonly used. You may also think that some terms are well known but usually

they are misinterpreted.

→ Fear-words

Be aware of the fear words. Make sure that you use these words only if your diagnosis is confirmed or there is high suspicion. You should not avoid using them where they are needed, because it may sometimes create confusion. Some fear words are mass, tumor, and a shadow on Chest X-ray. These terms, when used, should be explained thoroughly to realize the patient its exact meaning.

→ The importance of silence

During a consultation, silence is used to extract more information from the patient. Sometimes, silence makes your patient realize that you are listening and empathizing with him/her.

→ Remember the name

Talking to a patient or their family, try to remember your patient's names. Sometimes, forgetting a name or using a wrong name puts you in an embarrassing situation.

→ Standing

You should stand when a patient enters a room and take your seat at the same time as them.

→ Greeting

Greet your patient but beware of the "good afternoon" and "good morning" because they may not be appropriate if you don't have good news for your patient. Instead, use a simple Hello.

→ Shaking hands

Hand shake is a good point to start with. But judge the situation, because patient with certain backgrounds don't appreciate handshake.

→ Introductions

The way you introduce yourself is completely your personal choice.—choose terms that suit you.

- Title—them

Ask for name and preference. When you have your patient's name, you can use your judgment to address your patient. But keep changing from the first name to the family name and back looks unfriendly, and it can hinder the flow of your consultation.

- Title—you

Introduce yourself by your first name with a title to avoid any misunderstanding of the role. Possibly the best way is a long introduction using both your names and a title, and explain why you are here.

'Hello, my name is Jane Smith. I am one of the doctors in the emergency department. I am here to assess your condition.'

GENERAL PRINCIPLES

→ Demeanour

Greet your patient. Introduce yourself and anyone else in the room. Maintain a warm and friendly environment, and encourage the patient to speak up their mind.

→ Style of questioning

Open questions versus closed questions

- Open questions are used in the beginning of consultation to get as much information as possible.
- Multiple choice questions are used when patients have difficulty with an open question. For example, patients will most often not know what do you mean by 'What sort of pain is it?' In such situations, you may give them a few options. You must be very careful not to give the answer that you are expecting from them.
- You may use clarifying questions when there are terms that are not clear in meaning. For example, patients may complain of dizziness. You may ask, "what exactly do you mean by dizziness? Is it the sensation of spinning in your surrounding, or is it lightheadedness?"

→ Reflective comments

Use reflective comments to maintain a smooth flow of the consultation. Encourage the patient and reassure them that you are following.

→ Staying on topic

Sometimes the patients may talk about irrelevant things, which would be costing you time that you cant afford. Don't be afraid to interrupt because you need to keep the patient on the main topic. You need to be forceful but in a friendly manner. You can do the same to move the patient on to a new topic.

→ Eye-contact

Make eye-contact and look at the patient when they are speaking. You should resist looking at the notes or patient's test results and stick to the 'normal' rules of eye-contact.

→ Adjusting your manner

Adjust your style according to the patient level of understanding. However, don't assume things on the patient's part.

→ Interruptions

Apologize to the patient for interruptions. If the patient gets angry, it is your professional obligation to deal it with decency. Don't take it as a personal insult, it may be the patient way of coping with their ill health.

TELEPHONE COMMUNICATION

The essential rule of confidentiality is that you must not disclose any personal information to anyone without the permission of the patient concerned—except in a few specific circumstances.

- You must not give out any confidential information over the telephone as you cannot be sure of the identity of the caller. All communication should be done face-to-face. But because of this COVID-19 pandemic, the dynamics in the healthcare system are changing. You may need to attend on phone consultations with patients or their relatives. But the principle of confidentiality remains the same; if a relative calls to ask about the patient, you must stick to the principle of confidentiality.
- You can proceed with the consultation in different ways depending upon the circumstances. For example,
    1. Calling a patient after he has booked an appointment and the patient is not expecting you: Hello, can I speak to Mr. Johns. (Yes, I am). Ok, my name is dr. Rafiq. I am calling from the GP practice. Before we start, Can I check a few details to ensure I am talking to the right person? Can you confirm your date of birth and the first line of your address? Is this the right time to speak? Check geography (location), check support if breaking bad news. Can I confirm if you have privacy.
    2. When a patient calls you. Patient: Hello. Doctor: Hello, may I confirm to whom I am talking to? Alright, I am Dr. Rafiq. I am one of the junior doctors in the GP practice. I would like to check a few details. Confirm age, full address and ask, "can I note your number if we may have to call you back".

3. Calling to a relative about patient's condition after patient's permission: Hello, Can I speak to Mr. John. Mr. john I am Dr. Rafiq. I am talking from Manchester Royal hospital. Is this the right time to talk to you? I have been asked to talk to you about your father (patient). Before we start, can I confirm a few details: Patient name. Can you confirm the first line of your father (patient) address.

- History should be taken in more details. For example, where exactly you feel the pain. Can you tell me, is it above or below the belly button? If you suspect emergency or you are not sure about the diagnosis, ask them to come to the hospital or GP practice.

SBAR

SBAR is a mnemonic to frame consultation and to make the flow of consultation smoth and uniform. There are four sections:

→ **S: Situation**
- Identify yourself (name and designation) and where you are calling from.
- Identify the patient by name and the reason you are calling.
- Describe your concern in one sentence.
- Include vital signs where appropriate.

→ **B: Background**
- State the admission diagnosis and date.
- Explain the background to the current problem.
- Describe any relevant treatment so far.
- You should have the information (from patient's charts, notes, and drug card) at finger tips. Include medication, allergies, pertinent lab reports.

→ **A: Assessment**
- State your assessment of the patient (vital signs, early warning score) and your overall clinical impression and concerns.
- State what might be the reason for the patient's current condition.

→ **R: Recommendation**
- Explain what you need and the time-frame in which you need it.
- Make suggestions and clarify expectations.
- 'Is there anything else I should do?'
- Record "name and contact details" of the person you have been speaking to.
- Record the details of the conversation in the patient's notes.

OTHER SPECIFIC SITUATIONS

→ **Talking about sex**

Sexual history taking is extremely important in clinical consultations and it may be a embarrassing for the patient and for the inexperienced professional. Taking a sexual history, there are certain things that would make the situation easy and help you to get the relevant information.

- Maintain privacy, if there is anyone else in the room, ask them to leave the room with the patient permission.
- Ask direct and clear questions but relevant questions.
- Maintain a good eye-contact.
- Never show any surprise if you hear something which you have never heard before or conflicts with your beliefs.
- If you don't understand slang, never assume it but ask them directly. It is better understand sexual slang beforehand.

→ Angry patients

Use body language to look confident without appearing aggressive. Throughout the conversation, you should remain polite, helpful and empathizing. Never confront the patient or relative and resist becoming angry yourself.

- Ensure you safety first.
- Listen attentively and try to calm the situation.
- Acknowledge the difficulty of their situation but don't take responsibility for someone else deeds and never apologies on someelse behalf. I really appreaciate you not not happy with what has happened so far. I can see you are upset and angry. I am really sorry for what you are going through. I will be honest with you, at this point I don't know how it happened and who is responsible. Let me ask you a few questions to make sure we both understand the samething.
- Steer the conversation away from the area of unhappiness towards the positive and plans to move the situation forward. For example, in terms of moving forward, I will change your cannula now (the cuase of anger). As you mentioned, you want to complain about it. I can help you with the documentation. I will update you about any important necceary progress being made about your complain.
- Emphasize any grounds for optimism, or plans for resolving the situation and putting things right. Let me tell you that this is not something happening over here in routine. Our hospital takes such incidents very seriously and investigates them to find out the cause and make the necessary steps to prevent them from happening again.

BREAKING BAD NEWS

Breaking bad news in a sensitive way that you have helped the patient through a terrible experience can be one of the most uplifting aspects of working in healthcare.

→ **Setting:**

- Find a quiet, private location.
- Prepare yourself with background knowledge, be calm and confident. Make eye contact and anticipate emotions.
- Check for support: Have you come to the hospital alone today? Is there anyone you'd like to be in this discussion?
- Introduce yourself
- Talking to a relative, check identity and relationship (You should know the name of the patient). "How are you related to Mr. James?"
- Patients who ask questions before you introduce yourself: I am sorry, can I check a few details before we talk it? After apologizing, introduce yourself and check identity.
- If they are standing, invite them to sit. Is it okay if we sit down to talk? Otherwise , stand with the patient.

→ **Perception: Establish Previous Knowledge**

Assess the patient's understanding of thier condition. Ask what the patient and the family already know. Note any discrepancy of awareness.

'Tell me what you know about your condition so far?'

'What have you been told about your condition so far?'

Take a short history of symptoms where necessary. It is essential to understand what the patient already knows.

→ **Invitation:**

This is basically taking a permission to have the discussion. "Would it be okay for me to discuss the results of your investigations with you now? How much you want to know about your condition."

→ **Knowledge:**

Explain the facts righ from the beginning. Go through everything that have happened so far. Fill the in the gaps in patient's perception. Use simple and clear words. Avoid using medical jorgans. Then give a warning shot. For example, "I'm afraid your condition appears more serious than we thought".

→ **Break the Bad News:**
You should allow time for the information to sink in, ensure that the patient understands all that has been said, and repeat any important information.

→ **Emotions:**
Deal with the emotions. Show empathy. "I am really sorry for what you are going through, I can see this is not something you were expecting. Everyone at your position would feel the same, even if I were in your shoes." The patient may need a few moments assimilate the information. Wait in silence until the patient speaks. Offer support and give them sometime. Don't rush to the positive side. Be honest about the information. Facts are facts. Never give false hopes. After explaining the condition and its severity, you can now explain the prognosis. You can mention any hope that you can see.

→ **Strategy and Summary:**
Summarise the information and make a plan for future. You can arrange a follow up in 2 – 3 days for further discussion about future plans. Ask the patient if there is any thing they want you to repeat.

PROTOCOLs OF MEDICAL COMMUNICATION		
C-L-A-S-S Protocol: A protocol for all medical interviews. **C** – CONTEXT **L** – LISTENING SKILLS **A** – ACKNOWLEDGE **S** – STRATEGY **S** – SUMMARY	**E-V-E Protocol:** A sub-protocol for any emotional encounter. **E** – Explore the Emotion **V** – Validate the Emotion **E** – Empathic Response	**T-I-M-E-R Protocol**: A protocol for effective communication in supervision. **T** – Think Through the Encounter **I** – Introduce Issues **M** – Manage the Discussion **E** – Establish a Plan and Expectations **R** – Revisit and Give Feedback
S-P-I-K-E-S Protocol: A protocol for breaking bad	**B-U-S-T-E-R Protocol**: A protocol for challenging conversations.	**C-O-N-E-S Protocol**: A protocol for discussing a medical error.

S – Setting Up the Conversation **P** – Perception **I** – Invitation **K** – Knowledge **E** – Emotions **S** – Strategy and Summary	**B** - Be prepared **U** – Use non-judgmental listening **S** – Six second rule **T** – "Tell me more" statements **E** – Empathize and validate **R** – Respond with a wish statement	**C** – Context **O** – Opening Shot **N** – Narrative **E** – E-motions **S** – Strategy & Summary

B-A-L-A-N-C-E Protocol: A protocol for cultural competence.

B – Beliefs & Values (that influence perceptions of illness)
A – Ambience (living situation and family structure)
L – Language & Health Literacy (role of interpreters, accuracy of translation, metaphoric meanings)
A – Affiliations (community ties, religious & spiritual beliefs)
N – Network (social support system)
C – Challenges (cancer-related risks of home, work & life conditions)
E – Economics (socioeconomic status &community resources)

MCQS BANK OF COMMUNICATION SKILLS

1) Communication is a non-stop _____. .
   A) Paper
   B) Process
   C) Programme
   D) Plan

Answer: B

Explanation: Communication is a non-stop process which involves transmission of information from the sender through a selected channel to the receiver overcoming barriers that affect its pace. The process of communication is a cyclic one as it begins with the sender and ends with the sender in the form of feedback.

2) Communication is a part of _____ skills.

A) Soft
B) Hard
C) Rough
D) Short

Answer: A

Explanation: Communication is a part of Soft skills.

3) The _____ is the person who transmits the message.
A) Receiver
B) Driver
C) Sender
D) Cleaner

Answer: C

Explanation: The sender is the person who transmits the message. The person who receives the message is called the receiver. Communication is two-way traffic. This means that the receiver is a sender when gives feedback to the sender.

4) _____ is the person who notices and decodes and attaches some meaning to a message.
A) Receiver
B) Driver
C) Sender
D) Cleaner

Answer: A

Explanation: Receiver is the person who notices and decodes and attaches some meaning to a message. The "receiver" is the listener, reader, or observer—that is, the individual (or the group of individuals) to whom a message is directed.

5) Message is any signal that triggers the response of a _____.
A) Receiver
B) Driver
C) Sender
D) Cleaner

Answer: A

Explanation: Message is any signal that triggers the response of a receiver. The message can be written, oral, symbolic or non-verbal such as body gestures, silence, sighs, sounds, etc. or any other signal that triggers the response of a receiver.

6) The response to a sender's message is called _____.
   A) Food bank
   B) Feedback
   C) Food
   D) Back

Answer: B

Explanation: The response to a sender's message is called Feedback. Feedback can also be written like - replying to an e-mail, etc. it enables us to evaluate the effectiveness of your message.

7) _____ context refers to the relationship between the sender and the receiver
   A) Social
   B) Physical
   C) Cultural
   D) Chronological

Answer: A

Explanation: Social context refers to the relationship between the sender and the receiver. The social environment, social context, sociocultural context or milieu refers to the immediate physical and social setting in which people live or in which something happens or develops. It is the environment of people that surrounds something's creation or intended audience.

8) _____ context refers to the similarity of backgrounds between the sender and the receiver.
   A) Physical
   B) Social
   C) Chronological
   D) Cultural

Answer: D

Explanation: Cultural context refers to the similarity of backgrounds between the sender and the receiver. Cultural context looks at the society individuals are raised in and at how their culture affects behavior. It incorporates learned values and shared attitudes among groups of people. It includes language, norms, customs, ideas, beliefs and meanings.

9) _____ refers to all these factors that disrupt the communication.
   A) Nonsense
   B) Noise

C) Nowhere
D) Nobody

Answer: B

Explanation: Noise refers to all these factors that disrupt the communication. Noise factors are more than simply loud noises and refers to many kinds of roadblocks or interferences that prevent people from effectively exchanging messages.

10) Environmental barriers are the same as _____ noise.
A) Physiological
B) Psychological
C) Physical
D) Sociological

Answer: C

Explanation: Environmental barriers are the same as Physical noise. They limit a person with a disability from fully participating in activities. For a wheelchair-user, they may include stairs, narrow doorways, heavy doors, or high counter tops.

11) Our dress code is an example of _____ communication.
A) Verbal
B) Nonverbal
C) Written
D) Spoken

Answer: B

Explanation: Our dress code is an example of Nonverbal communication. Nonverbal communication is the process of sending and receiving messages without using words, either spoken or written. Also called manual language. Similar to the way that **Bold letters** emphasizes written language, nonverbal behavior may emphasize parts of a verbal message.

12) Communication strengthens_____ &_____ relationship is an organization.
A) Employer-father
B) Employer-employee
C) Mother-employer
D) Mother-child

Answer:B

Explanation: Communication strengthens Employer & Employee relationship in

an organization.

13) _____ communication includes tone of voice body language, facial expressions etc.
A) Nonverbal
B) Verbal
C) Letter
D) Notice

Answer: A

Explanation: Nonverbal communication includes tone of voice body language, facial expressions etc. Nonverbal communication is the process of sending and receiving messages without using words, either spoken or written. Also called manual language. Similar to the way that italicizing emphasizes written language, nonverbal behavior may emphasize parts of a verbal message.

14) When there is similarity of background between the sender and the receiver such as age, language nationality, religion, gender then this is called _____ context.
A) Social
B) Cultural
C) Physical
D) Dynamic

Answer: B

Explanation: When there is similarity of background between the sender and the receives such as age, language, nationality, religion, gender then this is called Cultural context.

15) Letter, e-mail telephone are examples of _____ .
A) message
B) feedback
C) channel
D) encoding

Answer: C

Explanation: Letter, e-mail telephone are examples of Channel. In the basic communication process, a sender puts a message in words and transmits it to a receiver who interprets the message. The medium the sender chooses to transmit the message is called the communication channel.

16) Understanding _____ different parts of speech forms the base of

leaning grammar.

A) Five
B) Eight
C) Six
D) Seven

Answer: B

Explanation: Understanding eight different parts of speech forms the base of leaning grammar. There are eight parts of speech they are noun, adjective, pronoun, verb, adverb, preposition, conjunction, interjection.

17) Nouns that end in “Y” but have a constant before “Y” form their plural by dropping “Y” and adding ___

A) ves
B) es
C) s
D) ies

Answer: D

To get the plural of words ending in 'y', there is a rule to remember. If there is a vowel before the y, you just add 's'. If there is a consonant before the 'y', drop the 'y' and add 'ies'.

18) ‘A’ and ‘an’ are the _____articles

A) Definite
B) Indefinite
C) Particular
D) Specified

Answer: B

'A' and 'an' are the Indefinite articles. The indefinite article (a, an) is used before a noun that is general or when its identity is not known.

19) It is of paramount importance that one need to construct a_____ sentence in the day to day affairs

A) Wrong
B) Correct
C) Incorrect
D) Right

Answer: B

Explanation: It is of paramount importance that one need to construct a correct sentence in the day to day affairs.

20) A_____ may be defined as the name of a person place or thing

A) Verb
B) Noun
C) Pronoun
D) Adverb

Answer: B

Explanation: A Noun is defined as the name of a person place or thing. Nouns are words that name people, places, things, or ideas. They are not actually people, places, things, or ideas.

21) According to Hoben, communication is the _____ interchange of thought or idea.

A) Visual
B) Audio
C) Verbal
D) Written

Answer: C

According to Hoben communication is the Verbal interchange of thought or idea. Hoben was a behavioral theorists .

23) Proper nouns always begin with _____ letters

A) Running
B) Capital
C) Small
D) Numerical

Answer: B

Proper nouns always begin with Capital letters. The word cat is a noun, which means there is more than one. The word Bob is a proper noun. All proper nouns must begin with capital letters. Countries all begin with a capital letter because they are also proper nouns.

24) _____ nouns require capitalization only if they start the sentence or are part of a title.

A) Common
B) Proper
C) Abstract
D) Collective

Answer: A

Common nouns require capitalization only if they start the sentence or are part of a title. Common nouns are not normally capitalized (unless they are the first

word of a sentence or part of a title, rarely if first word in a quotation or after a colon)

25) Once the message is encoded in a desired format, it is transferred through a medium called _____.
    A) Channel
    B) Medium
    C) Media
    D) Way

Answer: A

Once the message is encoded in a desired format it is transferred through a medium called Channel.

26) The nouns, which cannot be felt, seen or heard, are called _____.
    A) Common
    B) Proper
    C) Abstract
    D) Collective

Answer: C

The nouns which cannot be felt, seen or heard are called Abstract Noun. An 'abstract noun' is a type of noun that refers to the quality, action or state. It can't be seen or touched. It can be only felt and realized. For example: Honesty, bravery etc

27) The information, which is transferred to the receiver, has to be interpreted, this process is called _____.
    A) Encoding
    B) Decoding
    C) Opening
    D) Closing

Answer: B

28) All communication events have a _____. .
    A) Resource
    B) Source
    C) Start
    D) End

Answer: B

All communication events have a Source. All communication can be initiated,

carried out and finally ended only if there are proper resources to discuss or discuss on. Every occasion and every event will have some solid resource so that a communication session can be started.

29) Personifications of strength and violence are considered as _____ gender.
A) masculine
B) Feminine
C) common
D) Neuter

Answer: A

Personifications of strength and violence are considered as Masculine gender. Ex, Sun, Summer, Winter, Time, Death etc. It is considered feminine if the object is remarkable for beauty, gentleness and gracefulness. Ex: Earth, Moon, Spring, Nature, Mercy, etc.

30) The message may be misinterpreted because of _____.
A) Barriers
B) Distortions
C) Distractions
D) Noise

Answer: A

The message may be misinterpreted because of Barriers. These include filtering, selective perception, information overload, emotional disconnects, lack of source familiarity or credibility, workplace gossip, semantics, gender differences, differences in meaning between Sender and Receiver, and biased language.

31) The environment in which the transmitter or receiver are, should be _____.
A) Complex
B) Competent
C) Complete
D) Compatible

Answer: D

The environment in which the transmitter or receiver are should be Compatible. Communication is the act of conveying intended meanings from one entity or group to another through the use of mutually understood signs and semiotic rules.

32) A noun that dandies neither a male or a female is _____ gender
   A) Masculine
   B) Feminine
   C) Common
   D) Neuter

Answer: D

A noun that dandies neither a male or a female is Neuter gender. Neuter gender is a grammatical gender that. includes those nouns having referents which do not have distinctions of sex, and. often includes some which do have a natural sex distinction.

33) Countries when referred to by names are also considered _____.
   A) Masculine
   B) Feminine
   C) Common
   D) Neuter

Answer: B

In English Countries by default have neuter gender, but when referred to by names are considered Feminine. In some languages, such as French, every noun must be masculine or feminine. The result is that France is feminine, and so is Belgium. On the other hand, Germany, the Netherlands, and Great Britain are all masculine.

34) The Christian sign of the _____ is a gesture pertaining to religion and spirituality.
   A) Plus
   B) Minus
   C) Division
   D) Cross

Answer: D

35) In oral communication there is a possibility of immediate _____.
   A) Reaction
   B) Response
   C) Refection
   D) Reset

Answer: B

In oral communication there is a possibility of immediate Response. This ensures speedy interaction and makes immediate feedback possible.

Epidemiology, Research and Biostatistics

EPIDEMIOLOGY

Epidemiology is the study of how often diseases occur in different groups of people, and why. Medicine often asks 'Why has this person got this disease?' and 'What is the best way of treating them?' However, epidemiology asks broader questions such as 'What kind of people get this disease?', 'Why do they get it when others don't?' and 'How can we find out what is generally the best way of treating people with this disease?'

EPIDEMIOLOGICAL DATA MESAUREMENTS

Rate:

A *rate* is the number of events that occur in a defined time period, divided by the *average* number of people at risk for the event during the period under study. Because the population at the middle of the period (at 1st July of a year) can usually be considered a good estimate of the average number of people at risk during that period, the midperiod population is often used as the denominator of a rate. The formal structure of a rate is described in the following equation:

Rate = Numerator / Denominator × Constant multiplier

Rates are usually multiplied by a constant multiplier—100, 1000, 10,000, or 100,000—to make the numerator larger than 1 and thus easier to discuss (e.g., "one death per thousand people per year"). When a constant multiplier is used, the numerator and the denominator are multiplied by the same number, so the value of the ratio is not changed.

SOME SPECIFIC RATES:

1. Crude Birth Rate:
   The crude birth rate is the number of live births divided by the midperiod population, as follows:

$$\text{Crude birth rate} = \frac{\text{No. live births (defined place and time period)}}{\text{Midperiod population (same place and time period)}} \times 1000$$

2. Infant Mortality Rate:
   It is used as a overall index of health status of a nation. The formula is:

$$\text{IMR} = \frac{\text{No. deaths to infants <1 year of age (defined place and time period)}}{\text{No. live births (same place and time period)}} \times 1000$$

3. Neonatal Mortality Rate:

$$\text{Neonatal mortality rate} = \frac{\text{No. deaths to infants <28 days old (defined place and time period)}}{\text{No. live births (same place and time period)}} \times 1000$$

4. Post neonatal Mortality Rate:

$$\text{Postneonatal mortality rate} = \frac{\text{No. deaths to infants. 28 - 36 days old (defined place and time period)}}{\text{No. live births (same place and time period)} - \text{No. neonatal deaths same place and time period)}} \times 1000$$

5. Perineonatal Mortality Rate:

$$\text{Perineonatal Mortality Rate:} \frac{\text{Still births + No. death to infants < 7 days old (defined place and time period)}}{\text{Still births + No. live births (same place and time period)}} \times 1000$$

6. Materanal Mortality Rate:

$$\text{Maternal mortality rate} = \frac{\text{No. pregnancy-related deaths (defined place and time period)}}{\text{No. live births (same place and time period)}} \times 1,00,000$$

MEASURING DISEASE FREQUENCY

Mortality refers to death from a disease. Morbidity means the situation of living with a disease, and it is often measured in terms of incidence and prevalence. It

is important to distinguish between these two terms, which are often used incorrectly.

1. INCIDENCE

This is the number of new cases in a particular time period. For example, the 'incidence of lung cancer during 2009' means the number of newly diagnosed cases of lung cancer during that year. It is calculated as follows:

$$\text{Incidence} = \frac{\text{number of new cases in a given time period}}{\text{person years at risk during same time period}}$$

Person years at risk means the total amount of time (in years) that each member of the population being studied (study population) is at risk of the disease during the period of interest. In practice, we often do not know the exact number of person years at risk, so a proxy measure such as the mid- year population or total list size can be used.

2. PREVALENCE

This is defined as the proportion of current cases in a population at a given point in time. For example, the prevalence of angina in the UK is the proportion of people in the UK who are currently living with diagnosed angina. It is usually called the point prevalence, and is calculated as follows:

$$\text{Prevalence} = \frac{\text{number of cases in the population at a given point in time}}{\text{total population at the same point in time}}$$

The term point prevalence means —i.e., prevalence at a specific point in time. Whereas; period prevalence refers to the number of persons who had a given disease at any time during the specified time interval. Period prevalence is the sum of the point prevalence at the beginning of the interval plus the incidence during the interval. In other words, period prevalence is a mixed measure, composed of point prevalence and incidence, it is not recommended for scientific work.

EPIDEMIOLOGICAL STUDY DESIGNS

Before we embark on the various study designs, let us discuss a few terms;

CASES: People who have a disease or condition that is being studied are generally referred to as cases. People without the disease are called **NON-**

CASES. When comparisons are made in epidemiological studies i.e case-control and cohort studies, the non- cases or non- exposed individuals are referred to as **CONTROLS**. In these types of study, the groups are called **STUDY GROUPS**. Randomised controlled trials often compare a group of people who are receiving a certain treatment with another group who are receiving a different treatment or even a 'dummy' treatment called a placebo. In randomised controlled trials, the groups are usually called **TREATMENT ARMS.**

TYPES OF STUDIES

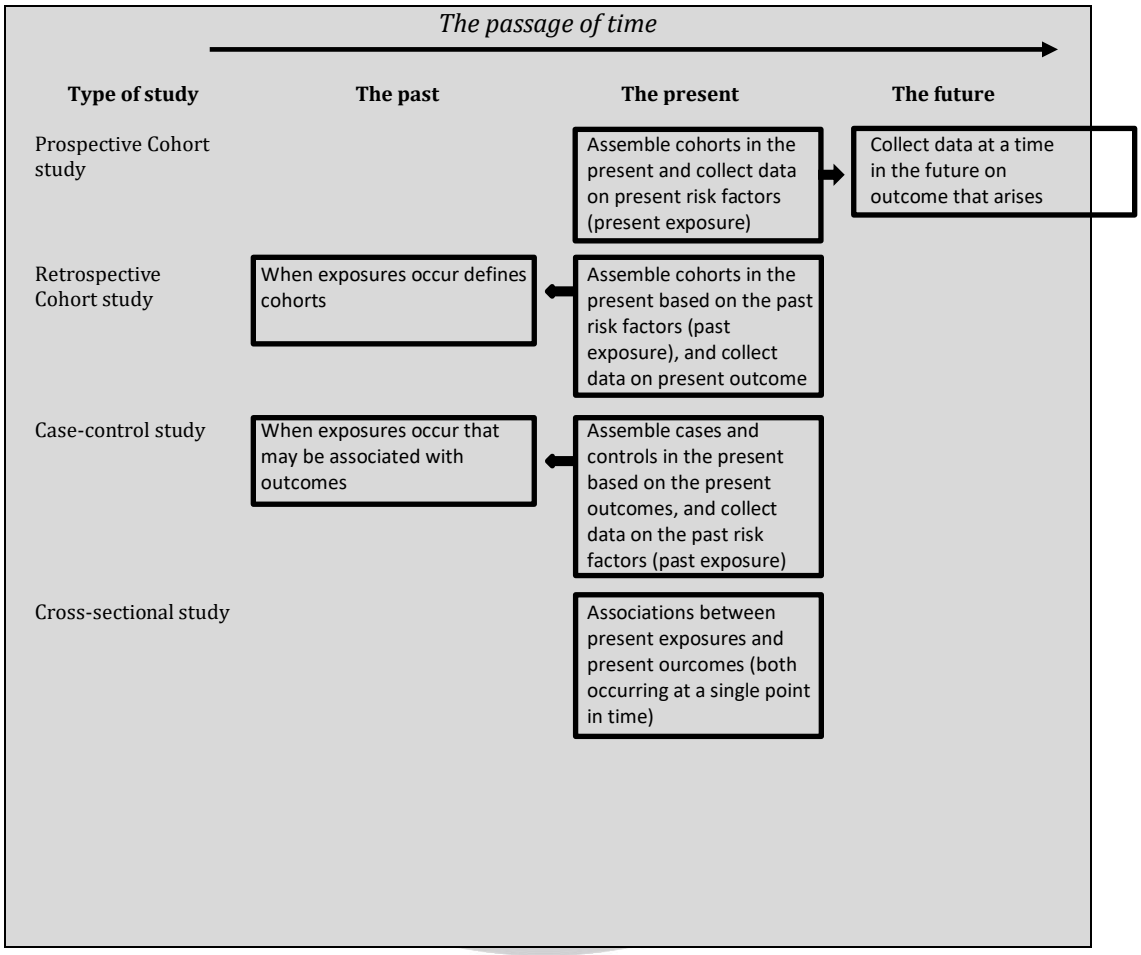
A research is the process of answering questions. Practically, we can say; a research project is conducted either to generate a hypothesis or test a hypothesis. The research designs discussed below are the primary designs used in epidemiology which can assist in developing hypotheses, testing hypotheses, or both. All designs can be used to generate hypotheses; and a few designs can be used to test them— with the caveat that hypothesis development and testing of the same hypothesis can never occur in a single study.

1. **In an experimental study** design the investigator has more control over the assignment of participants, often placing them in treatment and control groups (e.g., by using a randomization method before the start of any treatment)
    - Randomised control trials
    - Non randomized control trials

2. **In observational studies** the investigators simply observe groups of study participants to learn about the possible effects of a treatment or risk factor; the assignment of par- ticipants to a treatment group or a control group remains outside the investigators' control. Observational studies can be either descriptive or analytic. In descriptive observational studies, no hypotheses are specified in advance, preexisting data are often used, and associations may or may not be causal. In analytic observational studies, hypotheses are specified in advance, new data are often collected, and dif- ferences between groups are measured.

    - Descriptive studies:
        - *Cross sectional study*
        - *Ecological studies (Group)*

- Analytical studies:
    - *Cohort Study:*
        - *Prospective cohort study*
        - *Retrospective cohort study*
    - *Case Control study:*



Studies	**Advantages**	**Disadvantages**

Qualitative research	✓ Generates hypotheses and initial exploration of issues in participants' own language without bias of investigator	✓ Cannot test study hypotheses Can explore only what is presented or stated Has potential for bias
Cross-sectional surveys	✓ Are fairly quick and easy to perform Are useful for hypothesis generation	✓ Do not offer evidence of a temporal relationship between risk factors and disease ✓ Are subject to late-look bias Are not good for hypothesis testing
Ecological studies	✓ Are fairly quick and easy to perform Are useful for hypothesis generation	✓ Do not allow for causal conclusions to be drawn because the data are not associated with individual persons ✓ Are subject to ecological fallacy Are not good for hypothesis testing
Cohort studies	✓ Can be performed retrospectively or prospectively ✓ Can be used to obtain a true (absolute) measure of risk ✓ Can study many disease outcomes Are good for studying rare risk factors	✓ Are time-consuming and costly (especially prospective studies) Can study only the risk factors measured at the beginning Can be used only for common diseases May have losses to follow-up
Case-control studies	✓ Are fairly quick and easy to perform Can study many risk factors Are good for studying rare diseases	✓ Can obtain only a relative measure of risk Are subject to recall bias Selection of controls may be difficult Temporal relationships may be unclear Can study only one disease outcome at a time
Randomized controlled trials	✓ Are the "gold standard" for evaluating treatment interventions (clinical trials) or preventive interventions (field trials) ✓ Allow investigator to have extensive control over research process	✓ Are time-consuming and usually costly Can study only interventions or exposures that are controlled ✓ by investigator May have problems related to therapy changes and dropouts May be limited in generalizability Are often unethical to perform at all
Systematic reviews and meta-analysis	✓ Decrease subjective element of literature review Increase statistical power Allow exploration of subgroups Provide quantitative estimates of effect	✓ Mixing poor quality studies together in a review or meta- analysis does not improve the underlying quality of studies.
Cost-effectiveness analysis	✓ Clinically important	✓ Difficult to identify costs and payments in many health care systems

MEASURING ASSOCIATION IN EPIDEMIOLOGY

A number of measures are used to compare the rates of a particular disease experienced by people who have been exposed to a risk factor for that disease and those who have not. A 2 x 2 table is usually used for computations and calculations in association epidemiology.

A 2 x 2 Table

		Disease present?		
		Yes	No	Total
Exposed to risk factor?	Yes	a	b	a+b
	No	c	d	c+d
	Total	a+c	b+d	a+b+c+d

1. ABSOLUTE RISK

This is the probability of having a disease, for those individuals who were exposed to a risk factor. It is calculated as follows:

$$\text{Absolute Risk} = \frac{\text{number of cases of disease in those exposed}}{\text{number of individuals exposed}}$$

When using a 2 × 2 table, absolute risk can be calculated as a/(a + b). For Example

		Disease present?		
		Yes	No	Total
Exposed to risk factor?	Yes	a (20)	b (70)	a+b (90)
	No	c (16)	d (94)	c+d (110)
	Total	a+c (36)	b+d (164)	a+b+c+d (200)

If 90 people were exposed to a risk factor, and 20 of them develop a particular disease, their absolute risk is 20/90 = 0.22 or 22%.

Absolute risk is of limited practical use, because it takes no account of the risk in those individuals who have not been exposed to the risk factor.

2. RELATIVE RISK (RR)

Relative risk indicates the risk of developing a disease in a group of people who were exposed to a risk factor, relative to a group who were not exposed to it.
It is calculated as follows:

$$\text{relative risk} = \frac{\text{disease incidence in exposed group}}{\text{disease incidence in non-exposed group}}$$

- If RR = 1, there is no association.
- If RR > 1, there is an increased risk of developing the disease in exposed population.
- If RR < 1, there is a decreased risk of developing the disease in exposed population.

When using a 2 × 2 table, relative risk can be calculated as

Let us work out a relative risk from a real study. Are women who are undergoing in-vitro fertilization more likely to suffer a miscarriage in the first trimester if they have bacterial vaginosis? The data are shown in Table.

		First Trimester Miscarrigae (Disease)		
		Yes	No	Total
Bacterial vaginosis (risk factor)	Yes	a (22)	b (39)	a+b (61)
	No	c (27)	d (119)	c+d (146)
	Total	a+c (49)	b+d (158)	a+b+c+d (207)

Now,

$$\text{RR} = \frac{a/a+b}{c/c+d} = \frac{22/61}{27/146} = \frac{0.361}{0.185} = 0.361/0.185 = 1.95$$

This study reports that women who are undergoing in-vitro fertilization are nearly twice (1.95 times) as likely to suffer a miscarriage in the first trimester if they have bacterial vaginosis.

RR SHOULD NOT BE CALCULATED FOR CASE–CONTROL STUDIES. ODDS RATIO SHOULD BE USED INSTEAD.

3. ATTRIBUTABLE RISK

Attributable risk (or AR) is the excess risk of developing a disease in those who have been exposed to a risk factor compared with those who have not.

For example, how much more likely is an individual to develop liver cirrhosis if he or she drinks heavily?

Disease incidence in exposed group – disease incidence in non- exposed group

OR,

Using a 2 × 2 table: (a/a + b) – (c/c + d).

- In the previous relative risk example, the attributable risk (miscarriage) in exposed (bacterial vaginosis) is calculated as **(22/61) – (27/146) = 0.361–0.185 = 0.176**, which can be multiplied by 1000 to obtain the excess number of cases per 1000, e.g 176 miscarriages per 1000 women.

Attributable risk should not be calculated for case–control studies.

4. ODDS RATIO

In case–control studies, we retrospectively find people who have already developed a disease; therefore, we can't find out the incidence and also can't find out the relative or absolute risk.

The odds ratio is calculated as follows:

$$\text{odds ratio} = \frac{\text{odds that subjects } \textit{with} \text{ disease have been exposed to risk factor}}{\text{odds that subjects } \textit{without} \text{ disease have been exposed to risk factor}}$$

Using a 2 × 2 table, the odds ratio can be calculated as:

$$\frac{a/c}{b/d}$$

For example, is there a relationship between adverse life events and breast cancer? The data are shown

$$\text{OR} = \frac{\text{odds of subjects with disease being exposed to risk factor}}{\text{odds of subjects without disease being exposed to risk factor}}$$

$$= \frac{a/c}{b/d} = \frac{19/22}{15/63} = \frac{0.864}{0.238} = 0.864/0.238 = 3.63$$

This study reports that women who have experienced greatly threatening life events in the past 5 years are 3.63 times more likely to develop breast cancer than those who have not.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SCREENING

Screening is performed in order to identify whether people have a disease for which they currently have no symptoms. Screening is not carried out to diagnose illness. Instead, it aims to improve the outcomes of those who are affected, by detecting a disease before its symptoms have developed.

A screening test should be able to detect disease in the period between the time when it can be detected using a screening test and the time when symptoms develop. In practice, screening tests are never completely accurate. There will always be a number of false- positive results and False- negative results. A good screening test should keep false- positive and false- negative results to an absolute minimum.

Every screening programme is reviewed against a set criteria (including the disease, the test, treatment options and effectiveness, and the acceptability of the screening programme).

EVALUATING THE ACCURACY OF SCREENING TESTS

A screening test can be evaluated using a 2 × 2 table, as shown below. It shows:

1. How many subjects with a positive result actually have the disease (true positive) (cell a)
2. How many subjects with a positive result do not have the disease (false positive) (b)
3. How many subjects have a positive result (a + b)
4. How many subjects have a negative result (c + d)
5. How many subjects with a negative result actually have the disease (false negative) (c)
6. How many subjects with a negative result do not have the disease (true negative) (d)
7. How many subjects actually have the disease (a + c)
8. How many subjects do not have the disease (b + d)

		Disease status		
		Positive	Absent	Total
Result of screening test	Positive	a (True postive)	b (False positive)	a+b
	Negative	c (False negative)	d (True negative)	c+d
	Total	a+c	b+d	a+b+c+d

There are a number of ways to measure the accuracy of a screening test.
The most commonly used methods are described following.

1. SENSITIVITY

This is the proportion of subjects who really have the disease, and who have been identified as diseased by the test. The formula for calculating sensitivity is:

$$Sensitivity = a/(a + c).$$

2. SPECIFICITY

This is the proportion of subjects who really do not have the disease, and who have been identified as non- diseased by the test. The formula for calculating specificity is:

$$Specificity = d/(b + d).$$

Sensitivity and specificity both indicate how accurately the test can detect whether or not a subject has the disease (this is known as the test's validity).

3. POSITIVE PREDICTIVE VALUE (PPV)

This is the probability that a subject with a positive test result really has the disease. The formula for calculating PPV is

$$PPV = a/(a + b).$$

4. NEGATIVE PREDICTIVE VALUE (NPV)

This is the probability that a subject with a negative test result really does not have the disease. The formula for calculating NPV is

$$NPV = d/(c + d).$$

5. PREVALENCE

This is the proportion of diseased subjects in a screened population and it tells us about the probability of having the disease before the screening test is performed. The formula for calculating prevalence in screening is;

$$Prevalence = (a + c)/(a + b + c + d).$$

BIOSTATISTICS

INTRODUCTION

A subject, which deals with the collection, compilation, presentation, analysis and interpretation of data, is called statistics. And the statistics related to the data of living organisms is called biostatistics.

- Descriptive Statistics: Methods used to summarize or describe our observations
- Inferential Statistics: Using those observations as a basis for making estimates or predictions i.e. inferences about a situation that has not yet been observed. Appropriate tests of significance are applied in inferential statistics.

Common Terminology

- Population: Population is a whole set of things about which we want to draw conclusion and upon which we want to generalize our results.
- Sample: A part taken out of the population.
- Sampling: The procedures when some members of the population are drawn for examination.
- Data: Group of variables in the form of facts and figures are called data. When data is processed and made meaningful, it is called information.
- Variable: A characteristic of an one individual that is variable from one to another.

CLASSIFICATION OF DATA/VARIABLE

Data can be classified as either categorical or numerical.

1. CATEGORICAL DATA

Categorical data is also known as qualitative data that can arrange into categories.

Data of variables characterized by names only for example male/female, black/white/yellow/brown are called nominal data. There are no orders or ratios. If nominal data has only two groups, e.g. male/female it is called dichotomous data. If there are more possible categories (e.g. a range of several age groups or ethnic minority groups), the data may be described as polychomtomous.

When data is placed in meaningful order are called ordinal data. For example, very happy, quite happy, unhappy or very unhappy. Other examples are; positions in hospital league tables, Students may be ranked as 1st, 2nd, 3rd and tumor stages.

2. NUMERICAL DATA

Numerical data are also called quantitative data that includes numbers. There are three levels (scales) of numerical data.

i. *In discrete data*, all values are clearly separate from each other. Although numbers are used, they can only have a certain range of values. For example, age last birthday (e.g. 22 or 35, rather than 22.45 or 35.6, etc.). Other number of operation per year, or new cases of asthma in the last year. It is usually acceptable to analyze discrete data as if they were continuous. For example, it is reasonable to calculate the mean number of total knee replacement operations that are performed in a year.

ii. *Continuous data* have further two types – each value can have any number of values in between, there can be many smaller values in between a height of 2 m and a height of 3 m, e.g. 2.2 or 2.23 or 2.23978675

iii. *In interval data*, values are separated by equally spaced intervals (e.g. minutes, degrees centigrade). Thus the difference (or interval) between 5 kg and 10 kg, for example, is exactly the same as that between 20 kg and 25 kg. As interval data allow us to tell the precise interval between any one value and another, they give more information than discrete data.

iv. *Ratio data* are similar to interval scales, but refer to the ratio of two measurements and also have a true zero. However, degrees centigrade cannot be considered to be a ratio scale (20°C is not, in any meaningful way, twice as warm as 10°C, and the degrees centigrade scale extends below 0°C).

Another classification of variables is independent and dependent variable. They are used when we compare variables. Independent variables are presumed causes and dependent variables are presumed effects. Incidence of common cold in different seasons is an example to explain this. Season is independent variable and common cold is dependent variable.

FREQUENCY DISTRIBUTION:

The collected data can be plotted in tabular form or graphic form after organizing it showing frequencies of different observations.

i. Pie chart depicts each category as a slice of pie, with the size of each slice varying according to its proportion of the whole pie. This can be useful for comparing individual categories with the total.

ii. Bar diagrams have a number of blocks, the size of block represents the frequency recorded for the category concerned. Bar diagrams are useful for comparing one category with others.

iii. Histograms are bar diagrams, where the areas (i.e. height and width) of the bars are proportional to the frequencies in each group. These are especially useful for frequency distributions of grouped data (e.g. age groups, grouped heights, grouped blood measurements). For example, if you use age groups of equal range (e.g. 21–30, 31–40, 41–50 years, etc.), then the width of each bar is equal. And if the 21–30 years age group has a frequency of 30, while the 31–40 years age group has a frequency of 60, then the former group is exactly half the height of the latter.

iv. In a scatterplot, two observations (variables) are each plotted on separate axes. The variable on the (horizontal) x- axis is usually called the independent variable, and the variable on the (vertical) y- axis is usually called the dependent variable.

GRAPHS:

- INTERVAL-RATIO SCALE (NUMERICAL) DATA:
  - Histogram
  - Box plots
  - Stem and Leaf Plot
  - Scatter Diagrams
- NOMINAL-ORDINAL SCALE (CATEGORICAL) DATA:
  - Bar Charts
  - Grouped and Stacked Bar Charts
  - Pie Charts

DESCRIPTIVE STATISTICS

The description of data in the language of statistics using measures of central tendency, dispersion and correlation.

- Central tendencies of data
- Dispersion of data

CENTRAL TENDENCIES OF DATA:

Measured by Mean – Median – Mode

i. MEAN (ARITHMETIC MEAN):

It is defined as the sum of observations divided by the number of observations Remember that Mean of a sample is denoted by X (pronounced as X Bar) and mean of population is denoted by μ (pronounced as mew). Mean is used for continuous data.

ii. MEDIAN:

The centre value of series of observations when the observations are ranked in order from the lowest value to the highest. Median is the central value that divides the distribution into two equal halves. Median can be used in Ratio, Interval and Ordinal data.

iii. MODE:

The most frequently observed value in a distribution is known as mode. Some distribution may have two modes – they are called bimodal distributions. If there are more than two modes, such distributions are known as multimodal distributions. It can be used for all types of data.

- Mode can be used for all types of data.
- Mode is not affected at all by extreme values.
- Mode is of no value in further statistical computations.
- Mode does not take into account all the values in a distribution.

Note: Mean – Median – Mode have the same units as of observations and must be noted with the resultant value e.g. For Pulse rate observation, let's say Mean is 76 beats per minute.

MEASURES OF DISPERSIONS/ VARIATIONS

- Range
- Mean Deviation

- Variance
- Standard Deviation
- Coefficient of Variation

i. RANGE:

It is the difference between the highest and lowest observations. In the data of pulse rate of students as under;

72,73,80,62,66,108,82,73,69,78,86,67,76,73,75

Range is 62-108 beats per minute or 108-62 beats per minute or 46 beats per minute. It is a good measure of dispersion when we want to know immediately how the data spread but it takes into account only the lowest and highest values of a distribution. Therefore, it is not a good measure of dispersion of data.

ii. VARIANCE:

Variance is equal to the sum of squared deviation of observations from mean of the distribution divided by the number of observations. We square the deviations to get rid of the negative signs but by squaring the values we loose the units. Therefore, Variance is of limited value in measuring dispersion of the data.

We arrange data in the following table:

Heart Rate (X)	Mean $(\overline{X})$	Deviation from Mean $X-\overline{X}$	Squared deviation $(X-\overline{X})^2$

$$\text{Variance} = \frac{\Sigma(X-\overline{X})^2}{n}$$

iii. STANDARD DEVIATION:

It is the square root of the sum of squared deviations of observations from mean of the distribution divided by the number of observations. By squaring the deviation we get rid of the negative signs, but we loose the original unit, which is taken care of by applying the square root again, which means that original units are restored. Unlike Range, It is used in further statistics

$$\text{Standard Deviation } SD = \sqrt{Variance}$$

$$\text{Variance} = (\text{Standard Deviation})^2 = SD^2$$

$$SD = \sqrt{\frac{\Sigma(x-\bar{x})^2}{n}}$$

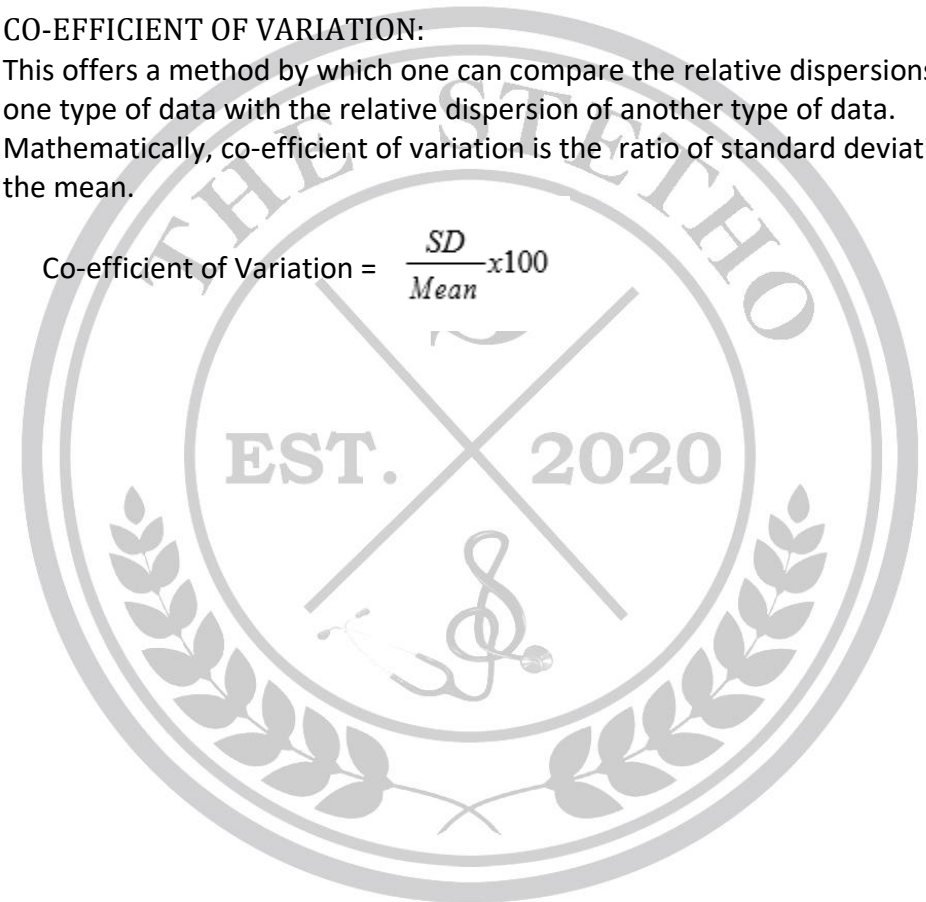
If your data consists of less than 30 observations then the above-mentioned formula will be edited as:

$$SD = \sqrt{\frac{\Sigma(x-\bar{x})^2}{n-1}}$$

iv. CO-EFFICIENT OF VARIATION:

This offers a method by which one can compare the relative dispersions of one type of data with the relative dispersion of another type of data. Mathematically, co-efficient of variation is the ratio of standard deviation to the mean.

Co-efficient of Variation = $\frac{SD}{Mean} x100$



INFERENTIAL STATISTICS

Inferential Statistics means when we go beyond the actual observations and state something (based on the collected data), which have not been actually observed. Here the theory of probability comes in.

NORMAL DISTRIBUTION (Gaussian Distribution)

A statistical distribution is a mathematical model of frequency distribution followed by natural observations in the universe. Shown diagrammatically the Standard Normal Distribution is denoted as a curve known as Normal Curve or Gaussian Curve.

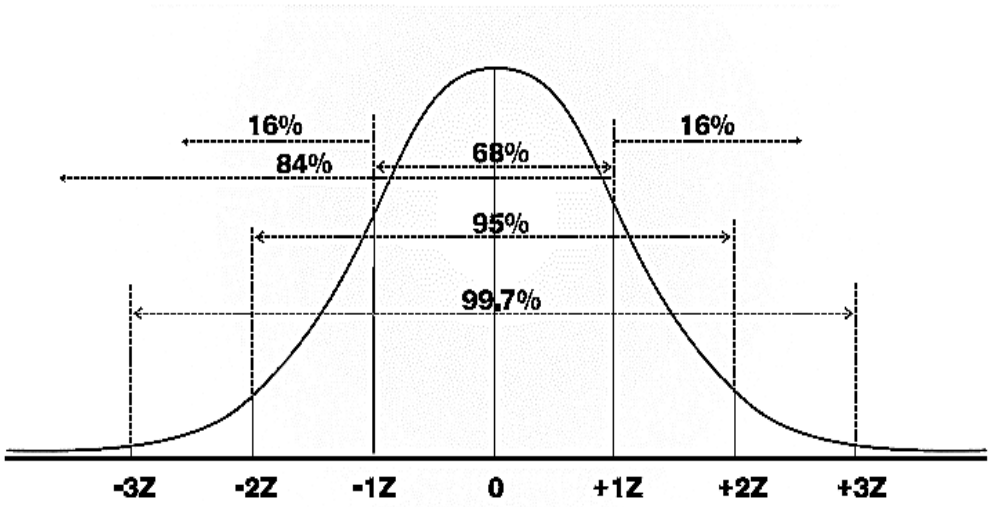
On the X-axis are the values and the Y-axis shows the frequency of those values like a frequency distribution. It is important to remember that normal distribution is a probability distribution and is an ideal world. If our collected data has tendency to conform to normal distribution then we make use of it in statistical inferences. The total probability of frequency of values under the curve is equal to 1 or 100%. All the individual values under the curve have probability of occurrence (frequency) ranging between 0 and 1 (or 0% to 100%) and total to 1.

PROPERTIES OF STANDARD NORMAL CURVE

- It is bell shaped and perfectly symmetrical.
- Mean, Median and Mode are in the centre (dome) of the curve.
- It has got two determinants Mean (μ) and Standard Deviation (δ).
- 68.26% of the values lie between the range of *Mean ± 1xSD*. In other words the probability of occurrence of values between the range 1xSD – Mean + 1xSD is 68.26% or 0.6826. This also implies that 31.74% of values are either below Mean – 1xSD or above Mean + 1x SD. In other words the probability of occurrence of values below Mean – 1xSD or above Mean + 1xSD is 31.74% or 0.3174.
- 95.45% of the values lie between the range of Mean ± 2xSD. In other words the probability of occurrence of values between the range 2xSD – Mean + 2xSD is 95.45% or .9545. This also implies that 4.55% of values are either below Mean – 2xSD or above Mean + 2x SD. In other words the probability of occurrence of values below Mean – 2xSD or above Mean + 2xSD is 4.55% or .0455.

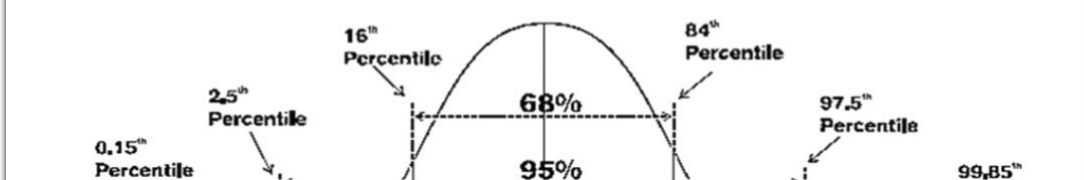
- 99.73% of the values lie between the range of Mean ± 3xSD. In other words

the probability of occurrence of values between the range 3xSD – Mean + 3xSD is 99.73% or .9973. This also implies that 0.27% of values are either below Mean – 3xSD or above Mean + 3x SD. In other words the probability of occurrence of values below Mean – 3xSD or above Mean + 3xSD is 0.27% or .0027.



To elaborate it further and make it useful, remember the following landmarks also:

- 95% of the values lie between the range of Mean ± 1.96xSD. In other words the probability of occurrence of values between the range 1.96xSD – Mean + 1.96xSD is 95% or .95. This also implies that 5% of values are either below Mean – 1.96xSD or above Mean + 1.96x SD. In other words the probability of occurrence of values below Mean – 1.96xSD or above Mean + 1.96xSD is 5% (2.5% 0n each side) or .05 (0.025 on each side).
- 99% of the values lie between the range of Mean ± 2.58xSD. In other words the probability of occurrence of values between the range 2.58xSD – Mean + 2.58xSD δ is 99% or .99. This also implies that 1% of values are either below Mean – 2.58xSD or above Mean + 2.58x SD. In other words the probability of occurrence of values below Mean – 2.58 or above Mean + 2.58xSD is 1% or .01.



This diagram helps to understand exactly the area under curve covered by observations dependent upon the multiples of standard deviation on both sides of mean. The multiple of standard deviation is called Z, which ranges from 0 to infinity. The area under normal curve is also referred to as area under Z. Note that Z in the case of 68.26% is 1, in the case of 95%, Z is 1.96, in the case of 95.45% Z is 2, in the case of 99% Z is 2.58 and in the case of 99.73% Z is 3.

OTHER SHAPES OF FREQUENCY DISTRIBUTION

The curve may not be symmetrical in some instances. It may have many shapes but three shapes are important to remember.

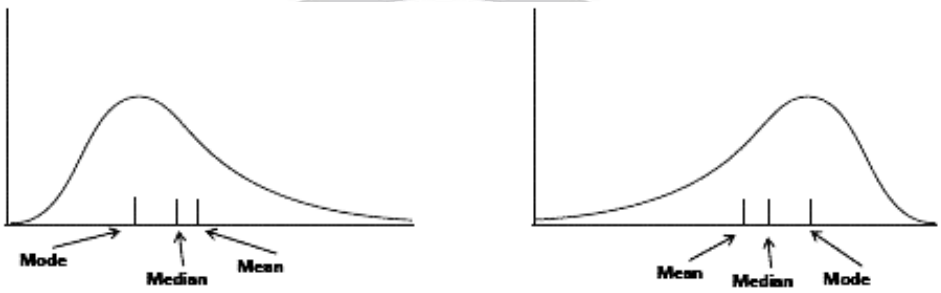
- Symmetrical Curve (Standard Normal Curve)
- Curve Skewed on the right
- Curve Skewed on the left

1. *SYMMETRICAL CURVE:*
   According to the properties of Normal Curve the Mean, Median and Mode lies on a same line.

2. *CURVE SKEWED TO THE RIGHT (Positively Skewed):*
   In this kind of curve we observe that the mode of the distribution lies on the extreme left side, next to mode to the right will be the median. Mean will be on the extreme right where the few extreme values lie. For example,

distribution of wealth in people.

3. *CURVE SKEWED TO THE LEFT (Negatively Skewed):*
   In this kind of curve we observe that the mode lies on the extreme right. To the left will be the median, and to further left will be mean. Distribution of Hemoglobin value in children is skewed to the left.
   Note: Skew means tail. Skew is said to be to the side where the tail of the distribution is.



Positive (Right) Skew

Negative (Left) Skew

The diagram on the left is a distribution skewed to right (Positively Skewed); and the right one shows a distribution that is skewed to the left (Negatively Skewed).

KURTOSIS:

Tells us about the thickness of the tails of the distribution – Whether the Distribution is Peaked or Flat?

Kurtosis of Normal Distribution is 3.

- Distributions with lesser Kurtosis are Platykurtic
- Normal Distribution is Mesokurtic
- Distributions with larger Kurtosis are Leptokurtic

ESTIMATION

STANDARD ERROR:

Standard Error is the estimate of the population Standard Deviation. It is just as estimate of the population standard deviation and not a true standard deviation.

To understand the concept of Standard Error let's assume we have a mean of the 125 mm Hg of systolic blood pressure of a sample A drawn from a population X. If we draw repeated samples (B, C, D and so on until Z) from the same population X and compute means of all the samples then we'll have a distribution of means of the samples like individual values of systolic blood pressure of sample A.

Central limit theorem states that means of many samples from the same population are normally distributed. The Standard Deviation of the distribution of means of many samples of one population is known as Standard Error (SE). We take Standard Error as an estimate of the population Standard Deviation. Again, is it possible to draw repeated samples from a population and of such a number to construct a meaningful distribution? This is almost impossible.

We calculate it with a simple formula:

$$\text{Standard Error (of Mean)} = \frac{SD}{\sqrt{n}}$$

SD = Standard Deviation of the sample n = Number of observations of sample.

Now we have got an estimate of the population standard deviation in the shape of standard error (SE). Based on this we can calculate confidence limits for the population exactly the same way as for sample but substituting standard deviation of the sample with standard error of the mean.

- 68.26% confidence limits are: Mean ± I x SE
- 95% confidence limits are: Mean ± I.96 x SE
- 95.45% confidence limits are: Mean ± 2 x SE
- 99% confidence limits are: Mean ± 2.58 x SE
- 99.73% confidence limits are: Mean ± 3 x SE

Confidence Limits based on standard error of a mean are confidence limits for population and hence an estimation of population situation based on sample. But remember that the actual explanation of confidence limits calculated on the basis of standard error of mean is a little bit different from the explanation of confidence limits calculated on the basis of actual standard deviation and mean of population if known.

- CONFIDENCE LIMITS BASED ON ACTUAL STANDARD DEVIATION AND MEAN:

95% confidence limits mean that 95% of the values of that particular observation in the population lie within Mean ± I.96x δ.

- CONFIDENCE LIMITS BASED ON STANDARD ERROR OF MEAN: 95% confidence limits mean that if we draw many samples from the same population 95% of the time the sample means will fall in these limits. But practically we mean the same as if we know the actual mean and standard deviation of the population. Confidence limits for proportion imply the same as is the case with confidence limits for mean. If we increase the sample size the standard error decreases and consequently the confidence interval will contract.
-

SIGNIFICANCE TESTING / HYPOTHESIS TESTING

While comparing two or more samples we may have a hypothesis, which is called research hypothesis. Such a hypothesis may state that there is a difference or otherwise. We have to prove it based on the collected data.

- *NULL HYPOTHESIS:*
  It states that the different sets of data belong to one population and the observed differences are by chance. In other words; A = B

- *ALTERNATIVE HYPOTHESIS:*
  It states that the different sets of data belong to different populations and the differences are statistically significant and are not due to chance. In other words it means; A ≠ B

In other words;
Statistical/Hypothesis Tests are used to make the generalize the results of a study using a sample about the population from which the sample was withdrawn. These tests are used to check whether there is a enough evidence in sample data to conclude/deduce that any particular/specific/certain condition is also true for entire population.

Certain condition/pattern of sample ≈ Certain condition/pattern for population

These test are performed to know the below parameters:

1) *Comparison*: Is there any difference between two data-sets/ groups/ data.
2) *Relationship*: Is there any connection between two groups /columns /data / variables.

STATISTICAL TESTS

There are various Statistical tests on data depending upon the type of variables in the data. There are two types of tests in Statistical/Hypothesis Tests.

- Parametric tests:
  Tests applied to data, which is normally distributed, are called parametric tests because they are applied to data, which have parameters like Mean and Standard Deviation. Parametric data consists of continuous variables.
- Non-parametric tests:
  For data, which are not normally distributed that means it is not parametric; we use Non-parametric tests. Non-parametric data consists of nominal or ordinal variables.

1) Parametric tests

Type	Measure	Name	Description
One Sample Test	Mean	One Sample T Test	Determine if there is a significant difference between an observed mean and a theoretical one. The sample size is small and the variance is unknown
		Z Test	Determine if there is a significant difference between an observed mean and a theoretical one. The variance is known and the sample size is large
Two Sample Test	Correlation	Pearson Correlation Coefficient	Test the association between two samples
	Mean	Two Group T Test	Compare two observed means (independent samples). The sample size is small and the variance is unknown
		Paired T Test	Compare two observed means (paired samples). The sample size is small and the variance is unknown
		Z Test	Compare two observed means (independent samples). The variance is known and the sample size is large

2) Non Parametric Tests

Type	Measure	Name	Description
One Sample Test	Mean	One Sample Wilcoxon's Test	Determine if there is a significant difference between an observed mean and a theoretical one
	Randomness	Runs Test	Determine the randomness of data
	Distribution	Kolmogorov-Smirnov Test [4]	Compare an observed distribution to a theoretical one. Data is continuous
		Chi Square Test	Compare an observed distribution to a theoretical one. Data are binned and represent frequencies
Two Sample Test	Correlation	Spearman Rank Correlation	Test the association between two samples
	Mean	Mann-Whitney's Test	Compare two observed means (independent samples)
		Wilcoxon's Test [5]	Compare two observed means (paired samples)
	Distribution	Kolmogorov-Smirnov Test	Compare an observed distribution to a theoretical one. Data is continuous
		Chi Square Test	Compare an observed distribution to a theoretical one. Data are binned and represent frequencies

HYPOTHESIS TESTING

We deal with two hypotheses which are:

- Null Hypothesis
- Alternative Hypothesis

We either accept Null Hypothesis or reject it. When we accept Null Hypothesis, we reject the Alternative Hypothesis. When we reject Null Hypothesis we accept the Alternative Hypothesis.

STEPS:

- State the null and alternative hypotheses, Ho and HA.
  - Null Hypothesis: There is no difference between the types of weapons used in causing injuries.
  - Alternative Hypothesis: There seems to be preference for weapons in inflicting injuries.
- Select the decision criterion α (or "level of significance"). We select a 5% significance level (p=0.05). Conventionally a 5% level of significance (p=0.05%) is selected. It can be more stringent and less than 5% (p<0.05) but it is never more than 5%.
- Establish the critical values: X2 table at p = 0.05 with degrees of freedom as will be calculated.
- Draw a random sample from the population, and calculate the mean of that sample: Sample randomly drawn from a district.
- Select appropriate statistical test and compute the value of the test statistic Z or t or X2 (as the case may be).
- Compare the calculated value of test statistic with the critical values of Z/t/X2, and then accept or reject the null hypothesis.

While testing a hypothesis we may be liable to commit errors, which are:

i. *Type I Error:*
Rejecting a true hypothesis (α) – rejecting a true null hypothesis, and accepting a false alternative hypothesis. The probability of making a type 1 error is called alpha (α)

ii. *Type II Error:*
Accepting a false hypothesis. (β) – not rejecting a false null hypothesis. The probability of making a type 2 error is called beta (β).

	H_0 is False	H_0 is True
We Reject H_0	True Positive 1- β [Power] .8 (80%)	False Positive Type I Error: Pr(I)= α: .05 /.01
We Fail to Reject H_0	False Negative Type II Error: Pr(II) = β: .2	True Negative 1- α

PROBABILITY

Probability is a mathematical technique for predicting outcomes. It predicts how likely it is that specific events will occur. It is measured on a scale from 0 to 1.0. The number of events occurring out of a total possible number of events is called probability.
A probability can never be more than 1.0, nor can it be negative. There is a range of methods for calculating probability for different situations.

ADDITION RULES:

For two or more possible mutually exclusive events the collective probability equals ONE or 100%.

MULTIPLICATION RULE:

For two or more independent and randomly occurring phenomena, the probabilities multiply.

1) *TO CALCULATE THE PROBABILITY OF EVENT (A) AND EVENT (B) HAPPENING (INDEPENDENT EVENTS)*

   For example, if you have two identical packs of cards (pack A and pack B), what is the probability of drawing the ace of spades from both packs?

   Formula: P(A) × P(B)

   - P(pack A) = 1 card, from a pack of 52 cards = 1/52 = 0.0192
   - P(pack B) = 1 card, from a pack of 52 cards = 1/52 = 0.0192
   - P(A) × P(B) = 0.0192 × 0.0192 = 0.00037

   This is called the rule of multiplication.
   One event happens regardless of the other, and its outcome is not related to the other.

2) *TO CALCULATE THE PROBABILITY OF EVENT (A) AND EVENT (B) HAPPENING (CONDITIONAL EVENTS)*

   What is the probability of drawing the ace of spades and the queen of clubs consecutively from a single pack of cards?

Formula: P(A) × P(B | A)

Where, (B | A) means [B given that A has happened]
We already know that the probability of drawing the ace of spades from a pack of 52 cards is 1/52 = 0.0192, so P(A) = 0.0192.
The chances of now drawing the queen of clubs are a little higher, because one less card is left in the pack, so the probability P(B | A) is now 1/51 = 0.0196.
P(A) × P(B | A) = (1/52) × (1/51) = 0.0192 × 0.0196 = 0.0004

3) *TO CALCULATE THE PROBABILITY OF EITHER EVENT (A) OR EVENT (B) HAPPENING (WHERE THE EVENTS ARE MUTUALLY EXCLUSIVE)*

Probabilities can be mutually exclusive. This means that one event prevents another event from happening. For example, throwing a die once will result in either a one, or a two, or a three, or a four, or a five, or a six – but only one number can be obtained.

Therefore throwing five, rules out any other number. In such cases, the rule of addition is used.

For example, what is the probability of throwing either a six or a five on a dice?

Formula: P(A) + P(B)

- P(A) = 0.1667
- P(B) = 0.1667
- P(A) + P(B) = 0.1667 + 0.1667 = 0.333 (or 33.3%)

This is called the rule of addition or the additive rule.

4) *TO CALCULATE THE PROBABILITY OF EITHER EVENT (A) OR EVENT (B) HAPPENING (WHERE THE EVENTS ARE NOT MUTUALLY EXCLUSIVE)*

Suppose that a local study finds that 90% of people aged over 60 years in Epitown suffer from at least one common cold during a 1- year period, and 20% suffer from heartburn at least once. What is the probability that any person over 60 years of age will suffer from either common cold or heartburn? We shall assume that common cold and heartburn occur independently of each other.

Using the rule of addition produces a probability of 0.9 + 0.2, which is equal to 1.1.

This cannot be correct, since we already know that a probability can never be more than 1.0. In this situation, we use a different formula:

P(A) + P(B) – P (both)

- P(A) = 0.9 (common cold)
- P(B) = 0.2 (heartburn)
- P (both) = 0.9 × 0.2 = 0.18

(since we are assuming that they are independent).

So P(A) + P(B) – P(both) = (0.9 + 0.2) – 0.18 = 1.1 – 0.18 = 0.92 (or 92%)

In this example, then, there is a probability of 0.92 (or 92%) that any person aged over 60 years in Epitown will suffer from either common cold or heartburn during a 1- year period. if the data are clearly not normally distributed, non- parametric tests can be used.

BIOSTATISTICS AND EPIDEMIOLOGY MCQS

EPIDEMIOLOGY AND RESEARCH

1) The policy makers want to know whether introduction of pentavalent vaccine

in the national program is resulting in reduction in the number of Hemophilus influenza cases. Which of the following studies will they have to conduct to find an answer?

A) Case-control study
B) Field trial
C) Ecological study
D) Case series key:B

2) What is true about Confounders?
   A) They affect both study variable as well as outcome
   B) Their effect can be minimized by proper study design and through stratified analysis
   C) Both 'a' and 'b'
   D) None of the above key: C
3) Which of the following is not a type of study design?
   A) Qualitative study
   B) Observational study
   C) Retrospective study
   D) Pilot study key: D
4) Any systematic error in the design, conduct or analysis of a study that results in an erroneous estimate of an exposure's effect on the risk of disease is called:
   A) Confounding
   B) Bias
   C) Interaction
   D) Stratification Key B
5) What effect does increasing the sample size have upon the random error?
   A) It increases the random error
   B) It has no effect on the random error
   C) It reduces the random error
   D) None of the above key: C
6) Which of the following is stated mainly for statistical purpose?
   A) Research question
   B) Objectives
   C) Research hypothesis
   D) All of the above Key: C
7) If your objective is to estimate the prevalence of a health problem in a community in 2019, Identify the type of research question this study is addressing

A) Analytical research question
B) Descriptive research question
C) Hypothetical research question
D) Experimental research question Key: B

8) A measure that reflects severity of an acute infectious disease
A) Case fatality ratio
B) Incidence rate
C) Prevalence
D) Mortality rate Key: A

9) This measure reflects the impact of a disease on population in terms of death
A) Incidence density
B) Case fatality
C) Disease specific mortality
D) Attack rate Key C

10) While measuring the frequency of a chronic disease in a community in terms of Incidence per 1000 persons per year, and point prevalence per 1000 persons, what is the expected pattern of incidence and prevalence?
A) Low prevalence, high incidence
B) High prevalence, low incidence
C) Both prevalence and incidence will be similar
D) None of the above statements are true Key: B

11) Statistic used to estimate the risk of acquiring a disease
A) Prevalence
B) Incidence
C) Mortality rate
D) All of the above Key: B

12) What is the appropriate measure when a researcher wishes to know the burden of a particular disease in terms of the number of deaths it causes in a specified geographical region and population?
A) Incidence density
B) Case fatality
C) Attack rate
D) Disease specific mortality Key: D

13) If health policy makers want to evaluate the impact of a prevention program, which is the appropriate measure to be considered?
A) Period prevalence
B) Incidence
C) Point prevalence

D) Case fatality Key:B

14) Select the correct statement among thefollowing
   A) Prevalence of a disease will increase when it has a high cure rate
   B) Prevalence of a disease will decrease when it has a low case fatality ratio
   C) Prevalence of a disease will increase when it has a low cure rate
   D) Prevalence of a disease will increase when it is acute in nature

Key: C

15) When measuring the frequency for an acute infectious disease in a community in terms of incidence per 1000 persons per year and point prevalence per 1000 persons, how will the pattern of incidence and prevalence be?
   A) High prevalence
   B) Low incidence
   C) Both prevalence and incidence will be similar
   D) Low prevalence and high incidence Key: D

16) Which of the following condition tends to increase the prevalence of a particular disease?
   A) High cure rate
   B) Low case fatality ratio
   C) Short duration
   D) Emigration of patients Key: B

17) Which of the following is true about incidence density?
   A) Numerator has number of new cases
   B) Also called cumulative incidence
   C) Denominator is number of persons at risk
   D) Numerator has person-years at risk Key: A

18) What is the appropriate epidemiologic measure to determine the burden of a disease in terms of number of cases present in a specified geographical area at a specific point in time?
   A) Cumulative Incidence
   B) Point Prevalence
   C) Incidence rate
   D) Case fatality ratio Key: B

19) In a study, 300 children were followed up for a period of one year to determine the burden of acute respiratory infections (ARI). Calculate the incidence density if the total number of ARI episodes recorded was 1500.
   A) 5 episodes per child year
   B) 0.2 episodes per child year

C) 3 episodes per child year
D) 0.5 episodes per child year Key: A

20) A total of 100 people with hypertension were followed up for 3 years to observe for the development of myocardial infarction in a cohort study. At the end of first year, 10 people developed myocardial infarction, at the end of second year, 10 people left the study and at the end of third year, another 10 people developed myocardial infarction. Calculate the total person-years of observation in this study?
A) 250
B) 260
C) 270
D) 280 Key: C

IMPORTANT BIOSTATISTICS MCQS

1. A study was conducted in America to find out the proportion of blacks and white Americans in California. This variable chosen is:
   a. Nominal
   b. Ordinal
   c. Continuous
   d. Discreet numerical
   e. Dichotomous
   Key: True: e
2. The median of the following data, is: 1,2,4,6,8,10,11,13
   a. 6
   b. 8
   c. 7
   d. 10
   e. 9
   Key: True: c
3. A household survey of 10 families was conducted by students of 4th year MBBS. In the collected data, the ages of heads of families were: 32, 34, 35, 36, 36, 42, 44, 46, 48, and 52. The mean age of heads of families is
   a. 36
   b. 38.5
   c. 40
   d. 40.5

e. 42
Key: True: d

4. Serum cholesterol levels for two groups of Americans were recorded in 1989. The mean cholesterol levels of the two groups were compared. To determine whether the measurements were significantly different or not, the most appropriate statistical test would be:
   a. Chi-square test
   b. Correlation analysis
   c. F test (ANOVA)
   d. Student's t test
   e. Regression analysis
   Key: True: d
5. In a descriptive study the mean is 220 and the standard error is 10, the 95 confidence limits would be:
   a. 210 to 230
   b. 215 to 225
   c. 200 to 240
   d. 220 to 230
   e. 205 to 235
   Key: True: c
6. The birth weights in a hospital are to be presented in a graph. This is best done by a:
   a. Bar diagram
   b. Pie chart
   c. Histogram
   d. Pictogram
   e. Frequency chart
   Key: True: c
7. An analysis of the race of patients who visit an emergency room reveals that 40% are white, 25% are black, 20% are Native American, and 15% are Asian. These data would best be depicted graphically with a
   a. Venn diagram
   b. Cumulative frequency graph
   c. Normal curve
   d. Histogram
   e. Pie chart
   Key: True: e
8. If six families were surveyed and the numbers of children per family were found to be 2, 3, 4, 4, 5, 6, fine the mean number of children per family

a. 2
b. 3.5
c. 4
d. 6
e. 4.5
Key: True: c

9. If, in one of the groups of premature infants, the maximum value for hexosaminidase A was substituted with a much higher value. The value which is unlikely to be affected by this higher value is:
aVariance
a. Range
a. Standard deviation
b. Median
c. Mean
Key: True: d
10. In study carried out in the hospital ward, every 10th admitted patient was included in the sample, which sampling procedure is this:
a. Random sampling
b. Stratified sampling
c. Quota sampling
d. Convenient sampling
e. Systematic sampling
Key: True: e
11. Three groups of subjects were followed over the course of five years to compare
treatments for sideroblastic anemia. The most appropriate statistical analysis to determine the quantitative serologic differences resulting from these treatments would be a(n)
a. Regression analysis
b. F test (ANOVA)
c. Correlation analysis
d. Chi-square test
e. T test
Key: True: b
12. In a class of 134 medical students, the mean systolic blood pressurewas found to be 126 mm Hg with a standard deviation of 6 mm Hg If the blood pressures in this sample are normally distributed, what portion of the medical students will have systolic blood pressures above 132 mm Hg?
a. 0.5%

b. 2.5%
c. 5%
d. 16%
e. 32%
Key: True: d

13. In a household survey conducted on ten families the frequency of family members in different age groups was less than 5 years \ 21, 5 – 14 years \ 16, 15 – 64 years \ 77 &> 65 years \ 1. The relative frequency of members in 15 – 64 years age group would be:
    a. 60.5%
    b. 67.5%
    c. 70.5%
    d. 76.5%
    e. 80.5%
    Key: True: b
14. Malaria cases were reported throughout the world during the year 1971 – 1978 excluding African region. These cases can be best represented by:
    a. Frequency polygon
    b. Histogram
    c. Line diagram
    d. Pictogram
    e. Scatter diagram
    Key: True: c
15. There are 50 individual in population and they have same hemoglobin level that is 14g/dL. As there is no variability, the standard deviation will be:
    a. 0
    b. 1, -1
    c. 0, 1
    d. +2
    e. -2
    Key: True: a
16. A mean hemoglobin level of 100 women in a population sample is 12g/dL with standard deviation of 2. The confidence interval for the population mean would be:
    a. 10.4 – 11.6
    b. 11.6 – 12.4
    c. 12.4 – 13.6
    d. 13.6 – 14.4

e. 14.4 – 15.6
Key: True: b

17. The students of4th year MBBS class visited a school. The numbers of students per class from class I to class IX were as follows:
27, 23, 15, 18, 30, 24, 8, 12 and 16. The median number in this series is:
a. 12
b. 15
c. 16
d. 18
e. 23
Key: True: d
18. The median of a series of 20 observations is 10, mean is 11.5 and mode is 11, which of the following measures can be subjected to statistical manipulation:
a. Sample size
b. Mean
c. Median
d. Mode
e. Range
Key: True: b
19. Which of the following can have more than one value?
a. The mean
b. The range
c. The mode
d. The median
e. Standard deviation.
Key: True: c
20. A large study of bladder cancer and cigarette smoking produced the following data:
INCIDENCE OF BLADDER CANCER (per 100,000 males per year)
Cigarette smokers 48.0 - Non-smokers 25.4
The relative risk of developing bladder cancers compared with non-smokers is:
a. Categorical variable
b. Ordinal data
c. Numerical, continuous variable
d. Numerical, discrete variable
e. Proportion
Key: True: c

ENGLISH

- ➔ Read the theory portion to prepare yourself for any kind of English questions.
- ➔ Do not skip the tables, and especially the examples. I would recommend that read the example in the table before you read the theory points.

PARTS OF SPEECH

A sentence is a collection of any of the following eight group of words, which are called parts of speech such as:

1. **NOUN**: Our first part of speech is Noun, which is specified as the name of a person, place or thing. There are five kinds of nouns:
    a. Proper Noun
    b. Common Noun
    c. Material Noun
    d. Abstract Noun
    e. Collective Noun

i. Proper Noun: A proper noun is the name of a particular place or person. For example, Dubai is the richest city, here Dubai is a proper noun.

ii. Common Noun: Specified as the name given in common to every person or thing. For example, The girl in my class. In English, one never capitalizes a common noun.

iii. Material Noun: Denotes the matter of the substance of the thing. For example, the house is built of wood.

iv. Abstract Noun: It is the name of a quality, action or state belonging to an object. For example, Darkness, movement, music, philosophy. The name of a non-tangible thing, an idea (violence, empathy, catastrophe).

v. Collective Noun: The name of a group of the collection of persons or things taken together. For example, army, group, team, class, crowd.

NOUN NUMBER – SINGULAR/PLURAL

Precious Points – Noun Number

- ➔ There are nouns which have the same form in singular as well as plural form. For example: *sheep, deer, apparatus, species, series, hundred, dozen, hair* etc. The preceding adjectives and articles decide whether the word is used in the singular form or plural form.
    - He paid eight **hundred** rupees for this pair of shoes.
    - India again lost the **series.**
- ➔ When words like hundred, dozen, thousand, pair, score are not preceded by any word denoting number then they take the plural form. Otherwise not.

a) **Three hundred** people attended the function.
b) **Hundreds** of people attended the party.

In sentence a), '**hundred'** is preceded by number '**three'**. So '**hundred'** will take no plural form. Word '**three hundred'** indicates plurality. But in sentence b), '**hundred'** is not preceded by any number. So to indicate plurality, we will write '**hundreds**'.

- They paid **lakhs** of rupees to Shahid Afridi.
- I brought **two dozen** bananas.

➔ Some nouns are always used as singular though they look like plural nouns. Ex: **summons, innings**.

- Since long no **news** have been heard.
- **Politics** is not my cup of tea.

➔ Some noun words are always used in the plural form. Ex: *trousers, arms, drawers, assets, scales, alms, thanks, cards; ashes, riches, premises, scissors, credentials, proceeds.*

- The **spectacles** that you are wearing **are** really nice

➔ Some nouns are always used as plurals though they look like singular. Ex: *public, people, folk, mankind, poultry, sheep, and police. gentry, peasantry, bulk, majority.*

- The **majority are** with the leader.
- **Police**, though late, **have** come.
- **Public** want**s** results.
- The **cattle were** grazing in the field.

➔ Some nouns are always used as singular. Ex: *expenditure, furniture, information, machinery, issue, offspring, alphabet, scenery, poetry*. Preceding adjectives or the verb form indicates the singularity or plurality.

- This project will lead to **lots** of **expenditure**.
- All the **furniture** was bought last year.
- All the **Information** was given to him.

There are easy rules to make plural of a singular noun. However, there do exist exceptions and hard rules. Learning the common rules, as given below can help you out in a majority of situations.

Rules		**Examples**
Most nouns	Add ***s*** to form the plural.	bug ⇒ bugs cat ⇒ cats

		truck ⇒ trucks
Nouns that end in ***s, sh, x, ch,*** or**z**	Add **es** to form the plural. For words that end in ***z***, add an extra ***z*** before the ***es***.	bus ⇒ buses brush ⇒ brushes fox ⇒ foxes beach ⇒ beaches quiz ⇒ quizzes
Nouns ending in ***f*** or ***fe***	Some nouns ending in ***f*** or ***fe*** just add ***s***. Sometimes it is necessary to change the ***f*** to a ***v***. In that case, always end the word with ***es***.	roof ⇒ roofs safe ⇒ safes shelf ⇒ shelves wife ⇒ wives
Nouns ending in -***o***	Nouns ending in -***o*** also form the plural by adding -es to the singular	Buffalo ⇒ buffaloes; Mango ⇒mangoes; hero, ⇒heroes; cargo, ⇒cargoes, volcano,⇒valcanoes.

Exceptions and Irregular nouns plurals:

Singular	Plural	Singular	Plural	Singular	Plural
Agendum	Agenda	Ratio	Ratios	Foot	Feet
Index	Indices	Datum	Data	Mouse	Mice
Formula	Formulae	Kilo	Kilos	Person	People
Tooth	Teeth	Photo	Photos	Focus	Foci
Foot	Feet	Logo	Logos	Phenomenon	Phenomena
Person	People	Chief	Chiefs	Goose	Geese
Leaf	Leaves	Safe	Safes	Analysis	Analyses
Mouse	Mice	Proof	Proofs	Nucleus	Nuclei
Half	Halves	Cliff	Cliffs	Loaf	Loaves
Knife	Knives	Sheep	Sheep	Diagnosis	Diagnoses
Wife	Wives	Series	Series	Oasis	Oases
Life	Lives	Species	Species	Thesis	Theses
Elf	Elves	Child	Children	Crisis	Crises

2. **PRONOUN**: Word that replaces, relates or which is used instead of a noun .

Pronouns are classified into ten types:	
1. Personal pronoun	2. Impersonal pronoun
3. Demonstrative pronoun	4. Distributive Pronoun
5. Indefinite pronoun	6. Reciprocal pronoun

7. Reflexive and Emphatic pronoun	8. Relative pronoun
9. Interrogative pronoun	10. Possessive pronoun

i. Personal Pronoun: It indicates any person while acting as a subject or an object. For example, I, we, they, you, he, she, him, her, our. Personal pronouns stand for three persons.

Personal Pronouns			
1.	The person speaking	First Person	I and We
2.	The person speaking to	Second Person	You
3.	The person speaking of	Thirds Person	He, She, They, It

Nominative	Possessive	Objective
I	My, mine	Me
We	Our, ours	Us
You	Your, yours	You
He	His	Him
She	Her, hers	Her
It	Its	Its
They	Their, theris	Them
Who	Whose	Whom

Precious Points - Personal Pronoun

➔ The use of subjective and objective case of pronoun at the end of a sentence: Remember, pronoun has to agree with the case. If the pronoun as the object of verb should be used in objective from. So, **'me'** should be used instead of **'I'**.

- My uncle asked my brother and **me** to dinner.

When two cluases are joined by conjuction **"than",** the second clause is not written. For example; *"He loves you more than I love you", becomes " He loves you more than I".* In this case the **"I"** in the later one should be in subjective case. So, in sentence when two clauses are joined by **'than'** the subjective case of pronoun should be used in the second clause.

- He is taller than **I** (am). *(Pronoun – subjective case)*
- He loves you more than **I** (love you). (Pronoun – subjective case)
- He loves you more than (he loves) **me**. (Pronoun – objective case)
- I like you better than **he** (likes you). (Pronoun – subjective case)
- They gave him as much as (they gave) **me**. (Pronoun – objective case)

➔ When a pronoun refers to *more than one noun* or *pronouns of different persons*, it must be of the first person plural in preference to the second and of the second person plural in preference to the third.

- **You** and I, husband and wife, have to look after **your** home. **(Incorrect)**
- You and **I**, husband and wife, have to look after **our** home. **(Correct)**

The order of precedence: "1st person before 2nd and 2nd before 3rd" . The number, of course, will be plural.

Let us take another example.

- You and Hari have done **their** duty. **(Incorrect)**
- **You** and Hari have done **your** duty. **(Correct**)

Similarly, when all the three persons are taken into account, it has to be I; that is, first person plural.

- **You**, he and I have not forgotten **your** roots. **(Incorrect)**
- You, he and **I** have not forgotten **our** roots. **(Correct)**

Remember the order of pronoun in the start of the above sentence.

➔ **Each**, **either** and **neither** are always singular and are followed by the verb in the singular.

- **Neither** of the accusations **is** true.
- **Each** boy took **his** turn.
- **Each** of the lady performs **her** duty well.

➔ Don't forget the complement in sentences pronoun should be in the nominative form.

- It was **he** (not him), who did the job.
- It is **I** (not me) that gave the prizes away.
- It might have been **he** (not him).

ii. impersonal Pronoun: It indicates mainly non-living things. For example, it.
iii. Distributive Pronoun: It distributes the sense of the subject or object. For example, each, every, either, neither.
iv. Indefinite Pronoun: It signifies the sense of the subject or object. For example, any, all, many, some, few, someone, anyone, none, anybody, nobody, everybody.
v. Interrogative pronoun: It makes the sense of interrogation. For example, who, which, what, whom, whose.
vi. Demonstrative Pronoun: It demonstrates any particular sense. For example, this, that, these, those, it, so, such.

Precious Points - Demonstrative Pronoun:

➔ **That** is used

i. **After adjectives in the superlative degree**.
   - This is the best **that** we can do.
   - He is the best speaker **that** we ever heard.

ii. After the words **all, same, any, none, nothing**, **only**
   - Man is the only animal **that** can talk.
   - He is the same man **that** he has been.

iii. After **two antecedents**, one denoting a person and the other denoting an animal or a thing.
   - The man and the pet **that** met with an accident yesterday died today.

➔ **What** and **That** refer to persons as well as things.

vii. Reciprocal Pronoun: It reciprocates between two or among more than two subjects and makes a complementary sense. For example, each other, one another.

viii. Reflexive and Emphatic Pronoun: It makes an extra emphasis on the main subject and is constructed with 'self' word. For example, my self, herself, himself, themselves, yourself.

ix. Possessive pronoun: It signifies a possession over any other person. For example, mine, ours, yours, his, its, theirs.

x. Relative Pronoun: It relates the subject or object with another clause or part of the sentence. For example, who, which, what, that, whose, whom, anyone, none, anybody.

a. The man who is honest is trusted.	b. I say what I mean.
c. This is the book that you lent me.	d. The book which I hold in yours.

Precious points - Relative Pronoun

➔ **Who** is used for persons only. It may refer to a singular or plural noun.

➔ **Whose** can be used for persons as well as things without life also.
   - This is the **hotel whose** owner is a criminal.
   - This is the **person whose** willpower is extraordinary.

➔ **Which** is used for inanimate things and animals. Which is used for both singular as well as plural noun.
   - I have found the book which I had lost last week.
   - The horse which won the race yesterday, is my favourite.

➔ When the subject of a verb is a **relative pronoun**, the verb should agree in number and person with the **antecedent of the relative**.
   - This is **one** of the most interesting **novels that** have (not has)

appeared this year. (Here, antecedent of relative pronoun "**that**" is "**novels**" and not "**one**")

- This is the **only one** of his **poems that** is (not are) worth reading. (Here the antecedent of "**that**" is "**one**" and not "**poems**".

3. **VERB**: A verb is a word that states **action**, position or being. Most of the time, it is the action done by the subject.
   There are seven types of verb:

1. Finite verb	2. Principal verb	3. Transitive verb
4. Intransitive verb	5. Auxiliary verb	6. Non-Finite verb
7. Infinite verb		

i. Finite Verb: When a verb has a subject and a tense, it can be referred to as a finite verb.These types of verb are restricted to the number and also to the persons. For example,
   - I **am** a good boy,
   - I **like** photographs of insects.

ii. Non-Finite Verb: By its name we can say these type of verb is not finite, that means these types of verb does not show their tense.
   - To **open**, tear off the tab.
   - **Looking** around, he noticed a letter on the floor.

iii. Principal Verb: Principle verbs are the main verb of a sentence; it carries the sense, action, or state of a sentence.
   - I played football yesterday. → "**Play**" sate an action that I performed yesterday.

iv. Transitive Verb: These types of verb are often used alone, with one or more objects in a sentence. Transitive verbs pass the action on to a receiver (person, place, or thing)/object
   The receiver is the object.
   - I **threw** the pen.

v. Intransitive Verb: These types of verb do not allow with a direct object, that means you can not use this type of verb where an object is clearly mentioned. An Intransitive Verb denotes an action which does not pass over to an object, but expresses a state or being.
   - He **ran** a long distance. (Action)
   - The baby **sleeps**. (State)

vi. Auxiliary Verb: An auxiliary verb is used together with a main verb to show time and continuity.
   - **Be** and **have** are the primary auxiliaries used to construct compound tenses. (The verb **be** is irregular. It has eight different forms: be, am, is, are, was, were, being, been)
   - **Do** is the supporting auxiliary. It is used in forming negatives, questions, and emphatic statements.
   - **Will, would, may, could, must, ought, might**, and the other verbs listed on Modal verbs are the modal auxiliary verbs, usually called simply, modal verbs, which allows us to talk about actions as possible, doubtful, or necessary.

4. **ADVERB:** It is a word that modifies the meaning of a verb, an adjective, or another adverb in a sentence. (Don't confuse it with adjective).
   It is often difficult to tell at first whether the word is an adjective or an adverb. The general rule is to look at the other words which it occurs with. If it comes before a noun it is probably an adjective.If it relates to a verb or an adjective it is probably an adverb.

THERE ARE NINE KINDS OF AN ADVERB.

1. Adverb of time	(Before, ago, lately, yet, soon, yesterday)
2. Adverb of Manner	(Slowly, so, soundly)
3. Adverb of Place	(Everywhere, down, near, away, etc.)
4. Adverb of frequency	(Once, seldom, rarely, usually)
5. Adverb of affirmation and negation	(Certainly, apparently, undoubtedly)
6. Interrogative Adverb	(Where, when, how, why, how often, how long)
7. Relative Adverb	(When, why, how)
8. Adverb of degree	(Almost, fully, very, enough, rather, really)
9. Adverb of sentence	(Surely, luckily)

5. **ADJECTIVE:** An adjective is a word that describe the qualities of a noun or pronoun in a given sentence.

   Tell which sentence is correct:
   a) Flowers are plucked freshly.
   b) Flowers are plucked fresh.

   Sentence (b) is correct as, adjective is correctly used with a verb when some quality of the subject rather than verb is to be expressed. Here, fresh describes the word Flowers (a noun) and not plucked (a verb).

THERE ARE EIGHT KINDS OF ADJECTIVES.

1. Possessive adjective	My, our, his, her
2. Proper adjective	Asian, chinese, american, japanese, african
3. Adjective of quality	Good, bad, rich, poor, wise, great, hot, cold, warm
4. Numerical adjective	Two, several, each, every, fourth, very few, many
5. Adjective of quantity	All, any, much, some, half, full, whole, enough
6. Demonstrative adjective	(This, that, these, those, such)
7. Distributive adjective	(Each, every, either, neither)
8. Interrogative adjective	(Which, what, whose)

DEGREES OF COMPARISON OF ADJECTIVES

I. **Positive** (an adjective describes one thing and offers no comparison): sweet, fine, intelligent, beautiful)

II. **Comparative** (an adjective compares two things only): sweeter, finer, more intelligent, less beautiful.

III. **Superlative** (an adjective compares more than two things): sweetest, finest, most intelligent, least beautiful.
(Use "most" or "least" in the superlative degree if the adjective has more than two syllables.)

IRREGULAR COMPARATIVES:

• Well	• Better	• Best
• Nigh	• Near	• Next
• Bad	• Worse	• Worst
• Little	• Less	• Least
• Good	• Better	• Best

ABSOLUTE ADJECTIVES:

These adjectives never compare because they identify characteristics of a person or thing which either exist or do not exist;

Adjectives such as **square**, **round**, **perfect**, **eternal**, **universal**, **unique Dead, Alive, Full, Empty Unique, Complete, Fatal.** do not admit of different degrees. So they cannot be compared. Thus strictly speaking we cannot say that a thing is more square more round or more perfect.

6. **PREPOSITION**: A preposition is a word placed before a noun or pronoun to show its relation with other parts of speech in a sentence.

There are six types, those are:

1. Preposition of Time	(At, in, on, by, off, from, away, since, for, towards)
2. Preposition of Place	(At, from, within, without, inside, outside, in front of, on top of, beyond, between)
3. Preposition of Possession	(By, of, with)
4. Prepositions of direction motion	(To, at, from, round, across, against)
5. Prepositions of cause, reason	(Of, for, with)
6. Preposition of Agent, Manner	(In, on, for, by with, though)

7. **CONJUNCTION**: A conjunction is a word which is used to join words, phrases, clause, and sentences.
   There are three types of conjunction.

1. Coordinating conjunction	2. Subordinating Conjunction	3. Correlative conjunction

8. **INTERJECTION**: An interjection expresses some sudden feeling of one's mind. For example, Alas! We have lost the match. Hurrah! We won the match. Some common interjections are Bravo, Hurrah, Alas, Oh, etc.

Parts of Speech	Definition	Examples
Nouns	Name of person, place, thing, quality or idea	**Teacher, place, book, proposal, pride**
Pronoun	It is used inplace of noun that is already mentioned	**He, She, I, You, They, her, mine, which etc.**
Verb	That convey action, a state of being, or existence	**Sleep, are, seem, go**

Adverb	Modify verb, adjective or other adverbs. Adverb answers: When?, Which? Where? In what way? Why? How?	**Gracefully, finally, loudly, too, very**
Adjectives	Words that describe noun or pronoun	**Beautiful, green, angry, necessary etc**
Prepositions	Words that link nouns or pronouns to other words within a sentence	**On, in, over, under, within etc**
Conjunctions	Words that link other words, phrases, or clauses in a sentence.	
a) Coordinating	Words that link independent clauses	**For, and, nor, but, or, yet, so**
b) Subordinating	Words that link dependent clauses with independent caluses.	**Although, because, whether, while**
Interjections		**Hey!, Oh!, Dam!, Wow!**

PREPOSITIONS

A Preposition is a word placed before a noun or a pronoun to show, in what relation the person or thing denoted by it, stands in regard to something else.

He is **at the top of** the class.

- The Preposition may join a Noun to another Noun; OR,
- The Preposition may join a Noun to an Adjective; OR,
- The Preposition may join a Noun to a Verb.

The Noun or Pronoun which is used with a Preposition is called its Object. A Preposition is usually placed before its object, but sometimes it follows it; as,

1) Here is the watch that you asked **for**.
2) That is the boy (whom) I was speaking **of**.
3) What are you looking **at**?

4) What are you thinking **of**?
5) Which of these chairs did you sit **on**?

KINDS OF PREPOSITIONS:

Prepositions may be arranged in the following classes :-

1. **Compound Prepositions:** which are generally formed by prefixing a Preposition to a Noun, an Adjective or an Adverb.

About	Above	Across	Along	Behind
Below	Beneath	Beside	Between	Without
Amidst	Among	Before	Amongst	Around
Beyond	Inside	Within	Outside	Underneath

2. **Phrase Prepositions:** Groups of words used with the force of a single preposition.

In accordance with	According to	In place of	By dint of	In reference to
In (on) behalf of	In regard to	In case of	In spite of	In comparison to
In compliance with	In the event of	Instead of	By way of	On account of
In consequence of	In course of	Owing to	In favour of	With a view to
With reference to	With an eye to	In front of	Away from	In order to
With regard to	Agreeably to	Along with	Because of	By means of
For the sake of	Conformably to	By reason of	By virtue of	In addition to

3. **Participial Prepositions**: A few similar words which are present participles of verbs, are used absolutely without any noun or pronoun being attached to them. For all practical purposes, they have become Prepositions, and are sometimes distinguished as Participial Prepositions.

Barring	Barring (= excepting apart from) accident, the mail will arrive tomorrow.
Concerning	Concerning (= about) yesterday's fire, there are many rumours in the bazar.
Considering	Considering (= taking into account the quality, the price is not high.
During	Ulysses is said to have invented the game of chess during the siege of Troy.
Notwithstanding	Notwithstanding (= in spite of) the resistance offered by him, he was arrested by the police.

Pending	Pending further orders. Mr. Desai will act as Headmaster.
Regarding	Regarding your inquiries regret to say that at present we are not interested in imitation silk.
Respecting	Respecting the plan you mention, I shall write to you hereafter.
Touching	Touching (= with regard to) this matter, I have not as yet made up my mind.

Having said all that; another classification fro better understanding is discussed in the parts of speech section, that is:

COMMON PREPOSITIONS ARE:

1. **Prepositions of time, which we use:**
   i. **At** for a PRECISE TIME
   ii. **In** for MONTHS, YEARS, CENTURIES and LONG PERIODS
   iii. **On** for DAYS and DATES

AT	IN	ON
at 3 o'clock	in May	on Sunday
at 10.30am	in summer	on Tuesdays
at noon	in the summer	on 6 March
at dinnertime	in 1990	on 25 Dec. 2010
at bedtime	in the 1990s	on Christmas Day

Remember, the exceptions when we say **last, next, every**,

a) I went to London last June. (not ~~in~~ last June)
b) He's coming back next Tuesday. (not ~~on~~ next Tuesday)
c) I go home every Easter. (not ~~at~~ every Easter)
d) We'll call you this evening. (not ~~in~~ this evening)

2. **Prepositions of location**

Prepositions can indicate:

1) The direction in which something is moving in relation to another person or thing: towards, from, to, off.
   a) They ran towards the station.
   b) He took the road from the town to the nearest village.
   c) Something or someone being enclosed: within, in, inside, outside.
   d) The lake can be seen from most positions within the room.
   e) There seems to be something loose inside the control box.
2) Being at a certain point: on, at, by, near.

a) Don't stand on the beds.
b) I'll meet you at the library.
c) There is a huge park near where I live.

3) Movement over or onto a place: over, across, on, onto.
   a) Graham jumped onto the back of the lorry.
   b) He slid the packet across the table.
   c) Warms tears flowed over his cheeks.
4) Location as a line: along, over, on.
   a) We walked along the bank of the river.
   b) Please sign on the dotted line.

IN	ON	AT	OUT	BY
In time	On watch	At high speed	Out of ideas	By virtue of
In demand	On the record	At one's side	Out of work	By way of
In of focus	On the road	At a fraction of	Out of fashion	By chance
In answer to	On pain of	At the end	Out of step	By luck
In anticipation of	On the air	At sight	Out of breath	By accident
In arrears	On balance	At the double	Out of context	By air
In danger	On a diet	At one time	Out of control	By sea

IN	OF	WITH	ABOUT	FROM
in difficulty	Approve of	Agree with	Argue about	Abstain from
in disguise	Bilk out of	Argue with	Boast about	Benefit from
in doubt	Compose of	Begin with	Care about	Borrow from
in exchange for	Conceive of	Collide with	Concern about	Deter from
in fact	Consist of	Compare with	Dream about	Differ from

ARTICLES

Article is a word that combines with noun and defines whether a noun in any sentence or phrase. It is often difficult to decide whether an English, a noun needs an article before it, and, if so, which article (a/an/the) to use. There are many rules for their use. However, learning a few general rules about the use of the articles is helpful..

There are two types of Articles:

i. Indefinite Articles: a (or. an)
ii. Definite Article: the

i. **Indefinite Article**: **A** or **an** is called the Indefinite Article, as it leaves indefinite the person or thing spoken of as: A doctor, A school, A man, A woman - here "a" points out any doctor, any school or any man or woman.

- A or An

The choice between "*a*" and "*an*" is determined by sound. Before a word beginning with a vowel sound *an* is used : For eg., an egg, an orange an honest man, an hour, An ass, an enemy, an ink-pad, an umbrella, an heir.

Before a word beginning with a consonant sound *"a"* is used; as, A boy, a reindeer, a woman, a yard, a horse, a hole, also a university,, a union, a European, a ewe, a unicorn, a useful article.

"A" and**"An"** are used with the singular number only.

ii. **Definite Article:** "**The**" normally points out some particular person or thing as : He saw the doctor - where **the,** points out some particular doctor. The definite article is used before singular countable nouns, plural countable and uncountable nouns, for eg. The book, the books, the milk.

When you are asked to put an article: use the following table:

NUMBER	INDEFINITE	DEFINITE
Singular	a / an	the
Plural	nothing	the
Non-Count	nothing	the

VERB TENSES WITH SENTENCE STRUCTURE

Before we go on to discuss sentence and its basic structures, first let's review verb tenses: The following classification of tenses would give you a better abstract idea about the tenses and would help to recognize the tense.

1) Present tenses

i. Present simple tense:

The simple present tense is used primarily for actions occurring at the moment, regularly, or at a set time in the future. It is formed by using the base verb or the base verb with "-s" or "-es".

	Subject	Auxiliary verb		Main verb	
+	I, You, We, They			like	coffee.
	He, She, It			likes	coffee.
–	I, You, We, They	do	not	like	coffee.
	He, She, It	does	not	like	coffee.
?	Do	I, you, we, they		like	coffee.
	Does	he, she, it		like	coffee.

ii. Present continuous tense:

The present progressive tense is used to indicate an action in progress at the moment of speaking. It is formed by using "am," "are," or "is" with the present participle of the base verb (I am, you,are, she/he/it is, we, they are).

	Subject	Auxiliary verb		Main verb	
+	I	am		watching	tv.
+	You	are		watching	tv.
-	She	is	not	watching	tv.
-	We	are	not	watching	tv.
?	Is	he, she,		watching	tv.
?	Are	you, they, we		watching	tv.

2) Past tenses

i. Past simple tense:

The simple past tense is used for actions completed in the past. With regular verbs, it is formed by using the base verb with "-ed" and can be singular (I lived, you lived, s/he/it lived) or plural (we lived, you lived, they lived).

	Subject	Auxiliary verb		Main verb	
+	I			went	to school.

+	You			worked	very hard.
-	She	did	not	go	with me.
-	We	did	not	work	yesterday.
?	Did	you		go	to london.
?	Did	they		work	at home.

ii. Past continuous tense:

The past progressive tense is used for an activity that was in progress over time or at a specified point in the past. It is formed by using "was," or "were" with the present participle of the base verb.

	Subject	Auxiliary verb		Main verb	
+	I	was		watching	tv.
+	You	were		working	hard.
-	He, She, it	was	not	helping	mary.
-	We	were	not	joking.	
?	Were	you		being	silly?
?	Were	they		playing	football?

3) Future tenses

i. Future simple tense:

The simple future tense is used for actions that will occur in the future. It is formed by using "will" and the base verb (I, you s/he/it, we, they will complete).

	Subject	Auxiliary verb		Main verb	
+	I	will		open	the door.
+	You	will		finish	before me.
-	She	will	not	be	at school tomorrow.
-	We	will	not	leave	yet.
?	Will	you		arrive	on time?
?	Will	they		want	dinner?

ii. Future continuous tense:

The future progressive tense is used for an activity that is expected to be in progress at a time in the future when something else will happen. It is formed by

using “will” plus “be” or a form the verb “be” with the present participle of the base verb (I, you s/he/it, we, they will be studying).

	Subject	Auxiliary verb		Auxiliary verb	Main verb	
+	I	will		be	working	at 10 am.
+	You	will		be	taking	exam tomorrow.
-	She	will	not	be	using	th car.
-	We	will	not	be	having	dinner at home.
?	Will	you		be	playing	football?
?	Will	they		be	watching	tv?

4) Present perfect

i. Present perfect simple:

The present perfect tense is used to indicate that an action occurring at some unstated time in the past is related or continues to the present time.

	Subject	Auxiliary verb		Main verb	
+	I	have		seen	him.
+	You	have		eaten	mine.
-	She	has	not	been	to Roome.
-	We	have	not	played	football.
?	Have	you		finished?	
?	Have	they		done	it?

ii. Present perfect continuous:

The present perfect progressive tense describes actions that start in the past and continue to the present.

	Subject	Auxiliary verb		Auxiliary verb	Main verb	
+	I	have		been	waiting	for one hour.
+	You	have		been	talking	too much.

-	It	has	not	been	raining.	
-	We	have	not	been	playing	football.
?	Have	you		been	seeing	her?
?	Have	they		been	Doing	Their homework.

5) Past perfect

i. Past perfect simple:

The past perfect tense is used when one past event was completed before another past event or stated past time. It is formed by using "had" plus the past participle of the base verb.

	Subject	Auxiliary verb		Main verb	
+	I	had		finished	my work.
+	You	had		stopped	before me.
-	She	had	not	gone	to school.
-	We	had	not	left.	
?	Had	you		arrived?	
?	Had	they		eaten	dinner?

ii. Past perfect continuous:

The past perfect progressive tense is used to indicate actions that ended or will end at a specified time or before another action. It is formed by using "**had**" plus "**been**" plus the present participle of the base verb.

	Subject	Auxiliary verb		Auxiliary verb	Main verb	
+	I	had		been	working.	
+	You	had		been	playing	tennis.
-	It	had	not	been	working	well.
-	We	had	not	been	expecting	her.
?	Had	you		been	drinking?	
?	Had	they		been	waiting	long?

6) Future perfect

i. Future perfect simple:

The future perfect tense is used to indicate an action that will be completed before another time or event in the future. It is formed by using “will” plus “have” and the past participle of the base verb.

	Subject	Auxiliary verb		Auxiliary verb	Main verb	
+	I	will		have	finishd	by 10 am.
+	You	will		have	forgetten	me by then.
-	She	will	not	have	gone	to school.
-	We	will	not	have	left.	
?	Will	you		have	arrived?	
?	Will	they		have	received	it?

ii. Future perfect continuous:

The future perfect progressive tense is used to indicate actions that ended or will end at a specified time or before another action. It is formed by using “will” plus “have” plus “been” plus the present participle of the base verb.

	Subject	Auxiliary verb		Auxiliary verb	Auxiliary verb	Main verb	
+	I	will		have	been	working	for four hours.
+	You	will		have	been	travelling	fro two days.
-	She	will	not	have	been	using	the car.
-	We	will	not	have	been	warting	long.
?	Will	you		have	been	playing	football?
?	Will	they		have	been	watching	tv?

SENTENCE

When we speak or write we use words. We generally use these words in groups; as,

Little Jack Homer sat in a corner.

A group of words like this, which makes complete sense, is called a Sentence.
When we make a sentence, we must have a *subject* to speak about and we must say or *predicate* something about that subject. Hence every sentence has two parts:

1) The part which names the person or thing we are speaking about is called *Subject.*
2) The part which tells something about the Subject. This is called the *Predicate.*

The Subject of a sentence usually comes first, but occasionally it is put after the Predicate; for example, "Here comes the bus."
In Imperative sentences the Subject is left out; as,

→ Sit down. → [Here the Subject You is understood].
→ Thank him. → [Here too the Subject You is understood.]

CLAUSE AND PHRASE:

Sentences are made up of clauses and phrases. All sentences must have at least one independent clause.

1) CLAUSE: A clause is a group of words which has:
   - A subject, ie. the focus of the clause, or someone or thing which does something in the clause

AND

   - A complete finite verb, ie. a verb which has a subject and a sense of time

For example,

Subject	Verb
The lecture	finished at 3 pm
Pollution	causes cancer
New Zealand	is in the south Pacific

There are two kinds of clauses: independent (or main) clauses and dependent (or subordinate) clauses

i. Independent

An independent clause expresses a complete thought and can stand on its own as a sentence
For example: Learning a new language is often frustrating.

ii. Dependent

A dependent clause does not express a complete thought and needs to be joined to an independent clause to become a sentence. It usually begins with a word such as although, while, because, who, which, if, etc.
For example: Although learning a new language is often frustrating

2) PHRASE: A phrase is a group of words which either does not have a subject, or does not have a finite verb.

For example:

→ "walks to work every day." – This phrase has no subject.

→ " The reason being their good design" This phrase has no finite verb.

SENTENCES ARE OF FOUR TYPES:

i. A sentence that makes a statement or assertion is called a Declarative or Assertive sentence. This makes statements or assertions as, Humpty Dumpty, sat on a wall.

ii. A sentence that asks a question is called an Interrogative sentence. This asks questions; as Where do you live?

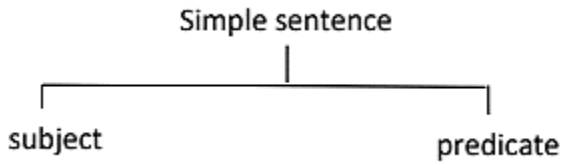
iii. A sentence that expresses a command or an entreaty is called an Imperative sentence. This expresses commands, requests, or entreaties; as, Be quiet. Have mercy upon us.

iv. A sentence that expresses strong feeling is called an Exclamatory sentence. This expresses strong feelings; as, How cold the night is! What a shame!

KINDS OF SENTENCES:

1) SIMPLE SENTENCE:

A Simple sentence is one which has only one Subject and one Predicate.



"His courage won him honour."

A simple sentence has a **subject**, **verb**, and **object**.

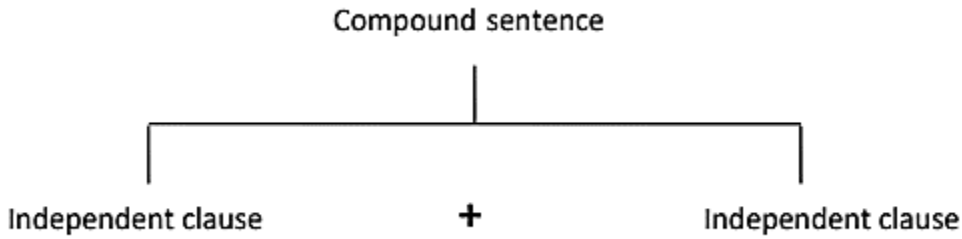
Your subject is the noun at the beginning of your sentence. It is the doer of the action to follow. Your verb is the action word that describes what the noun is doing. And your object is everything that follows your verb. It is the result of the action taking place.

Here are some examples:

- Chelsea ran to the shop.
- This research examines the gender identity of two middle class women.

2) COMPOUND SENTENCE:

A Compound sentence is one made up of two or more Principal or Main Clauses.



"The moon was bright and we could see our way."

The above sentence has two parts, which are joined by the Co-ordinating Conjunction **"and".** Each part contains a Subject and a Predicate of its own. Each part is what we call a Clause. We further notice that each Clause makes good sense by itself, and hence could stand by itself as a separate sentence. Each Clause is therefore independent of the other and is called a Principal or Main Clause.

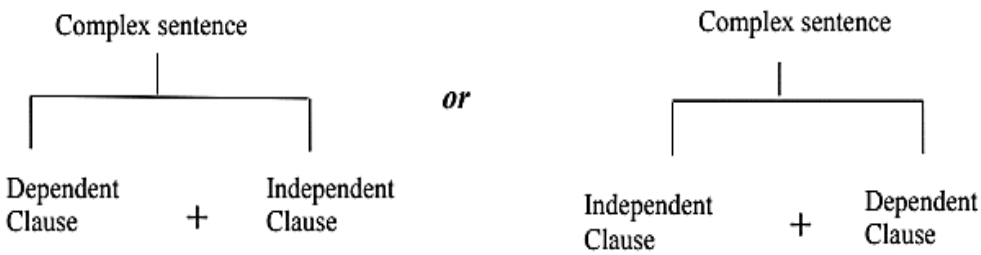
In this sentence type, you use **and**, **or**, or **but** to connect two simple sentences together. Each '**half'**of your compound sentence can stand on its own as a complete sentence. When you write a compound sentence, you have decided that both pieces are related, and therefore can be connected together into one sentence.

Here are some examples:

- Chelsea ran to the shop to buy milk, eggs and ham for dinner that night, **but** the shop was closed due to a power outage.

3) COMPLEX SENTENCE:

A Complex sentence that has two or more clauses, in which one clause *(Subordinate Clauses)* depends on the another *(Main Clause)* clause and forms a large meaningful sentence is called complex sentence. The dependent clause doesn't make sense when used alone, however, the independent clause keeps its meaning, even if used alone. In other words,



For example:

"They rested when evening came."

The Clause, "They rested", makes good sense by itself, and hence could stand by itself as a complete sentence. It is therefore called the Principal or Main Clause. The Clause, "when evening came", cannot stand by itself and make good sense. It is dependent on the Clause, they rested. It is therefore called a Dependent or Subordinate Clause.

An independent clause is a simple sentence. It is a sentence that can stand on its own. A dependent clause is a part of a sentence that cannot stand on its own. These clauses contain a subject and a verb, but do not express a complete thought. Here are some examples of dependent clauses:

- Although Chelsea ran to the shop ……..
- Even though these results are accurate …..

4) COMPOUND-COMPLEX SENTENCE:

A compound-complex sentence contains two or more independent clauses and at least one dependent or subordinate clause:

For example:

"When the package finally arrived, after a delay of more than two weeks, she was anxious to open it, but she decided to wait until we could share the experience with her."

These are the trickiest sentence types. By now, you can probably guess that this sentence type combines a compound sentence with a complex one. So, a dependent clause is combined with a compound sentence.. Here are some examples:

- Since the shop was closed, Chelsea ran home and her sister made her a cheese sandwich.

5) CONDITIONAL SENTENCES:

Conditional sentences are in the conditional mood which is used for hypothetical scenarios that aredependent on a certain condition or conditions. They are usually constructedusing if to identify the conditions that must be met.

There are four "degrees" of conditionals, all of which vary in structure andmeaning.

i. Zero Conditional

A zero conditional sentence uses the present simple tense to talk about what is always or generally true. It is classified as a conditional because it creates a hypothetical situation to describe what would be true each time something happens.

The general structure for the zero conditional is:

"If + subject + present tense of predicate verb**,** subject + present tense of main verb."

For example:

- "If you throw a ball in the air, it comes back down.

ii. First Conditional

The first conditional is very similar in structure to the zero conditional. We still use *if* plus the present simple to create the condition, except that we now use the future simple tense *(will + bare infinitive)* to describe a probable result of the condition.

Thus, the structure is:

"If + present simple tense, will + infinitive."

For example:

- **"**If I see him, I will tell him."

iii. Second Conditional

We use the second conditional to speak about a hypothetical situation or outcome resulting from the condition. Unlike the first conditional, we use the second conditional to talk about things that cannot or are unlikely to happen.

To create the second conditional, we use:

If clause + pas simple + would + the bare infinitive for the result of the condition.

In addition to **would** (which we use to describe something we would definitely do), we can also use **could** for what we would be able to do, as well as **might** for what it is possible (but unlikely) we would do.

For example:

- "If I went to London, I would visit Trafalgar Square."
- "If I won the lottery, I could buy a new house."

iv. Third Conditional

Third conditionals are used to establish a hypothetical situation in the past, followed by a hypothetical outcome that did not really happen—typically, the outcome is the opposite of what actually happened.

To form the third conditional, we use the past perfect tense for the *If clause:*

If past perfect clause, + would have + the past participle of the verb for thehypothetical outcome**.**

(As with the second conditional, we can also use could or might instead of would. Additionally, we can use should have + the past participle to describe an outcome that ought to have happened.)
For example'

- "If I had been more prepared, I would have passed that test."

v. The Mixed Conditional

A very commonly used "fifth" conditional is what's known as the mixed conditional, which is a cross between the third conditional and the second.
There are two ways to form a mixed conditional, depending on the meaning we wish to achieve.
If it is being used to describe how an unreal situation in the past might have affected an unreal outcome in the present, we use:

<u>The past perfect tense in the"if conditional clause" and would / could + the bare infinitive of the verb for the result of the condition.</u>

For example:

- "If I had studied more *(the condition is in the past)*, I would be a doctor *(the result of the condition is in the present)."*

ACTIVE AND PASSIVE

The scenario of active of passive voice revolves around one single concept that if understood appropriately, makes this part an easy one. The voice is decided upon the role of subject in the sentence. If the *SUBJECT IS ACTIVE AND DOES SOMETHING,* the sentence is said to be in active voice. On the other hand, when *SUBJECT IS PASSIVE THAT IS, SUFFERS, RECEIVES SOME ACTION,* the sentence is said to be in passive voice.

Active:	My grandfather planted this tree.
Passive:	This tree was planted by my grandfather.

In the passive sentence, the subject *"This tree"* is passive that is being planted by the objected *"my grandfather*".

To make passive voice, first of all you have to use following rules:

I. First of all, find subject, object and the main verb it means find SVO .
II. Change the object into subject. If in object, we have a pronoun of object case convert that by following rules.

	Object of active	Subject of passive
First Convert	me	I
	You	You
	her	She
	them	They
	us	We
	him	He
	it	It
	whom	Who

III. Use the helping verb according to the tense and the object *(now the subject of the passive sentence)*
IV. Convert the verb into 3rd form of the verb.
V. Use the preposition “by”.
VI. Convert the subject into object.

Change the subject into object by the following rules and use ***by*** before the object.

	Subject of active	Object of passive
Second Convert	I	by me
	You	by you
	She	by her
	They	by them
	We	by us
	He	by him
	It	by it
	Who	by whom

Examples of passive voice with reference to the verb tenses

TENSE	ACTIVE	PASSIVE

Present Simple	He delivers the letters.	The letters are delivered.
Past Simple	He delivered the letters.	The letters were delivered.
Future Simple	He will deliver the letters.	The letters will be delivered.
Present Continuous	He is delivering the letters.	The letters are being delivered.
Past Continuous	He was delivering the letters.	The letters were being delivered.
Going to	He is going to deliver the letters.	The letters are going to be delivered.
Present Perfect	He has delivered the letters.	The letters have been delivered.
Past Perfect	He had delivered the letters.	The letters had been delivered.
Infinitive	He has to deliver the letters.	The letters have to be delivered.
Modals	He must deliver the letters.	The letters must be delivered.

Formulae for conversion to passive voice, for each tense:

Simple Present Tense is,am,are+3rd verb	
Active Voice	Passive Voice
He lights the candle.	The candle is lighted by him.
He does not light the candle.	The candle is not lighted by him.
Do you eat meat?	Is meat eaten by you?
Present Continuous Tense is,am,are+being+3rd verb	
Active Voice	Passive Voice
I am driving a car.	A car is being driven by me.
I am not driving a car.	A car is not being driven by me.
Am I driving a car?	Is a car being driven by me?
Present Perfect Tense has,have+been+3rd verb	
Active Voice	Passive Voice
She has stolen my book.	My book has been stolen by her.
She has not stolen my book.	My book has not been stolen by her.

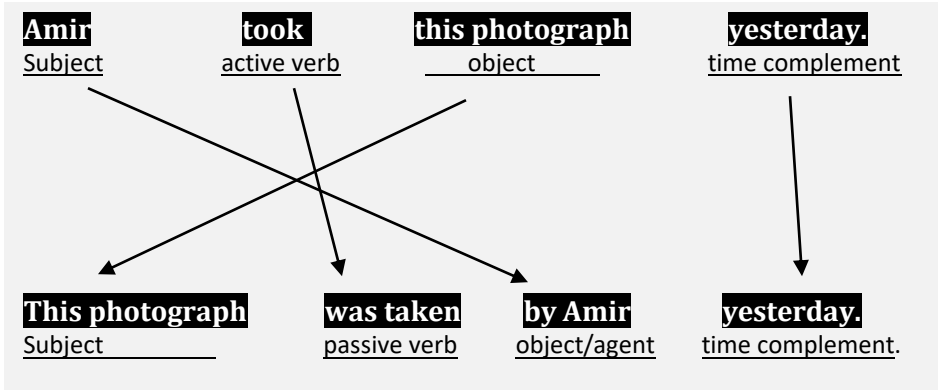
Has she stolen my book?	Has my book been stolen by her?
Simple Past Tense was,were+3rd verb	
Active Voice	Passive Voice
She finished work.	Work was finished by her.
She did not finish work.	Work was not finished by her.
Did she finish work?	Was work finished by her?
Past Continuous Tense was,were+being+3rd verb	
Active Voice	Passive Voice
He was revising his books.	His books were being revised by him.
He was not revising his books.	His books were not being revised by him.
Was he revising his books?	Were his books being revised by him?
Past Perfect Tense had+been+3rd verb	
Active Voice	Passive Voice
I had completed the assignment.	The assignment had been completed by me.
I had not completed the assignment.	The assignment had not been completed by me.
Had I completed the assignment?	Had the assignment been completed by me?
Simple Future Tense will,shall+be+3rd verb	
Active Voice	Passive Voice
My uncle will pay my tuition fee.	My tuition fee will be paid by my uncle.
My uncle will not pay my tuition fee.	My tuition fee will not be paid by my uncle.
Will my uncle pay my tuition fee?	Will my tuition fee be paid by my uncle?
Future Perfect Tense will, shall+ have been+3rd verb	
Active Voice	Passive Voice
We shall have done our home-work.	Our home -work shall have been done by us.
We shall not have done our home-work.	Our home -work shall not have been done by us.
Shall We have done our home –work?	Shall our home -work have been done by us?

Please note that, in the following tenses, we use the same sentence in passive voice. It means these tense cannot be changed in passive form.

- Present perfect continuous tense,

- Past perfect continuous tense,
- Future perfect continuous tense,
- Future perfect tense,
- Also, Sentence containing intransitive verb (verb with no object)

Summary:



NARRATION (DIRECT /INDIRECT)

There are two ways of relating what a person has said: direct and indirect.

(i) **In direct speech**, we repeat the original speaker's exact words: He said, "I have lost my umbrella."
The remarks (I have lost my umbrella) thus repeated are placed between inverted commas, and a comma is placed immediately beforethe remark. Direct speech is found in conversations in books, in plays and in quotations.

(ii) **In indirect speech**, we give the exact meaning of a remark or a speech, without necessarily using the speaker's exact words: He said (that) he had lost his umbrella.
There is no comma after **say** in indirect speech. "**That**" can usually be omitted after **say** and **tell** + object. However, it should be kept after other verbs: **complain, explain, object, point out, protest** etc.
Indirect speech is normally used when conversation is reported verbally, though direct speech is sometimes here to give a more dramatic effect.

(iii) **Reporting Speech:** The part of the whole sentence outside the Inverted Commas in Direct Narration is called *Reporting Speech*, and the verb used in this part is called *Reporting verb*.

(iv) **Reported Speech:** The part of the whole sentence in which the actual words of the speaker are written within the Inverted Commas is called the *Reported Speech*, and the verb used in this part is called *Reported Verb*.

When we turn direct speech into indirect, some changes are usually necessary.

I. Rules for CONNECTIVES:
When the entire sentence is required to be change from Direct Narration

into Indirect Narration. The two parts of the sentence is likely to be joined by some connectives. The following are these rules.

A. Interrogative Sentence: If the Reported speech is in the form of an Interrogative sentence, it can be connected in two ways according to the structure of the Interrogative sentence.
   (i) If the interrogative sentence begins with an Interrogative Adverb (**What, Why, Where, How, When etc)** or with an Interrogative Adjective/Pronoun **(Who, Whose, Whom, What, Which etc.)** no connectives is required to join it. It is a mistake to use that to connect such a sentence. For Example
      - Direct: He said, “where are you going”?
      - Indirect: He asked me where I was going.

   (ii) If the Interrogative sentence begins with the Auxiliary Verb / **Helping Verb**, the connective **Whether** or**if** is used to join it. For Example
      - Direct: Hesaid, “Is he a doctor”?
      - Indirect: He said whether he was a doctor.
      - Direct: I said,” Do you smoke”?
      - Indirect: I asked whether you smoke.

   (iii) If the reported speech begins with the **Do**or**Does**, then **Do** and **Does** is removed from the reported speech, and in their place the Past Indefinite Tense of the main verb is used. For Example
      - Direct: He said to Ram,”Do you know his name”.
      - Indirect: He asked Ram whether he knew his name.
      - Direct: Ram said to him,”Does Suresh Go to School”.
      - Indirect: Ram asked him whether Suresh goes to School.

   (iv) If the Reported Speech begins with the Auxiliary Verb Did then the did is removed and the Past Perfect form of the main verb is used. For Example
      - Direct: I said to him, “Did you go to School yesterday”.
      - Indirect: I asked him whether he had gone to school the previous day.

B. Assertive Sentence: If the reported speech is in the form of assertive sentence, then the connective **that**is used to join two sentence. For Example
      - Direct: He said, “He is going to home”.
      - Indirect: He said that he was going to home.

C. Imperative Sentence: If the reported speech is in the form of Imperative sentence, then the no connective is used to join two sentence but the main verb of the Imperative sentence is converted into an Infinite Verb. For Example

- Direct: He said to the servant,"Close the door."
- Indirect: He asked the servant to close the door.
- Direct: He said,"Please give me a glass of water."
- Indirect: He requested to give him a glass of water.

D. Exclamatory Sentence: If the Reported Speech is in the form of Exclamatory Sentence **(indicating surprise, fear, wish or contempt etc.),** it is changed into an assertive sentence in the Indirect Narration form and connective **that** is used to join it with the Reporting speech. For Example

- Direct: He said," What a horrible scene ?
- Indirect: He said that it was a horrible scene.

Exclamatory sentence: The sentences which carry the sense of *sudden joy, sorrow, Wonder, disappointment*are called exclamatory sentence. These sentences generally begins with word **Alas, Oh, Hurrah, Bravo, How, What a, etc.**Exclamations usually become statements in indirect speech. The exclamation mark disappears.

(i) In place of the Reporting Verb '**Said'** some other verbs as Exclaimed, Wished and Prayed are used according to the sentence.
(ii) Connective '**that'** is used.
(iii) After the Reporting Verb, we use such expressions as **Joyfully**, **Sorrowfully**, **WithSorrow**, **With Joy**, **In astonishment**, according to the sense.
(iv) Exclamatory sentence is changed into assertive sentence.
(v) If the exclamation is followed by an *action* we can use the construction ***with an exclamation of delight/disgust etc. + he/she etc. + verb.***

- "Ugh!" she exclaimed, and turned the programme off.
- With an exclamation of disgust she turned the programme off.

(vi) The rules for change for Tense and Pronoun are the same as used in assertive sentence.

- Direct: He said,"Alas, I am ruined".
- Indirect: He exclaimed that he was ruined.
- Direct: He said, "O, what a chance !.

- Indirect: He exclaimed that it was a fine chance.
- Other important sentences of exclamation:

DIRECT	INDIRECT
He said, “Thank you!”	He thanked me.
He said, “Good luck!”	He wished me luck.
He said, “Happy Christmas!”	He wished me a happy Christmas.
He said, “Congratulations!”	He congratulated me.
He said, “Liar!”	He called me a liar.
He said, “Damn!” etc.	He swore.
The notice said: WELCOME TO WALES!	The notice welcomed visitors to Wales.

II. Rules for PRONOUNS AND ADJECTIVES: CHANGES NECESSARY

A. First and second person pronouns and possessive adjectives normally change to the third personexcept when the speaker is reporting his own words.

I →	he, she;	me →	him, her;	my →	his, her;	mine →	his, hers; we	they →	they

- ✓ She said, “he’s my son”. She said that he was her son.
- ✓ “I’m ill”, she said. She said that she was ill.

Please remember: Every second person in the reported speech is changed according to the person of the Object of the reporting speech. For Example

- ✓ Direct: Mohan said to you,“you are not doing your work seriously”.
- ✓ Indirect: Mohan told you that you were not doing your work seriously.

B. THIS / THESE

(i) **This** used in time expressions usually becomes **that**.

- ✓ She said, “She’s coming this week”. She said that she was coming that week.

(ii) **This** and **that** used as adjectives usually change to **the**.

- ✓ He said, “I bought this pearl/these pearls for my mother”.
- ✓ He said that he had bought the pearl/the pearls for his mother.

(iii) **This**, **these** used as pronouns can become **it, they/them**.

- ✓ He came back with two knives and said, "I found these beside the king's bed".
- ✓ He said he had found them beside the king's bed.

III. STATEMENTS IN INDIRECT SPEECH: TENSE CHANGES NECESSARY

A. Indirect speech can be introduced by a verb in a present tense: He says that ... This is usual when we are:

(i) reporting a conversation that is still going on
(ii) reading a letter and reporting what it says
(iii) reading instructions and reporting them
(iv) reporting a statement that someone makes very often, e.g. Tom says that he'll never getmarried.

When the introductory verb is in a present, present perfect or future tense we can report the directspeech without any change of tense:

- ✓ PAUL (phoning from the station): I'm trying to get a taxi.
- ✓ ANN (to Mary, who is standing beside her): Paul says he is trying to get a taxi.

B. However, indirect speech is usually introduced by a verb in the past tense. Verbs in the direct speech havethen to be changed into a corresponding past tense. The changes are shown in the following table.

DIRECT SPEECH	INDIRECT SPEECH
Simple Present *"I never eat meat", he explained.*	***Simple Past*** *= He explained (that) he never ate meat.*
Present Continuous *"I'm waiting for Ann", he said.*	***Past Continuous*** *= He said (that) he was waiting for Ann.*
Present Perfect *"I have found a flat", he said.*	***Past Perfect*** *= He said (that) he had found a flat.*
Present Perfect Continuous *He said, "I've been waiting for ages".*	***Past Perfect Continuous*** *= He said (that) he had been waiting for ages.*
Simple Past *"I took it home with me", she said.*	***Past Perfect*** *= She said (that) he had taken it home with her.*
Future *He said, "I will/shall be in Paris on Monday".*	***Conditional*** *= He said (that) he would be in Paris on Monday.*
Future Continuous *"I will/shall be using the car myself on the 24h", she said.*	***Conditional Continuous*** *= She said (that) she'd been using the car herself on the 24th.*
Conditional *I said, "I would like to see it".*	***Conditional*** *= I said (that) I would like to see it.*

Remember that: All those changes represent the distancing effect of the reported speech. Common sense, togetherwith the time aspect from the speaker's point of view, are more important than the rules when making the usual changes.

ANALOGY

Analogy is a comparison between two items or objects based on a similar characteristic or feature. Analogies can be very helpful for learning new vocabulary. Simple analogies are presented in pairs, with the first pair having the same relationship as the second pair.

Example:

Days are to week as months are to year.

What do week and year have in common? They are both measurement of days - as days make a week, the same way months make a year.Analogy is in a sense, a test of vocabulary since you need to know the meaning of the words given, but in a broader sense it is a test of reasoning ability.

To know the meaning of the words will not be enough if one is not able to understand clearly what the relation between the pairs of words is. Therefore, there are two things that are important to attempt a question on analogy:

- Meaning of all given words.
- Relationship between the given pairs of words.

It is more convenient and time-saving to first figure out the relation between the given pair and then compare it with the relations between the pairs in the options given for choice.

Different Kinds of Relationships

There are different kinds of relationships that could be drawn from daily usage but some common relationships are given below:

1) CAUSE : EFFECT
   - Liquor : Intoxication — Liquor causes intoxication
   - Wound : pain — wound causes pain.

   In this relation the first word is the cause for the second and the second is the result of the first.
2) PURPOSE
   - Bottle : Cork — a cork is used to close a bottle
   - Dress : cloth — cloth is used to make a dress

   In this relation, one word is used for another, there is a purpose between the two.
3) OBJECT : ACTION
   - Gun : Fire — you fire a gun
   - Violin : play — you play a violin

   In this, one term is an object and the other action undertaken with the help of that object.

4) ACTION : OBJECT
   - foment : Riot — you foment a riot

- Wear :clothes — you wear clothes

This is opposite to the previous relation, here the first word is the action and the second the object with which that action is done.

5) PART : WHOLE
   - Book : Literature — a book is a part of the larger body of literature
   - Ship : fleet — ship is a part of the collection called fleet

   In this relation, the first word will in the same way bea constituent of a bigger body represented by the second word.
6) SYNONYMS
   - Abundant : ample — ample means the same as abundant
   - Skilled : adroit — the two words are synonymous,i.e., they mean the same

   This relation is when both the words are synonyms
7) ANTONYMS
   - Abstinence : indulgence — indulgence means the opposite of Abstinence
   - Legitimate : Unlawful — Legitimate means legal which is the opposite of unlawful

   In this relation, the two words are opposite to each other in meaning.
8) SECONDARY SYNONYMS
   - Callous : Indifference — The synonym of callous will be indifferent, since both words are adjectives but rather the noun form. Indifference has been given in the relation
   - Brainwave : Inspired — The synonym of Brainwave is inspiration, but instead the second word in this relation is Inspired – the one who has inspiration.

     In this relation, the two words are not directly synonymous but a slight mutation of the part of speech has been made in the second word.
9) WORKER : ARTICLE CREATED
   - Carpenter : furniture — carpenter makes wooden furniture
   - compose : music — a composer composes or creates music

   In this relation, the first word is the doer and the second is the professional work done by the first.
10) SYMBOL : QUALITY
    - Olive leaf : Peace — an olive leaf is a symbol of peace.
    - Red : passion — the color red symbolizes passion.

    In this relation the first word is a symbol, and the second is the meaning represented by the symbol.
11) CLASS : MEMBER
    - Mammal : man — man belongs to the class of mammals.

- Doggerel : Poem — Doggerel is a class of poem which is bad in quality.

In this relation the first word is a member belonging to the class denoted by the second word.

12) ACTION : SIGNIFICANCE
    - Blush : embarrassment — if one blushes, that signifies that the person is embarrassed.
    - Spasm : pain — a spasm indicates that the person is in pain

In this relation, the first word is an action and the second is what that action signifies.

Although most of the questions asked in a competitive exam can be solved with the help of the given relationships for subtle questions student should apply reasoning to figure out the relation between the given words. Following are certain tips that would help a student to attempt analogy questions.

- **Tip 1**

The first and foremost step while attempting an analogy question should be to DEFINE THE RELATIONSHIP. To avoid any errors first define the relationship on paper or in your mind before searching for options. Once you have defined the relationship, analyze the given pairs in the light of the relationship.

(i) ANXIOUS : REASSURANCE
    a) Resentful : gratitude
    b) Perplexed : classification
    c) Insured : imagination
    d) Vociferous : suppression

First, the relationship can be defined as 'need' i.e, an anxious person needs reassurance and then you can check the given pairs to find out that 'a perplex person needs classification'. Thus, this will be the right analogy.

(ii) SIMMER : BOIL
    a) Cook : Fry
    b) Chill : Freeze
    c) Roast : Stew
    d) Slice : Cut

Now, establish the relation between the two given words. It is that of degree. Simmer is the lower degree of boil. Just as chill is the lower degree of freeze.

- **Tip2**

Always be careful about apparent and easy similarity. These are only to deceive the student as you would be attracted by these options. Always confirm all the options and be highly careful while considering an obvious answer.

(iii) STUTTER: SPEECH
    a) Blare : hearing

b) Aroma : smelling
c) Astigmatism : sight
d) Novocain : Touch

Stutter is a defect of speech, so the relation between the two is that of defect. But Blare and hearing are closely related since blare means a harsh sound. This may attract the student, but this is not a relation of defect. This relation is in the third option, astigmatism is a defect of sight. So always avoid giving into the temptation of obviously correct answers.

- **Tip 3**

Sometimes a word has two meanings, while what may first come to your mind will be the more frequent use of that word, if you cannot find logical relation between the two words, go beyond the obvious meaning and link the word with the other meaning of the second word.

(iv) ANNEX : BUILDING
a) Postscript : letter
b) Lyric : song
c) paragraph : text
d) hill : mountain

The common meaning of annex is to add, append or take possession. But with this meaning a logical relationship cannot be built with building. Soone must refer to the other meaning of annex, which is a supplementary building. Similarly, the relation of supplement also exists between postscript and letter.

(v) MAROON : SAILOR
a) Red : Ship
b) Crimson : flower
c) Stranded : Tourist
d) Color : Dress

Maroon also has two meanings the color ‘maroon ‘and the verb maroon which means being left alone or abandoned. Obviously, the second meaning will make a logical relation with sailor, a sailor is marooned just as a tourist is stranded.

SYNONYMS AND ANTONYMS

Words	Synonyms – Same Meaning	Antonyms – Opposites
Abate	Moderate, decrease	Aggravate
Adhere	Comply, observe	Condemn, disjoin
Abolish	Abrogate, annul	Setup, establish
Acumen	Awareness, brilliance	Stupidity, ignorance
Abash	Disconcert, rattle	Uphold, Discompose
Absolve	Pardon, forgive	Compel, Accuse
Abjure	Forsake, renounce	Approve, Sanction
Abject	Despicable, servile	Commendable, Praiseworthy
Abound	Flourish, proliferate	Deficient, Destitute
Abortive	Vain, unproductive	Productive
Acrimony	Harshness, bitterness	Courtesy, Benevolence
Accord	Agreement, harmony	Discord
Adjunct	Joined, Added	Separated, Subtracted
Adversity	Misfortune, calamity	Prosperity, Fortune
Adherent	Follower, disciple	Rival, Adversary
Adamant	Stubborn, inflexible	Flexible, Soft
Admonish	Counsel, reprove	Approve, Applaud
Allay	Pacify, soothe	Aggravate, Excite
Alien	Foreigner, outsider	Native, Resident
Ascend	Climb Escalate	Descend, Decline
Alleviate	Abate, relieve	Aggravate, Enhance
Allure	Entice, fascinate	Repulse, Repel
Arraign	Incriminate, indict	Exculpate, Pardon
Amplify	Augment, deepen	Lessen, Contract
Axiom	Adage, truism	Absurdity, Blunder
Audacity	Boldness, Courage	Mildness, Cowardice
Authentic	Accurate, credible	Fictitious, unreal
Awkward	Rude, blundering	Adroit, clever
Barbarous	Frustrate, perplex	Civilized
Bleak	Grim, Austere	Bright, Pleasant
Bewitching	Alluring, charming	Repulsive, Repugnant

PASSAGE READING

Usually, a paragraph or two are provided and questions base on the information provided in the paragraph are asked. There are eight different types of questions which are commonly tested in exams. Understanding them makes this part of the paper easier. These are:

1) FACTUAL
   The most straightforward type of question that focus on obvious details from the passage
   - ✓ What did Ethan bring to class?
   - ✓ Where was Julian in the afternoon?
2) INFERENCE
   These questions are less direct compared to factual questions. They require the students to think and look for clues instead of obvious answers in the text. For instance, looking at the phrase "the sun was directly above their heads", the student should be able to deduce that it was noontime.
3) MAIN IDEA QUESTIONS
   Main idea questions ask the test taker to identify the passage's overall theme, as opposed to supporting facts and arguments. Just because all of the answer choices have been discussed in the passage, it does not mean that every one of them can be called the passage's central theme.
   In main idea questions, answer choices that emphasize factual information can usually be eliminated. Answer choices that are too narrow or too broad also tend to be incorrect. Those answer choices that contain key words and concepts from the main idea presented by the passage are more likely to be correct.
4) SEQUENCING
   This type of question requires students to figure out the order in which events happened in a story. However, this question is not asking which event APPEARED first. An event that appeared in the first paragraph may not have happened first.
5) TRUE OR FALSE
   For these questions, students have to identify whether a given statement is entirely true or if a false detail is given. The students are to provide evidence to prove why the statement is true (by finding the original sentence) or false (by finding the false detail). Find that detail and write the answer in a way that matches (if true) or contrasts (if false) with the statement.
6) CAUSE AND EFFECT
   These questions are asking the students to identify the cause (what made something happen) and effects (what happened because of the cause).
7) BEFORE / AFTER

These questions require students to make comparisons and identify a given detail in the statement, which changed over time. Once again, do not confuse this with events that appeared first (appearing first doesn't necessarily mean that it happened first).

8) VOCABULARY IN CONTEXT
These questions are basically testing the students' vocabulary. However, do not forget that many words have multiple meanings. Identify the correct usage of the words based on the way they are used in the passage (that's why it's called "in context").

IMPORTANT STRATEGY TO SOLVE COMPREHENSION PASSAGES

1. Read the passage **as fast as possible**.
2. Get involved with the paragraph to understand it.
3. **Underline** important lines or parts of the passage to answer the questions. It will also help to understand the main idea of the passage or the tone or mood of the author.
4. Try to **translate a complex line** in an easy one in your own words and your own language. This will help you in analyzing the main idea of the paragraph and in seeking the cause and effects of the passage.
5. **Underline or mark the keywords**. These will help you to discover the logical connections in the passage and help in understanding it better.
6. Try to understand some certain **unfamiliar words by reading the line thoroughly**. The theme of the line will make you understand the meaning of the words.
7. Determine the main idea, tone or mood, inferential reasoning, and other details from the paragraph.
8. Do not assume anything based on your personal belief.
9. Look back at the paragraph when in doubt.
10. Tips for main idea questions:
    - ✓ If you find mostly reasons or explanations, the main idea will deal with "why."
    - ✓ If most of the sentences talk about a place, the main idea will deal with "where."
    - ✓ If most of the sentences are about time, the main idea will deal with "when."
    - ✓ If most of the sentences give steps to do or make something, the main idea will deal with "how."
    - ✓ If most of the sentences are about one person or several people or even a group of people, the main idea will deal with "who.">

- ✓ If most of the sentences describe something, or, if none of the other answers seems right, then the main idea may deal with "what." ("What" main ideas can be very different kinds of things?)

Answer the questions according to the reading passage.

Psychologist George Spilich at Washington College in Chestertown, Maryland, decided to find out whether, as many smokers say, smoking helps them to think and concentrate. He put non-smokers, active smokers and smokers deprived of cigarettes through a series of tests. In the first test, each subject sat before a computer screen and pressed a key as soon as he or she recognized a target letter. In this simple test, smokers, deprived smokers and non-smokers performed equally well. The next test was more complex. Non-smokers were faster, but under the stimulation of nicotine, active smokers were faster than deprived smokers. In the third test of short-term memory, non-smokers made the fewest errors, but deprived smokers committed fewer errors than active smokers. In the fourth test, non-smokers were the best and deprived smokers bested those who had smoked a cigarette just before testing. As the tests became more complex, non-smokers performed better than smokers by wider and wider margins.

1. It is pointed out in the passage that the purpose of George Spilich's experiments is ----.
   A. to test whether smoking has a positive effect on the mental capacity of smokers
   B. to show how smoking damages people's mental capacity
   C. to prove that smoking affects people's regular performance
   D. to show that non-smokers are less productive at work than smokers
   E. to prove that nicotine helps people's short term memory
2. We understand from the passage that ----.
   A. active smokers in general performed better than deprived smokers
   B. active smokers responded more quickly than the other subjects in all tests
   C. the other subjects were not better than nonsmokers in the simplest test
   D. deprived smokers gave the slowest responses to the various tasks
   E. non-smokers committed more errors than deprived smokers in most of the tests
3. George Spilich's experiment was conducted in such a way as to ----.
   A. check the effectiveness of nicotine on nonsmokers
   B. put the subjects through increasingly complex tests
   C. finish the tests as quickly as possible
   D. force the subjects to recall the words they learned
   E. compel the subjects to respond as fast as possible

Answers: (A, C, B)