INSTITUE OF AERONAUTICAL ENGINEERING
(Autonomous)
MBA Department

PPTs on

Business Research Methods

II YEAR I SEMESTER

Unit - I

Introduction to business research

What is Research?

Research, a somewhat intimidating term for some, is simply the process of finding solutions to a problem after a thorough study and analysis of the situation factors.

Business Research

Business research can be described as a systematic and organized effort to investigate a specific problem encountered in the work setting, which needs a solution.

Definition of Business Research

We can define business research as an *organized, systematic, data-based, critical, objective, scientific inquiry or investigation into a specific problem,* undertaken with purpose of finding answers or solutions to it.

Some commonly researched areas in business

1. Employee behaviors such as performance, absenteeism, and turnover
2. Employee attitudes such as job satisfaction, loyalty, and organizational commitment
3. Supervisory performance, managerial leadership style, and performance appraisal systems.

Types of business research: applied and basic

1. **Applied research**

   Research done with the intention of applying the results of the findings to solve specific problems currently being experienced in an organization

1. **Basic research “ fundamental – pure”**

   Research done chiefly to make a contribution to existing knowledge

Managers and research

Managers with knowledge of research have an advantage over those without
Knowledgeable about research and research methods helps professional managers to:

1. Identify and effectively solve minor problems in the work setting
2. Know how to discriminate good from bad research
3. Appreciate and be constantly aware of the multiple influences and multiple effects of factors impinging on a situation
4. Take calculated risks in decision making, knowing full well the probabilities associated with the different possible outcomes.
5. Prevent possible vested interests from exercising their influence in a situation.
6. Related to hire researchers and consultants more effectively.
7. Combine experience with scientific knowledge while making decision.

The Manager and the consultant- researcher

Managers often need to engage a consultant to study some of the more complex, time consuming problems that they encounter

The Managers – researcher relationship

During their careers, it often becomes necessary for managers to deal with consultants, so while hiring researchers or consultants the manager should make sure that:

1. The roles and expectations of both parties are made explicit.
2. Related philosophies and value systems of organization are clearly stated and constraints, if any, are communicated.
3. A good rapport is established with the researchers, and between the researchers and the employees in the organization, enabling the full cooperation of the latter.

Internal consultants / researchers 1-2

Some organizations have their own consulting or research department, which might be called the management services department, the organization and methods department, R & D

Knowledge about research and managerial effectiveness

Managers are responsible for the final outcome by making the right decisions at work. This is greatly facilitated by research knowledge

Ethics and business research

Ethics in business research refers to a code of conduct or expected societal norm of behavior while conducting research.

The hallmarks of scientific research

1. Purposiveness

Started the research with a definite aim or purpose

2. Rigor

Rigor connotes carefulness, scrupulousness, and the degree of exactitude in research investigations

3. Testability

The manager or researcher develops certain hypotheses on how employee commitment can be enhanced, then these can be tested by applying certain statistical tests to the data collected for the purpose.

The hallmarks of scientific research 2-3

4. Replicability

The results of the tests of hypotheses should be supported again and yet again when the same type of research is repeated in other similar circumstances.

5. Precision and confidence

Design the research in a manner the ensures that our findings are as close to reality

Precision: reflects the degree of accuracy or exactitude of the results on the basis of the sample, to what really exists in the universe.

Confidence: refer to the probability that our estimations are correct, it is important that we can confidently claim that 95% of the time our results will be true and there is only a 5 % chance of our being wrong.

The hallmarks of scientific research 3-3

6. Objectivity

The conclusion drawn through the interpretation of the results of data analysis should be based on facts of the findings derived from actual data, and not on our own subjective or emotional values.

7. Generalizability

Refers to the scope of applicability of the research findings in one organizational setting to other settings

8. Parsimony

Simplicity in explaining the phenomena or problems that occur, and in generating solutions for the problem,
And it can be introduced with a good understanding of the problem and the important factors that influence it.

Some obstacles to conducting scientific research in the management area

In the management and behavioral areas, it is not always possible to conduct investigations that are 100 % scientific, in the sense that, unlike in the physical sciences, the results obtained will not be exact and error-free. This is primarily because of difficulties likely to be encountered in the measurement and collection of data in the subjective areas of feelings, emotions, attitudes, and perceptions.

deductive method

Scientific research pursues a step –by- step, logical, organized, and rigorous method to find a solution to a problem

The seven-step process in the hypothetico-deductive method

1. Identify a broad problem area

A drop in sales, frequent production interruptions,… and the like, could attract the attention of manager and catalyze the research project

2. Define the problem statement

Problem statement that stats the general objective of the research should be developed

3. Develop hypotheses

In this step variable are examined as to their contribution or influence in explaining why the problem occurs and how it can be solved.

4. Determine measures

Unless the variables in the theoretical framework are measured in some way, we will not be able to test our hypotheses.

The seven-step process in the hypothetico-deductive method

5. Data collection

Data with respect to each variable in the hypothesis need to be obtained.

6. Data analysis

In the data analysis step, the data gathered are statistically analyzed to see if the hypotheses that were generated have been supported

7. Interpretation of data

Now we must decide whether our hypotheses are supported or not by interpreting the meaning of the results of the data analysis.

Review of the hypothetco-deductive method

Deductive reasoning is a key element in the hypothetic—deductive methods.

- **Deductive reasoning:** start with a general theory and then apply this theory to a specific case.
- **Inductive reasoning:** works in the opposite direction it is a process where we observe specific phenomena and on this basis arrive at general conclusions.

Other types of research

Case studies and action research are sometimes used to study certain types of issues.

- **Case studies**

Involve in depth, contextual analyses of similar situations in other organizations.

Case study, as a problem solving technique, is not often undertaken in organizations

- **Action research**

Is sometimes undertaken by consultants who want to initiate change processes in organizations.

Thus, action research is a constantly evolving project with interplay among problem, solution, effects or consequences, and new solution.

Unit –II

THE DESIGN OF RESEARCH-RESEARCH METHODS

Research designs and methods

Research Design

1. Provides a framework for the collection and analysis of data.
2. Choice of research design reflects decisions about priorities given to the dimensions of the research process.

Research Method

1. Is simply a technique for collecting data.
2. Choice of research method reflects decisions about the type of instruments or techniques to be used.

Steps of research design

Research Plan

Picture

- What you intend to do
  - Specific Aims
- Why it is important
  - Background and Significance
- What has been done so far
  - Preliminary Studies
- How you are going to do it
  - Research Design and Methods

Instructions

1. Describe the research design procedures, and analyses to be used to accomplish the specific aims of the project.
2. Include how the data will be collected, analyzed, and interpreted as well as the data-sharing plan as appropriate.
3. Describe any new methodology and its advantage over existing methodologies.
4. Describe any novel concepts, approaches, tools, or technologies for the proposed studies.

Instructions

5. Discuss the potential difficulties and limitations of the proposed procedures and alternative approaches to achieve the aims.
6. provide a sequence or timetable for the project.

I'd love to add something to this discussion but I have no idea what we're talking about

Main Points That You Must consider

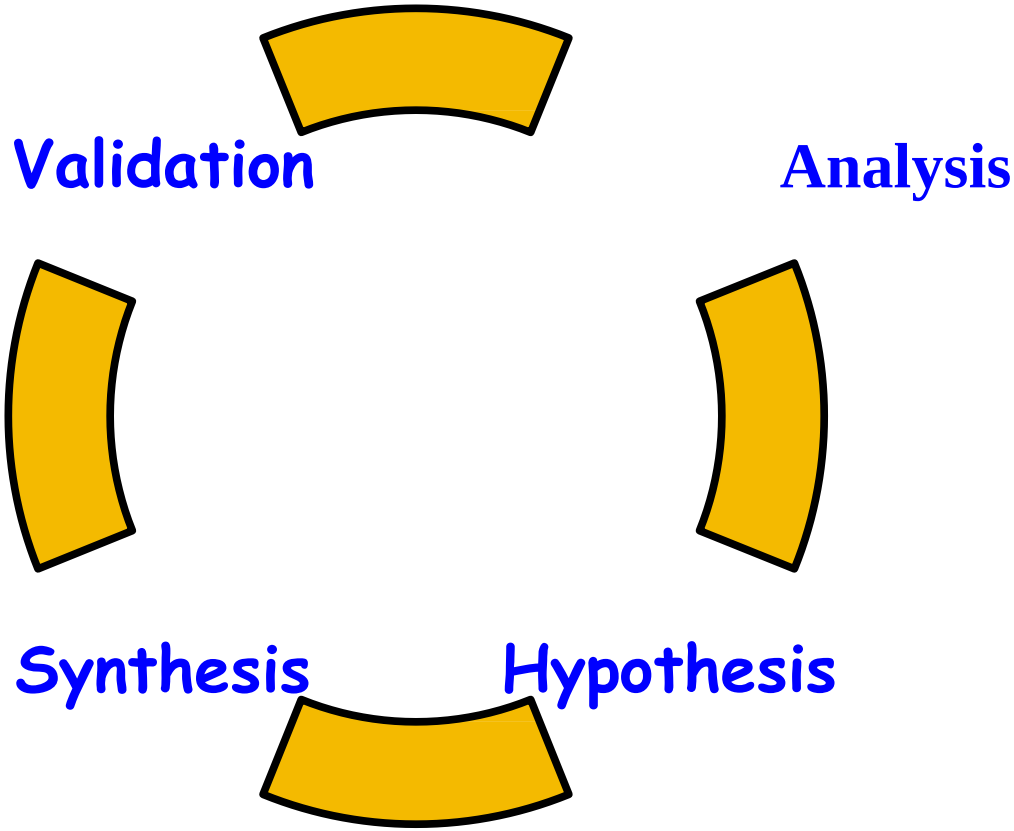
- Successful research design will accomplish specific Aims
- Methods are feasible and well developed
- Original Approach
- Analyzing Data correctly
- Availability of enough subjects/specimens that will be tested to lead to good conclusive results
- Limitations are of minor concern only
- Study could be accomplished in requested time

Organization

- No one organization fits all proposals
  - Try to organize in logical sequence of Specific Aims and corresponding experiments
- Start with an outline

D. RESEARCH DESIGN AND METHODS
D1. Overview
Flowchart
Brief description D2. Aim 1
Rationale Design

Scientific Method



Audience

- Write for reviewers and funding agency staff
- It is very important to remember that you need to be very clear and you need to emphasize health significance throughout

Organization

Consider giving overview at start of entire section

- Describe overall approach that will be used to achieve aims
- Consider using flowchart or table

For Each Specific Aim

- Reiteration of Research Question
  Directly reiterate why you are doing this Specific Aim
- Rationale
- Design, Approach
- Methods
- Anticipated Results, Interpretation
- Difficulties, Limitations, Alternative approaches

Or could include section on *Detailed Methods* common to more than one Specific Aim after description of Aims

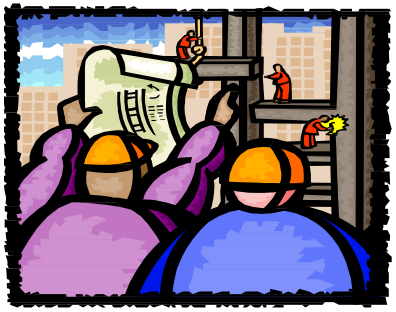
Experiments

- Is it really necessary?
- How about theoretical or simulation work?
- Experiment = verification
- Example: Find solution of two-dimensional plane that satisfy certain conditions

Experiment Laboratory

- Laboratory is where the experiment takes place
- Large room with test & measurement equipments, units under test, chemical & mechanical apparatus, computers

- Experiments can also take place:
  - In an office
  - Field
  - Manufacturing Plant



Sample

- Task unit consisting of objects, living plants, animals, humans that is the subject in the experiment

Methods

- Novel; Emphasize what is new about your methods or what is your new approach for using these methods
- Emphasize the advantages to using your proposed techniques over other approaches

Data Analysis

Describe approach for data analysis in detail

If using analytic statistics, specify

- Statistical parameters and tests
- Assumptions of tests
- Reference if statistical approach is not well known

Effect Size

- Ratio of expected difference to measure of variability

Based on

- Published work
- Preliminary studies
- Educated guess

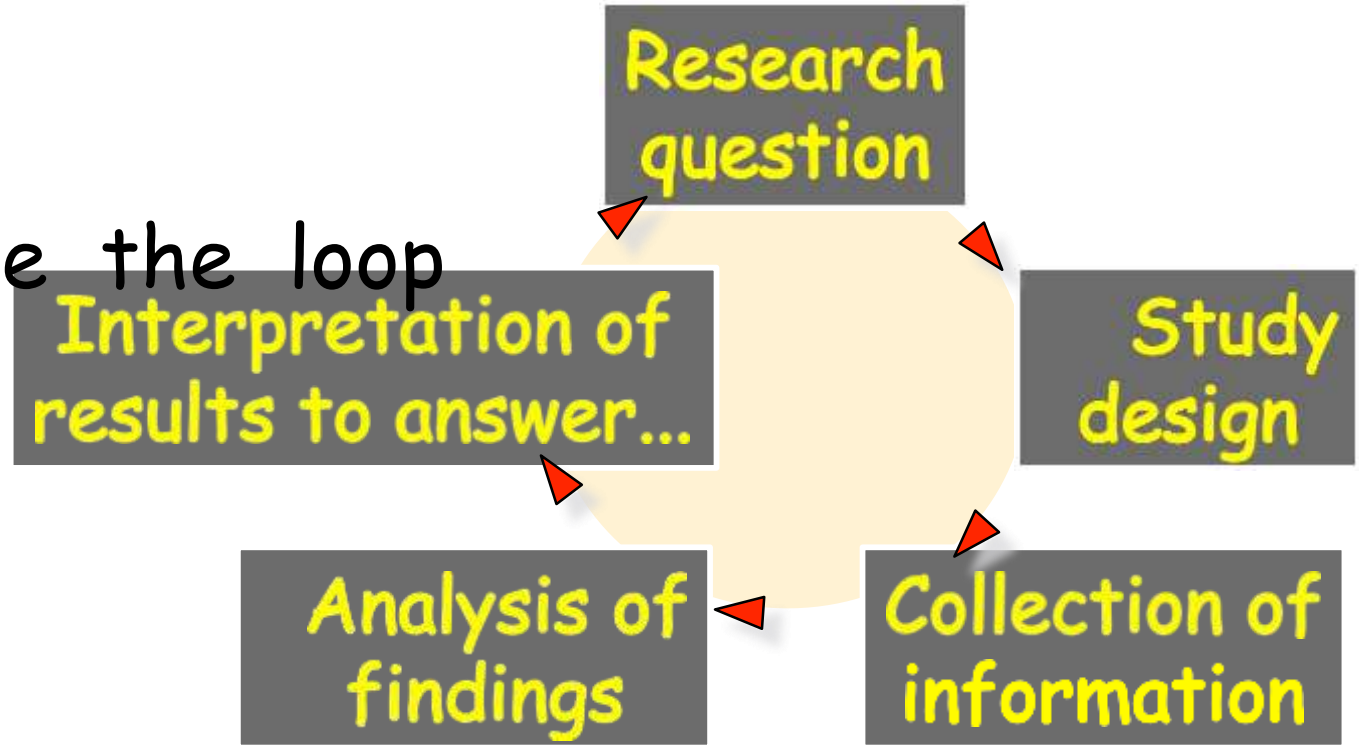
Number of Specimens

- Calculate number
  - Hand calculation
  - Computer programs, e.g., nQuery, PASS
- Make adjustments for loss of samples or animals tested

Expected Results and Interpretation

Remember to discuss expected results and interpretation of analysis

Close the loop



Limitations

- Include segment on potential difficulties & limitations at one of following locations
  - Under each Specific Aim
  - End of entire *Research Design and Methods* section
  - As they occur in methods
- Use limitations to point to future studies

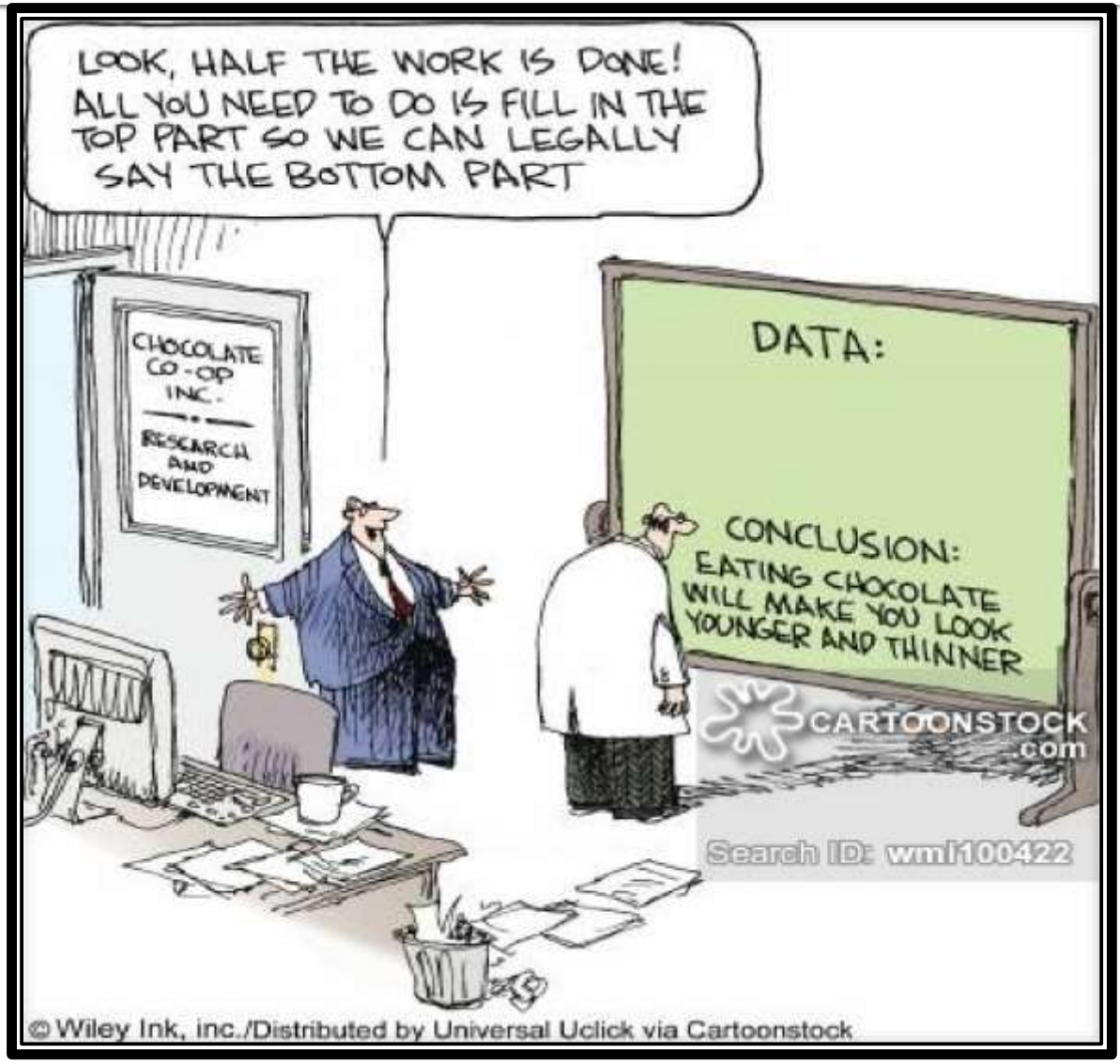
Timetable

Include timeline or timetable at end of *Research Design and Methods*

- Give enough detail for evaluation
- Make certain it is reasonable

Ending

- Close *Research Design and Methods* with overall statement about significance of studies
- Be enthusiastic



Tips on Clarity and Style

Make appearance conducive to easy reading on paper and on screen

- Neat
- White space
- 11-12 point font

- Proofread
- Make figures, tables, and legends legible

Length

Stick to page length recommendations

- Title
- Abstract (~200 words)
- Justification
- Specific Aims (1 page)
- Background and Significance (2-3 pages)
- Preliminary Studies (6-8 pages)
- Research Design and Methods

No more Than 25 pages

- Human Subjects
- Vertebrate Animals
- Literature Cited

Informative Writing

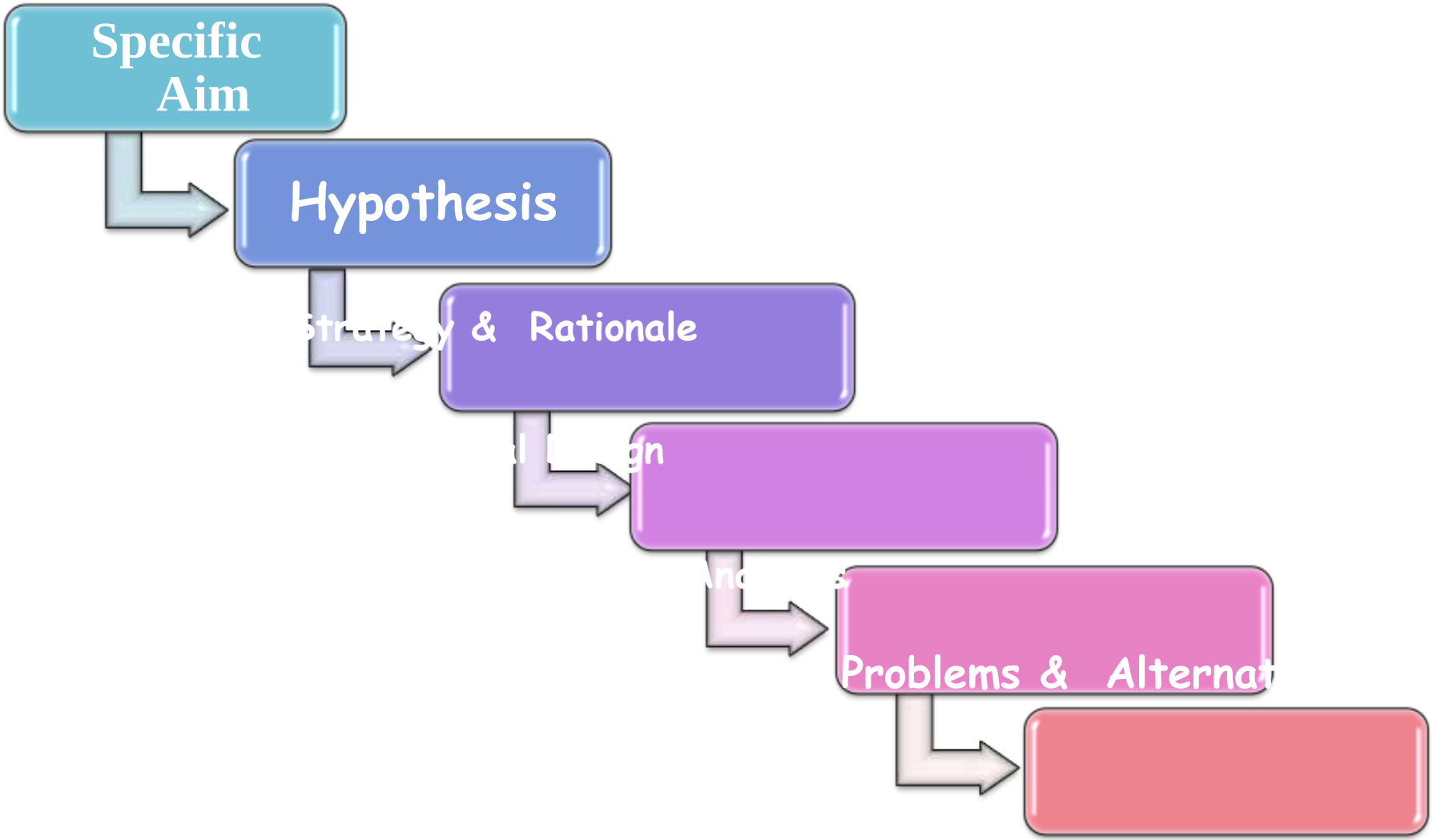
Target understanding readers

- Inform the reader
- Explain what is difficult to understand in a simple way
- Say only what needs to be said

Avoid

- Overly ambitious research plans
  - Unclear *Specific Aims*
- Complex, emerging techniques without establishing familiarity or including expert
- Unavailable tools or equipment
- Too little detail on data analysis
- Under-powered studies

Summary: Steps for Research Design & Methods



Summary: Successful Research Design and Methods

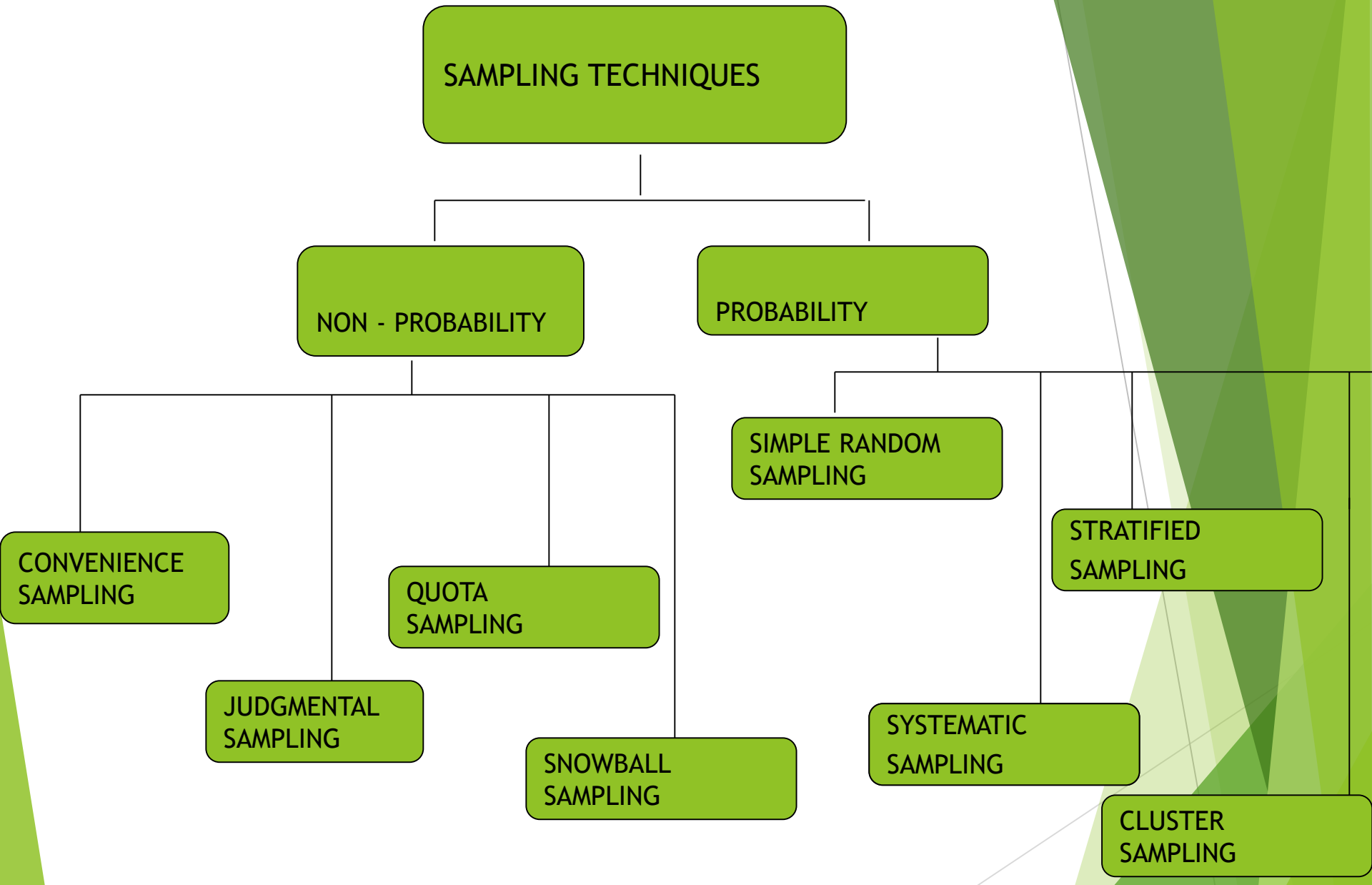
- Bright idea 
- Well developed and clearly described methods
- Appropriate data analysis
- Large enough sample size
- Plenty of time to do the work
- Only minor limitations
- Clear pathway to strong conclusions

UNIT-III

THE SOURCES AND COLLECTION OF DATA

SAMPLE

A SUBGROUP OF THE ELEMENT OF THE POPULATION SECLECTED FOR PARTICIPATION IN THE STUDY


SAMPLING TECHNIQUES
NON - PROBABILITY
PROBABILITY
CONVENIENCE SAMPLING
JUDGMENTAL SAMPLING
QUOTA SAMPLING
SNOWBALL SAMPLING
SIMPLE RANDOM SAMPLING
SYSTEMATIC SAMPLING
STRATIFIED SAMPLING
CLUSTER SAMPLING

SAMPLING DESIGN PROCESS

- **Define Target Population**
- **Determine Sampling Frame**
- **Select a Sampling Techniques**
- **Determine Sample Size**
- **Execute the Sampling Process**

QUESTIONNAIRE CONSTRUCTION AND DATA COLLECTION

QUESTIONNAIRE DESIGN PROCESS

- Specify the information needed
- Specify the type of interviewing method
- Determine the content of individual questions
- Design the questions to overcome the respondents inability & unwilling to answer
- Design on question structure
- Determine the question wording
- Arrange the question in proper order
- Identify the form & layout
- Reproduce the Questionnaire
- Eliminate bugs by pretesting

Determine the Content of Individual Questions

- **Is the Question necessary**
- **Are Several Questions needed instead of one**

Overcoming Inability to Answer

- **Is the Respondent Informed**
- **Can the Respondent Remember**

Overcoming Unwillingness to Answer

- **Effort Required of the Respondents**
- **Sensitive Issues**
- **Legitimate Purpose**

Choosing Question Structure

- **Unstructured Questions**
- **Structured Questions**

Choosing Question Wording

- **Define the Issue**
- **Use Ordinary Words**
- **Use Unambiguous Words**

SURVEY METHODS

- **Telephonic Interviewing**
- **Personal Interviewing**
- **Mail Interviewing**
- **Electronic Interviewing**

OBSERVATION METHODS

- Structured & Unstructured Observation
- Disguised & Undisguised Observation
- Natural & Contrived Observation

CROSS – SECTIONAL DESIGN

INCLUDES:

- SINGLE CROSS – SECTIONAL DESIGN
- MULTIPLE CROSS – SECTIONAL DESIGN

LONGITUDINAL DESIGN

FIXED SAMPLE OF POPULATION ELEMENTSMEASURED REPEATEDLY ON THE SAME VARIABLES

CAUSAL RESEARCH

- **OBJECTIVE: TO OBTAIN EVIDENCE REGARDING CAUSE - EFFECT RELATIONSHIP**

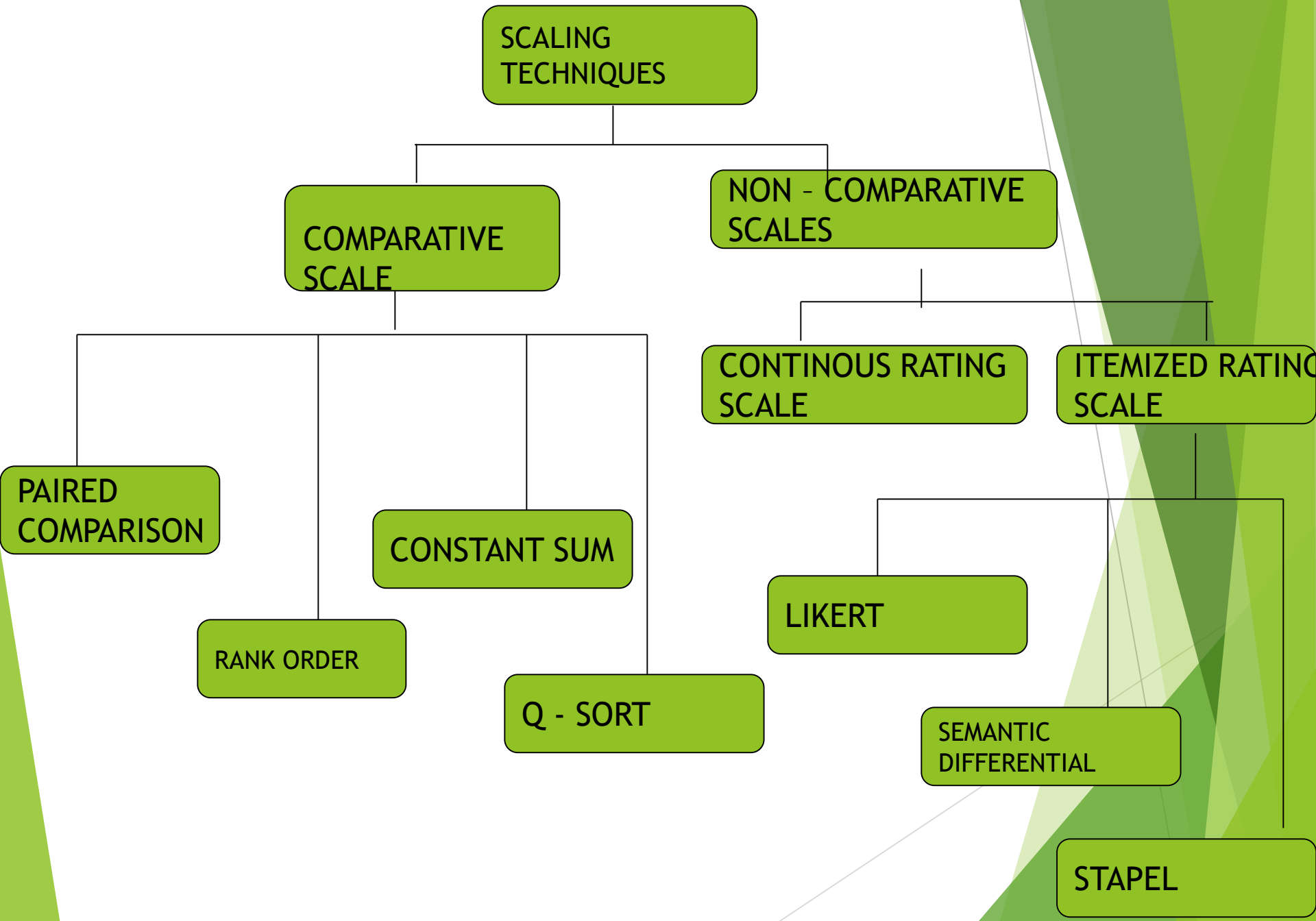
- **CHARACTERSTICS: PLANNED & STRUCTURED DESIGN**

PRIMARY SCALES OF MEASUREMENT

- **Nominal Scale**
- **Ordinal Scale**
- **Interval Scale**
- **Ratio Scale**

SCALING

THE GENERATION OF A CONTINUM UPON WHICH MEASURED OBJECTS ARE LOCATED


SCALING TECHNIQUES
COMPARATIVE SCALE
NON – COMPARATIVE SCALES
PAIRED COMPARISON
CONSTANT SUM
RANK ORDER
Q - SORT
CONTINOUS RATING SCALE
ITEMIZED RATING SCALE
LIKERT
SEMANTIC DIFFERENTIAL
STAPEL

Scales:

Is tool or mechanism by which individuals are distinguished as to how they differ from one to another on the variables of interest to our study

There are four basic types of scales:

- Nominal scale
- Ordinal scale
- Interval scale
- Ratio scale

1- Nominal scale :

Allows the researcher to assign subjects to certain categories or groups it categorize individuals or objects into mutually exclusive and collectively exhaustive groups, thus such scaling tells us nothing more about the two groups and gives some basic, categorical, gross information, personal data such gender or department in which one works ,

There are two types :

a) Dichotomous scale :

Used to … elicit a yes or no answer

ex. Do you own a car? Yes no

b) Category scale :

Used to … elicit a single response

ex. Where in London do you reside?

- east London - south London
- west London - north London
-outskirts

2- Ordinal scale:

In this scale the respondents might be asked to indicate their preferences by ranking the importance they attach to five distinct characteristics in a job that the researcher might be interested in studying

Job characteristic	Ranking of importance
The opportunity provided by the job to	-
Interact with people	-
Use a number of different skills	-
Complete a whole task from beginning to end	-
Serve others	-
Work independently	-

The ordinal scale helps researcher to determine the percentage of respondents who consider interaction with others as most important, those who consider using a number of different skills as most important and so on, such knowledge might help in designing jobs that are seen as most enriched by the majority of the employees.

Here we know the differences in the ranking of objects, persons, or events investigated but we don't know their magnitude

There are two types:

- **Fixed or constant scale:**

The respondents are here asked to distribute a given number of points across various items as shown in example:

Toilet soap

Fragrance	**40**
Color	10
Shape	10
size	20
Texture of lather	20
Total points	100

- **Graphic rating scale:**

Used to obtain responses regarding people's feelings with respect to some aspect or how they feel about their jobs

It's a graphical representation helps the respondents to indicate on this scale their answers to a particular question by placing a mark at the appropriate point on the line

How would you rate your supervisor?

10 excellent 5 adequate 1 very bad

3- Interval scale:

In nominal scale we can make qualitatively distinguish groups by categorizing them into mutually exclusive and collectively exhaustive and in ordinal scale allow us to rank order the preferences the interval scale **indicate whether once preference is the same extent**, or a greater extent than the second.

This can be done by changing the scale from the ranking type to make it appear as if there are several points on a scale that represent the extent or magnitude. **So it used when responses to various items that measure a variable can be tapped on a five points or more**

Strongly disagree 1 disagree 2 neither agree nor disagree 3 agree 4 strongly agree 5

Interacting with other	1	2	3	4	5
Using a number of different skills	1	2	3	4	5
Completing a task from beginning to end	1	2	3	4	5
Serving others	1	2	3	4	5
Working independently	1	2	3	4	5

There are five types:

1) Semantic differential scale: لفظي

It is used to assess respondent's attitudes toward a particular brand, advertisement, object, or individual.

Several bipolar attributes: respondents are asked to indicate their attitudes toward a particular individual, object

Several bipolar adjectives: used might employ such terms as good-bad, strong-weak, hot-cold

Responsive -----unresponsive

Beautiful --------ugly

Courageous ------- timid

2) Numerical scale :

Similar to the semantic scale but with numbers on five-point or seven-point scale are provided

Extremely pleased 7 6 5 4 3 2 1 extremely displeased

3) Itemized rating scale : يفصل المفردات أو يضع جدولا لها

It provides the flexibility to use as point in the scale as considered necessary (4,5,7,9 or whatever) and its possible to use different anchors e.g. very unimportant to very important and extremely low to extremely high)when a neutral point is provided it is a balanced rating scale, and when it is not it is an unbalanced rating scale.

1	2	3	4	5
Very unlikely	Unlikely	Neither unlikely nor likely	likely	Very likely
1	I will be changing my job within the next 12 months			
2	I will take on new assignments in the near future			
3	It is possible that I will be out of this organization within the next 12 months			

It is balanced rating scale with a neutral point

	Not at all interested 1	Somewhat interested 2	Moderately interested 3	Very much interested 4
How would you rate your interest in changing current organizational policies?	1	2	3	4

It is unbalanced rating scale which does not have a neutral point.

4) Likert scale:

Used in it the summated approach

My work is very interesting	1	2	3	4	5
I am not engrossed in my work all day	1	2	3	4	5
Life without my work would be dull	1	2	3	4	5

High score in items I and 3 reflects a favorable attitude to work this will lead to high total scores for respondents who have a favorable attitude toward work and low total scores for respondents who have an unfavorable attitude towards work.

5) Staple scale:

This scale measures both the direction and intensity of the attitude toward the items under study

Rate your supervisor abilities:

+3	+3	+3
+2	+2	+2
+1	+1	+1
Adopting modern technology	Product innovation	Interpersonal skills
-1	-1	-1
-2	-2	-2
-3	-3	-3

4- Ratio scale:

Usually used in organizational research when exact numbers on objective (as opposed to subjective) factors are called:

1. How many other organizations did you work for before joining this system?

2. Please indicate the number of children you in each of the following categories:

--- Below 3 years of age

--- Between 3 and 6

--- Over 6 years but under 12

--- 12 years and over

3. How many retail outlets do you operate?

The responses to the questions could range from 0 to any reasonable figure

Unit –IV

ANALYSIS AND PRESENTATION OF DATA

Analysis of data

- Is of two types
  - Qualitative analysis
  - Quantitative analysis

Qualitative analysis

- Process of interpreting data collected during qualitative research
- Analysis depends on its type

Quantitative analysis

- Presenting and interpreting numerical data
- Includes descriptive analysis and inferential statistics
- Descriptive statistics include measures of central tendency and measures of variability
- Inferential statistics is to test hypotheses set and relating findings to the sample or population

Descriptive statistics

- Quantitative research gives masses of data, in order to give an idea of typical values in the data and their variation
- Two main descriptive statistics are
  - Measures of central tendency
  - Measures of dispersion

Measures of central tendency

“A measure of central tendency is a typical value around which other figures congregate” – Simpson and Kafka

- Types
  - Arithmetic mean
  - Geometric mean — mathematical averages
  - Harmonic mean — calculated averages
  - Median
  - Mode

Measures of dispersion

“Dispersion is the measure of the variation of the items” – A.L.Bowley

- Types
  - **Absolute measures**
    - Range
    - Quartile deviation
    - Mean deviation
    - Standard deviation
  - **Relative measures**
    - Coefficient of range
    - Coefficient of quartile deviation
    - Coefficient of mean deviation
    - Coefficient of standard deviation
    - Coefficient of range

Inferential statistics

- It is impossible to measure every item in the population
- There is an uncertainty as to how well the sample results reflects the population
- Two aspects of statistical inference are
  - Estimation
  - Hypothesis testing using statistical tests

Graphical presentation

Graphical presentation of data

- The statistical data represented in graph

Graphs

- Used to explain the relationship between different variables
- Geometrical image of data
- Drawn on graph paper
- Has two intersecting lines called axis-horizontal line called X-axis and vertical axis-Y axis

- A suitable scale is given
- Independent values are in X-axis and dependent values on Y-axis
- A title is given
- The values corresponding to X and Y axis are plotted
- The points are joined with straight or curved lines.

Graphs

Graphs of time series

- Graph of one variable
- Graph of two or more variable
- Range chart
- Band graph

Graphs of frequency distribution

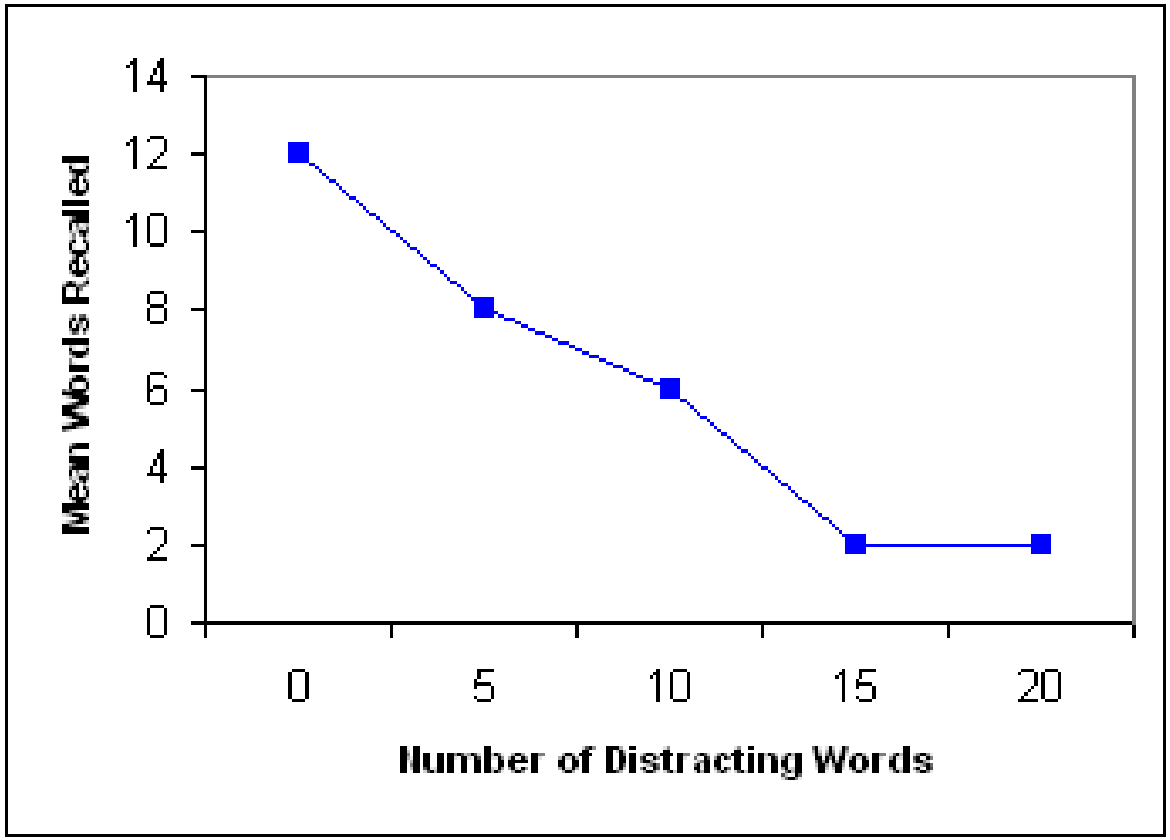
- Histogram
- Frequency polygon
- Frequency curve
- O gives

Graphs of time series

- In a line graph, the data are represented in a straight line
- 4 types
  - Graph of one variable
  - Graph of two or more variable
  - Range chart
  - Band graph

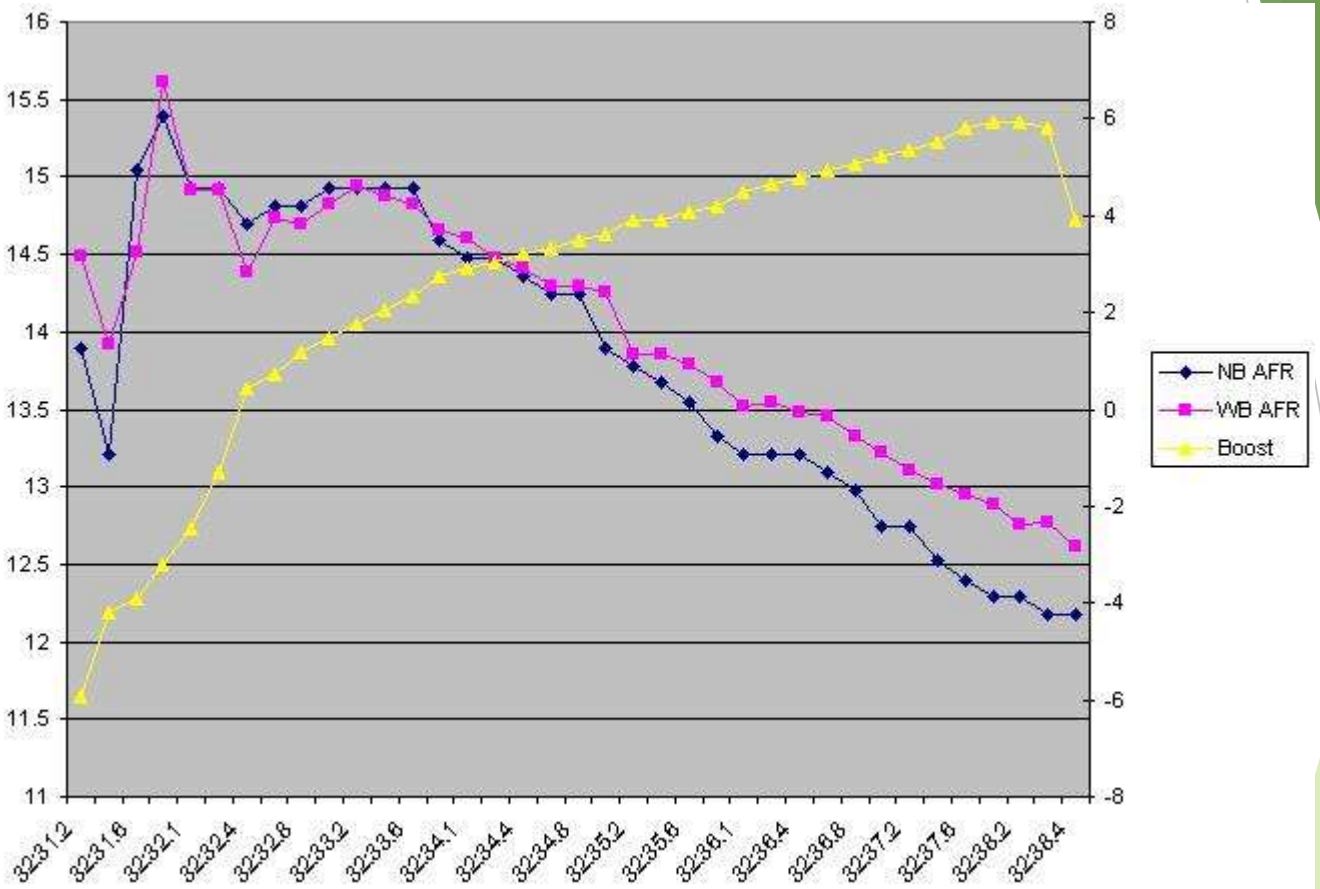
Graph of one variable

- One variable is represented
- Plotting time along X-axis and the value of variable on Y-axis, on a suitable scale
- The points are joined by straight line


Mean Words Recalled
14
12
10
8
6
4
2
0
0
5
10
15
20
Number of Distracting Words

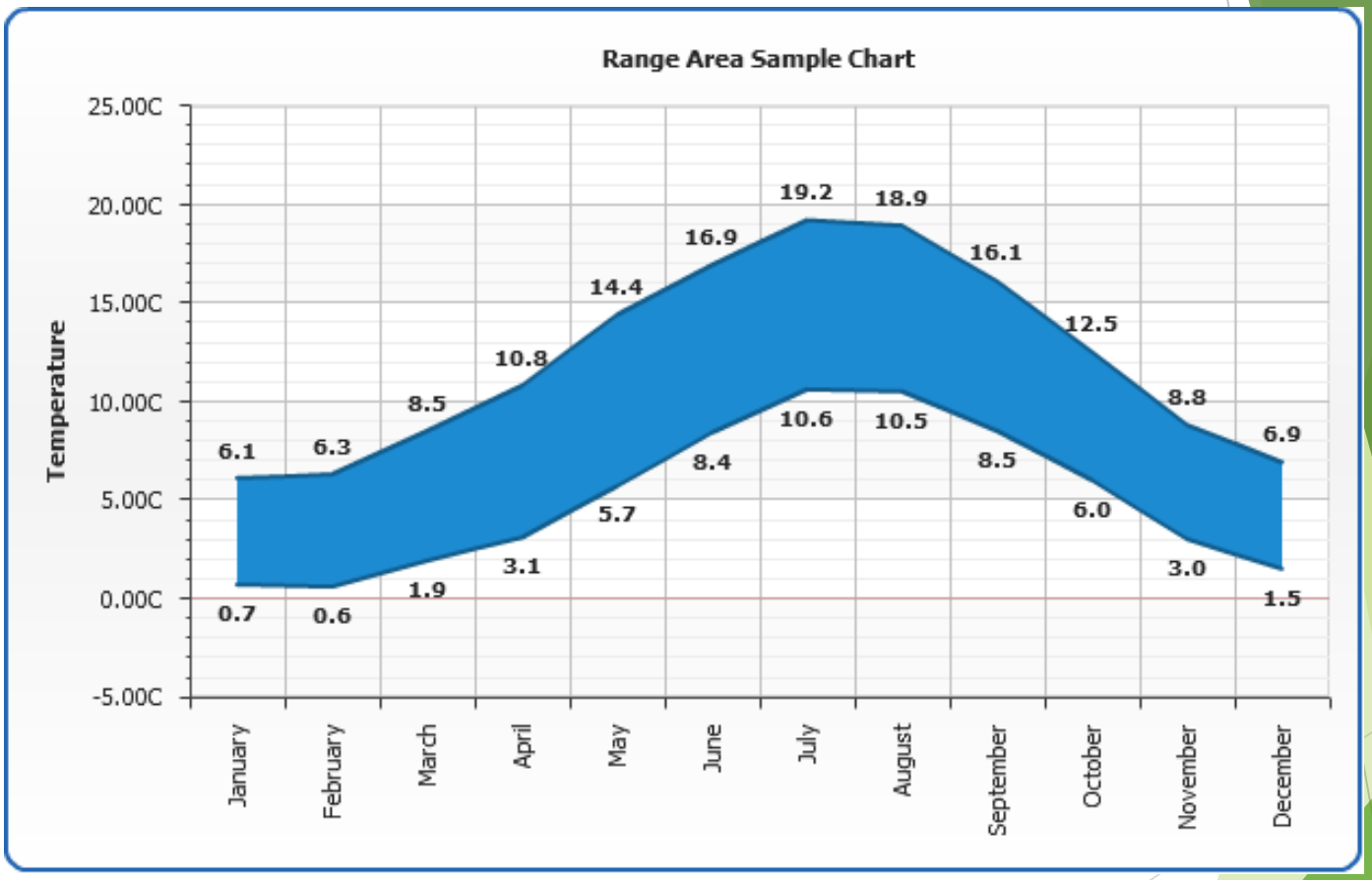
Graph of two or more variable

- Two or more variable are taken
- Comparison is easier in this type of graph


16
15.5
15
14.5
14
13.5
13
12.5
12
11.5
11
8
6
4
2
0
-2
-4
-6
-8
32312
32316
32321
32324
32328
32332
32336
32341
32344
32348
32352
32356
32361
32364
32368
32372
32376
32382
32384
NB AFR
WB AFR
Boost

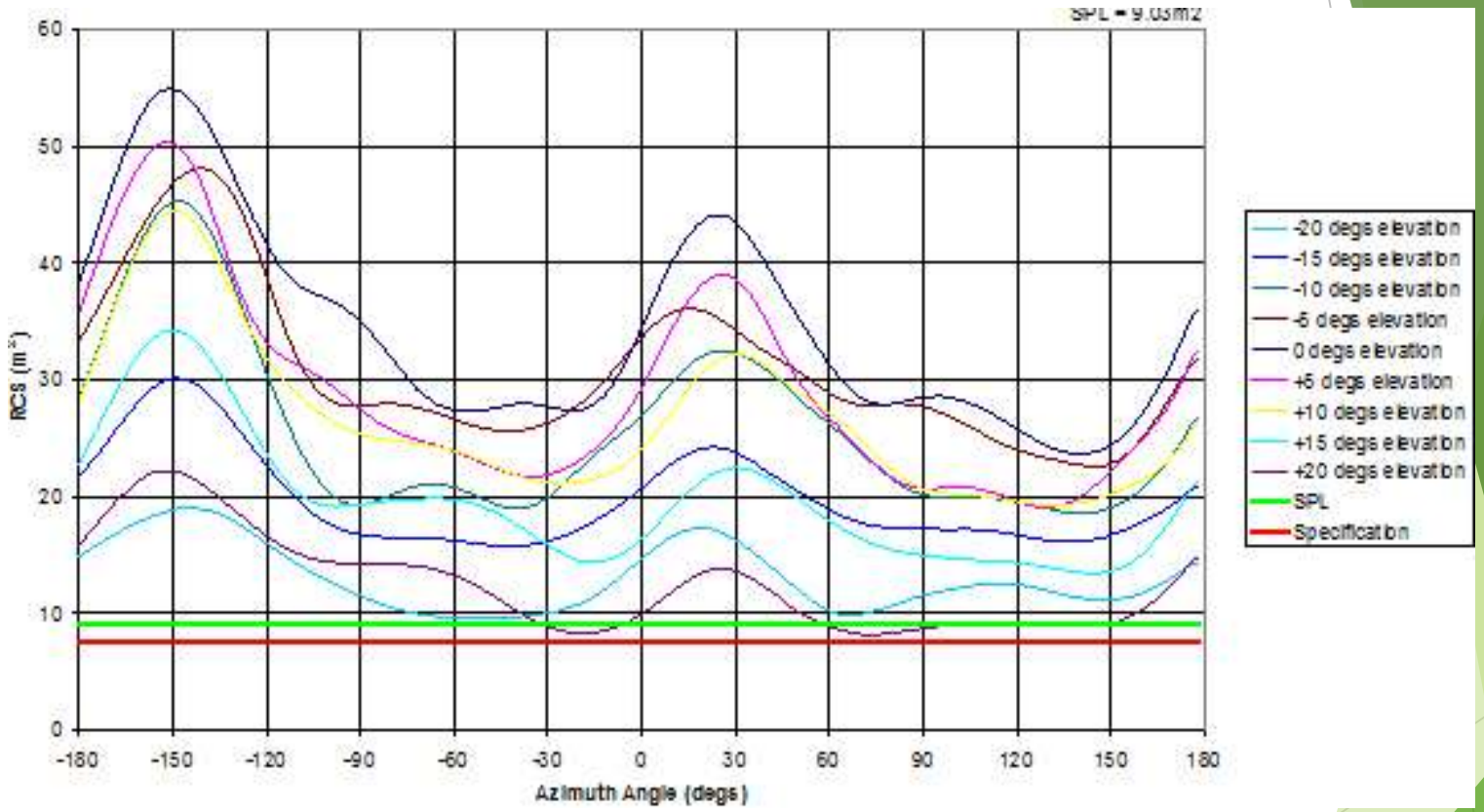
Range chart

- Used to exhibit the minimum and maximum values of a variable
- Eg., range of variation in temperature on different days


Range Area Sample Chart
Temperature
25.00C
20.00C
15.00C
10.00C
5.00C
0.00C
-5.00C
January
February
March
April
May
June
July
August
September
October
November
December
6.1
6.3
8.5
10.8
14.4
16.9
19.2
18.9
16.1
12.5
8.8
6.9
0.7
0.6
1.9
3.1
5.7
8.4
10.6
10.5
8.5
6.0
3.0
1.5

Band graph

- The various component parts are represented
- Also called component part line chart or layer chart
- The various component parts are plotted and gaps between then are shaded with different colours


SPL = 9.03m2
60
50
40
30
20
10
0
RCS (m²)
-180
-150
-120
-90
-60
-30
0
30
60
90
120
150
180
Azimuth Angle (degs)
-20 degs elevation
-15 degs elevation
-10 degs elevation
-5 degs elevation
0 degs elevation
+5 degs elevation
+10 degs elevation
+15 degs elevation
+20 degs elevation
SPL
Specification

Graphs of frequency distribution

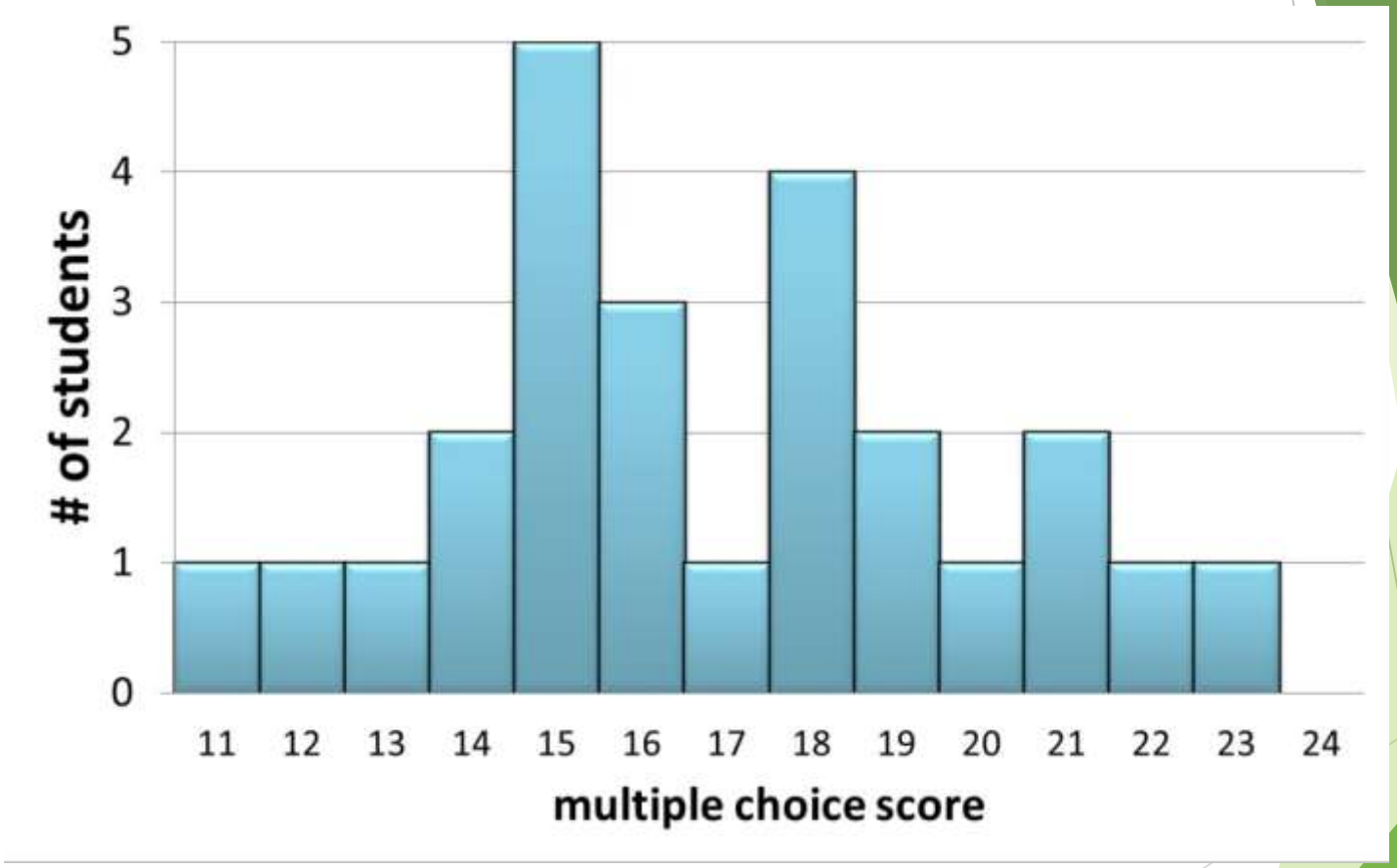
- Frequency distribution is represented graphically
- 4 types
  - Histogram
  - Frequency polygon
  - Frequency curve
  - O give

Histogram

- Graph with frequency as vertical rectangles
- It is an area diagram
- X-axis with class intervals
- Y-axis with frequencies
- Vertical rectangles are to the height of the frequencies
- Width equal to the range of the class
- It is two dimensional

Uses of histogram

- Gives clear of entire data
- Simplifies complex data
- Attractive and impressive
- Facilitates comparison
- Gives pattern distribution of variables in the population

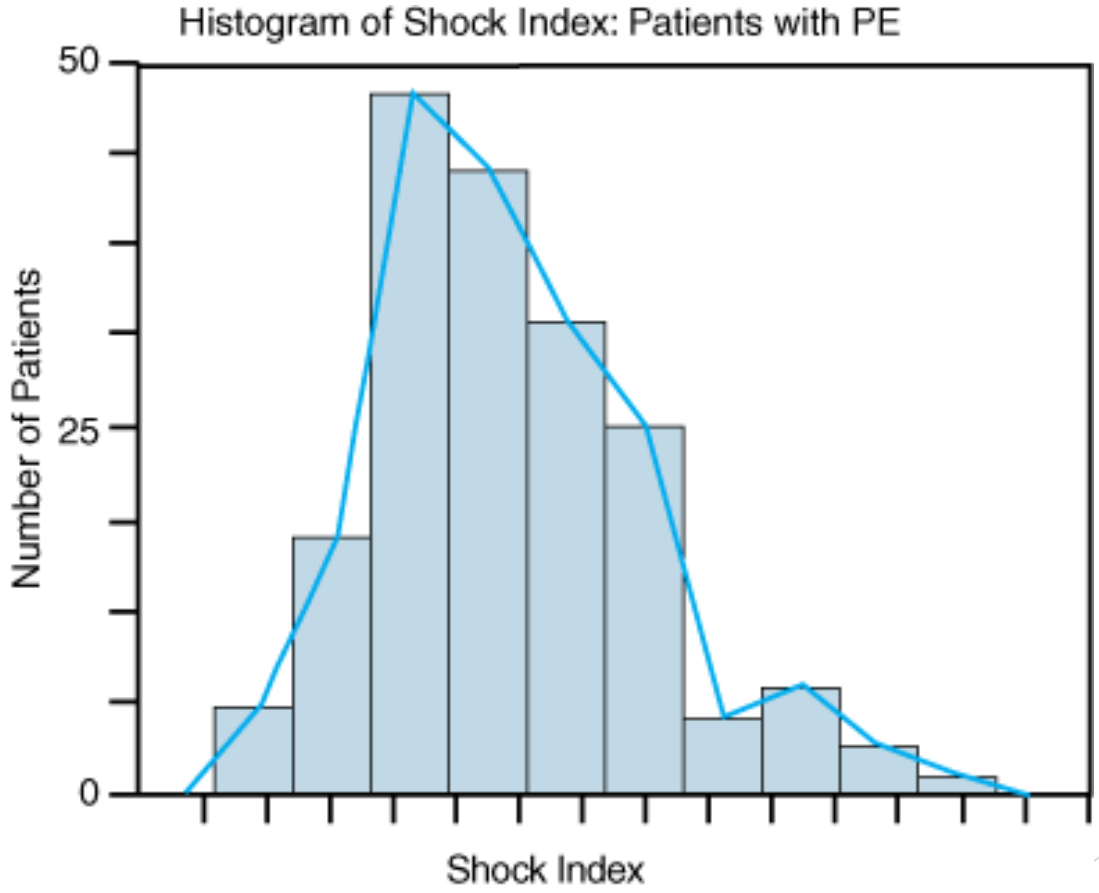

5
4
3
2
1
0
# of students
11
12
13
14
15
16
17
18
19
20
21
22
23
24
multiple choice score

Frequency polygon

- Curve consisting of straight line
- Lines drawn by connecting points located above the mid points of the intervals of heights corresponding to frequencies
- Class intervals on X-axis and frequencies on Y-axis
- Midpoint of various class intervals are taken
- The frequencies corresponding to each midpoint and all poin joined

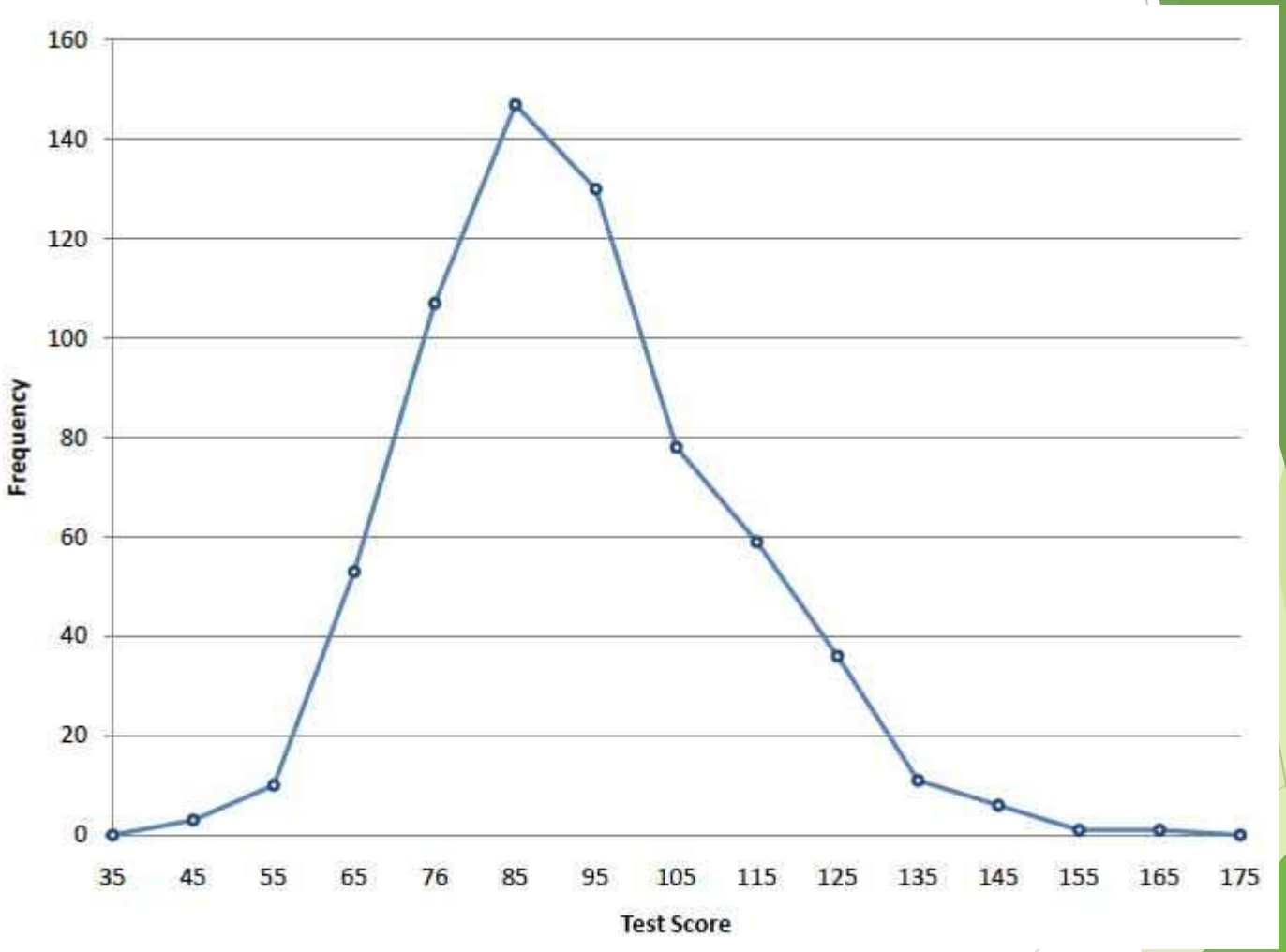
Uses of frequency polygon

- Used to locate mode of frequency distribution easily
- It facilitates comparison of two or more frequency distribution on the same graph


Histogram of Shock Index: Patients with PE
50
25
0
Number of Patients
Shock Index

Frequency curve

- Drawn through various points of the polygon
- Also called smoothed curve
- Smoothening of frequency polygon gives frequency curve
- Should begin and end at OX axis

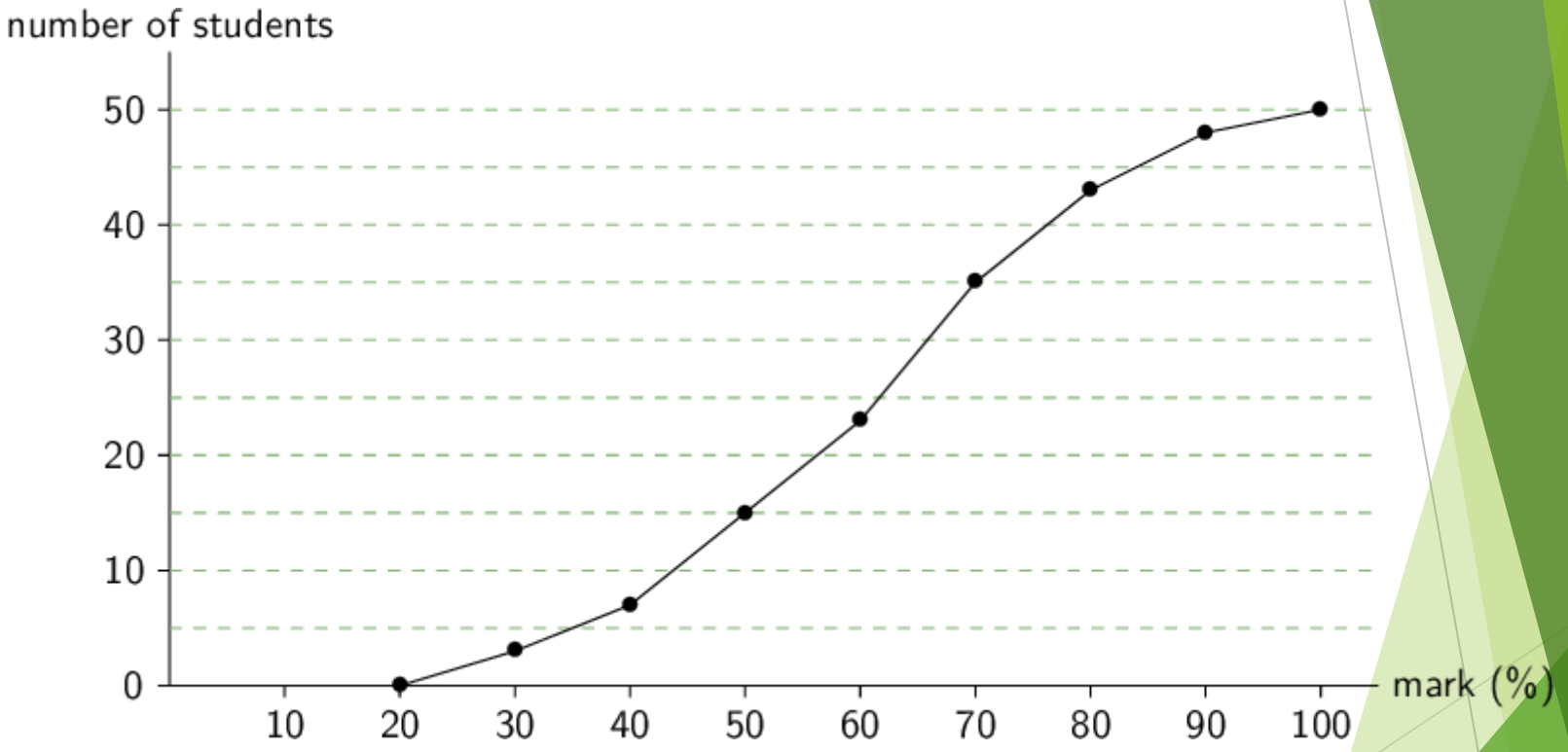

160
140
120
100
80
60
40
20
0
Frequency
35
45
55
65
76
85
95
105
115
125
135
145
155
165
175
Test Score

O gives

- They are cumulative frequency curve
- When frequencies re added called cumulative frequencies
- Two methods
  - ‘less than’ method
  - ‘more than’ method

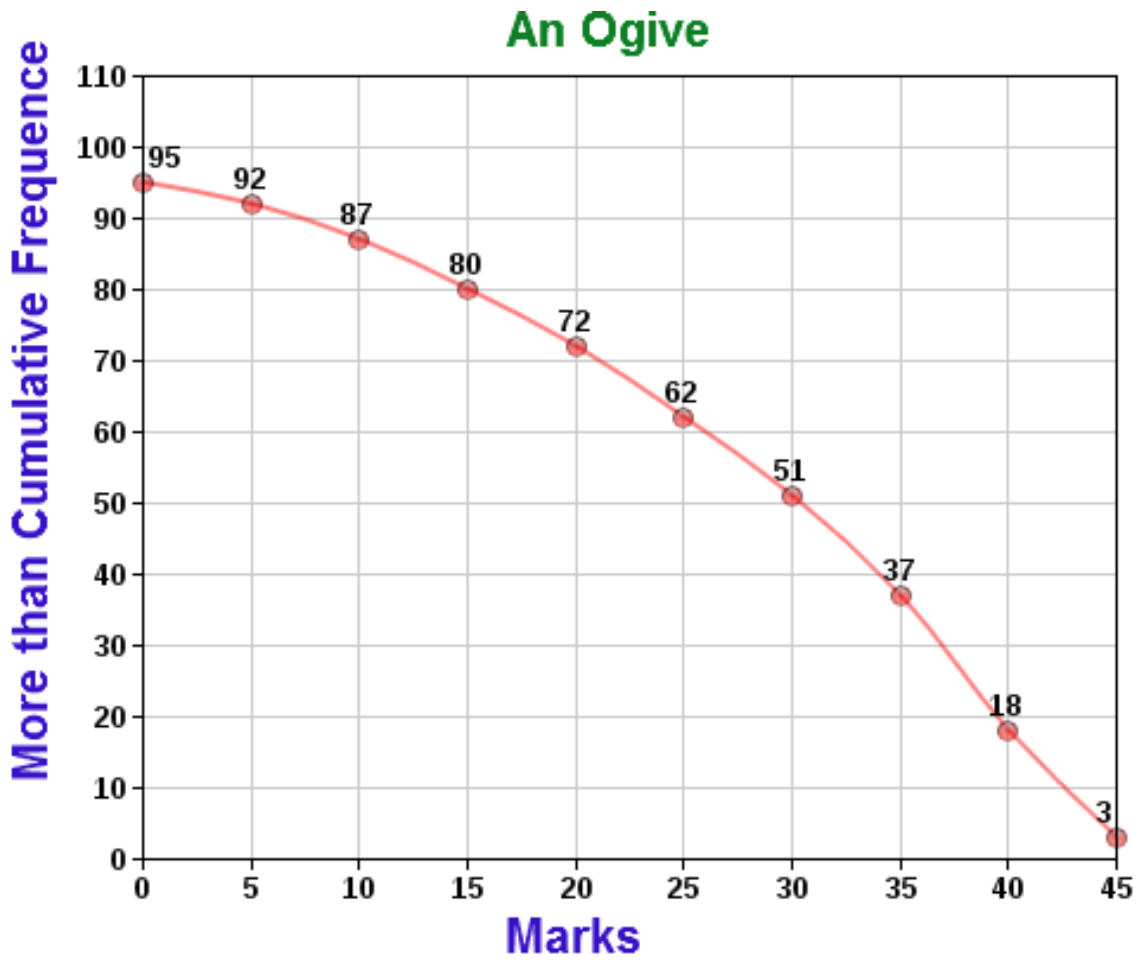
‘less than’ method

- we have to plot the less than cumulative frequencies against upper class boundaries
- Joining the points by a smooth free hand gives ‘less than’ O gives
- Sloping from left to right


number of students
50
40
30
20
10
0
10
20
30
40
50
60
70
80
90
100
mark (%)

‘more than’ method

- we have to plot the more than cumulative frequencies against upper class boundaries
- Joining the points by a smooth free hand gives ‘less than’ O gives
- Sloping from right to left


An Ogive
More than Cumulative Frequence
Marks
110
100
90
80
70
60
50
40
30
20
10
0
0
5
10
15
20
25
30
35
40
45
95
92
87
80
72
62
51
37
18
3

Unit-V

Presentation of Data

Collection of data

- Collect data carefully and thoroughly.
- Units of measurements should be clearly defined.
- Record should be correct , complete, clear, sufficiently concise and arranged in a manner that is easy to comprehend.
- Collected data should be
  - **Accurate** (i.e. Measures true value of what is under study)
  - **Valid**(i.e. Measures only what is supposed to measure)
  - **Precise**(i.e. Gives adequate details of the measurement)
  - **Reliable**(i.e. Should be dependable)

Sources for collection of data

- Census: The First regular census in India was taken in 1881, taken every 10 years. Defined as “The total process of collecting, compiling and publishing demographic, economic and social data pertaining at a specific time or times, to all persons in a country or delimited territory.”.
- Registration of vital events: Civil registration System.

  In 1873,GOI passed the Births, Deaths and Marriages Registration Act, but the Act provided only for voluntary registration.

  However the registration system in India tended to be very unreliable, the data being grossly deficient in regard to accuracy, timeliness, completeness and coverage.

Continued..

The Central Births and Deaths Registration Act, was passed by Govt Of India in 1969, but it came into force on 1st April 1970.The acts provides the compulsory registration of births and deaths throughout the country, and compilation of vital statistics in the states to so as to ensure uniformity and comparability of data.

Time limit: For events of births-21 days, and for events of deaths-21 days. In case of default fine up to Rs 50 can be imposed.

- Sample Registration System(SRS): Dual record system, consisting of continuous enumeration of births and deaths by an enumerator and independent survey every 6 months by an investigator-supervisor.

- Notification of diseases: Valuable source of morbidity data such as incidence, prevalence and distribution of certain specified diseases which are notifiable. Internationally notifiable diseases: Cholera, Plague and Yellow fever. A few others- Louse-borne typhus, Relapsing fever, Polio, Influenza, Malaria,

  Rabies and Salmonellosis are subject to international surveillance.

- Hospital Records: Primary and basic source of information about disease prevalent in the community . Serious limitation of this data is that it represents only those individuals who seek medical care and we do not know denominator due to lack of precise boundaries of catchment area of hospital.

- Epidemiological Surveillance: Special surveillance activities are conducted for diseases like Malaria, Leprosy, TB, Filariasis, AIDS etc.
- Surveys: Population surveys supplement routinely collected statistics . Methods used in data collection in surveys include health interview, health examination, study of health records, mailed questionnaire survey.
- Research Findings: Findings of various research or investigations are helpful for planning and implementation of health activities in general.

Presentation of data

- Principles of presentation of data:

1. Data should be arranged in such a way that it will arouse interest in reader.
2. The data should be made sufficiently concise without losing important details.
3. The data should presented in simple form to enable the reader to form quick impressions and to draw some conclusion, directly or indirectly.
4. Should facilitate further statistical analysis .
5. It should define the problem and suggest its solution.

Methods of presentation of data

The first step in statistical analysis is to present data in an easy way to be understood.

The two basic ways for data presentation are

- Tabulation
- Charts and diagram

Rules and guidelines for tabular presentation

1. Table must be numbered
2. Brief and self explanatory title must be given to each table.
3. The heading of columns and rows must be clear, sufficient, concise and fully defined.
4. The data must be presented according to size of importance, chronologically, alphabetically or geographically
5. If data includes rate or proportion, mention the denominator.
6. Table should not be too large.
7. Figures needing comparison should be placed as close as possible.

Continued..

8. The classes should be fully defined, should not lead to any ambiguity.
9. The classes should be exhaustive i.e. should include all the given values.
10. The classes should be mutually exclusive and non overlapping.
11. The classes should be of equal width or class interval should be same
12. Open ended classes should be avoided as far as possible.
13. The number of classes should be neither too large nor too small.Can be 10-20 classes.
14. Formula for number of classes(K):

    $K=1+3.322 \log_{10} N$, where N is total frequency

Tabulation

- Can be Simple or Complex depending upon the number of measurements of single set or multiple sets of items.
- Simple table :

Title: Numbers of cases of various diseases in Nair hospital in 2009

Disease	Cases
Malaria	1100
Acute GE	248
Leptospirosis	60
Dengue	100
Total	1308

Frequency distribution table with qualitative data:

- Title: Cases of malaria in adults and children in the months of June and July 2010 in Nair Hospital.

	Jun-10		Jul-10		
Type of malaria	Adult	Child	Adult	Child	Total
P.Vivax	54	9	136	23	222
P.Falciparum	11	0	80	13	104
Mixed malaria	11	4	36	12	63
Total	76	13	225	43	389

Frequency distribution table with quantitative data:

- Fasting blood glucose level in diabetics at the time of diagnosis

Fasting glucose level	No of diabetics		
	Male	Female	Total
120-129	8	4	12
130-139	4	4	8
140-149	6	4	10
150-159	5	5	10
160-169	9	6	15
170-179	9	9	18
180-189	3	2	5
	44	34	78

Chart and diagram

Graphic presentations used to illustrate and clarify information. Tables are essential in presentation of scientific data and diagrams are complementary to summarize these tables in an easy, attractive and simple way.

The diagram should be:

- Simple
- Easy to understand
- Save a lot of words
- Self explanatory
- Has a clear title indicating its content
- Fully labeled
- The y axis (vertical) is usually used for frequency

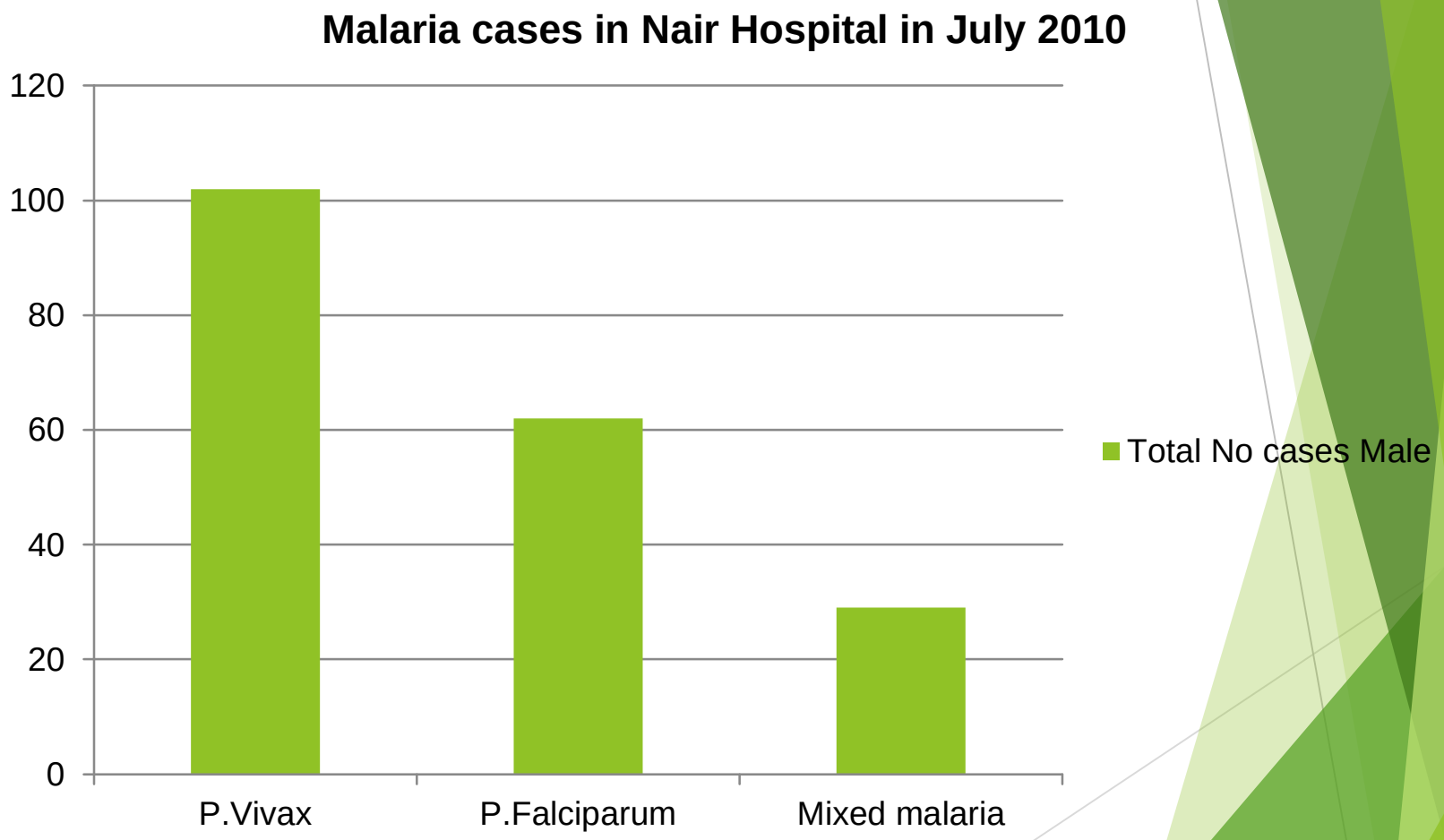
Various charts and diagrams

- Bar Diagram
- Histogram
- Frequency polygon
- Cumulative frequency curve
- Scatter diagram
- Line diagram
- Pie diagram

Bar diagram

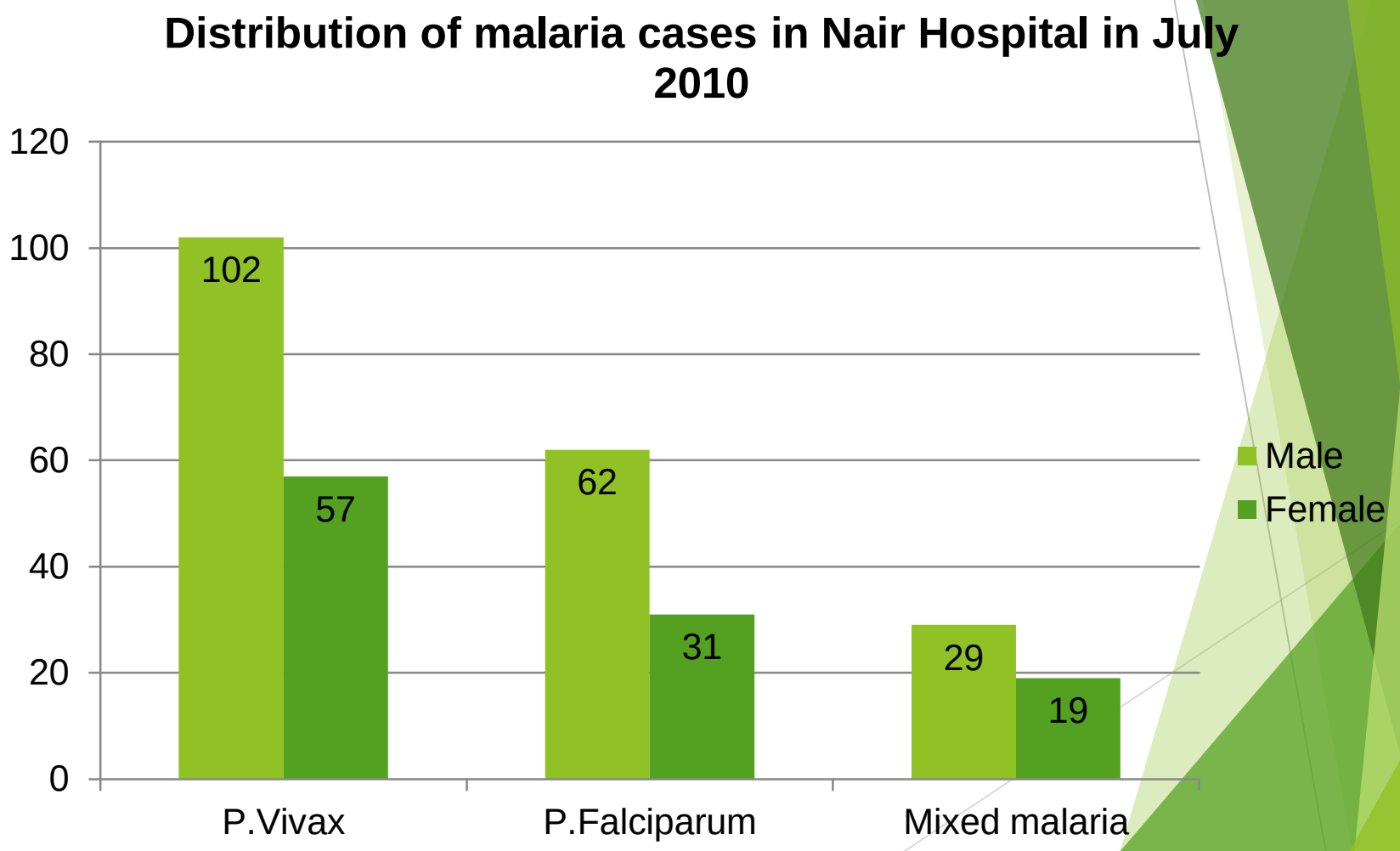
- Widely used, easy to prepare tool for comparing categories of mutually exclusive discrete data.
- Different categories are indicated on one axis and frequency of data in each category on another axis.
- Length of the bar indicate the magnitude of the frequency of the character to be compared.
- Spacing between the various bar should be equal to half of the width of the bar.
- 3 types of bar diagram:
    - Simple
    - Multiple or compound
    - Component or proportional

Simple bar diagram:



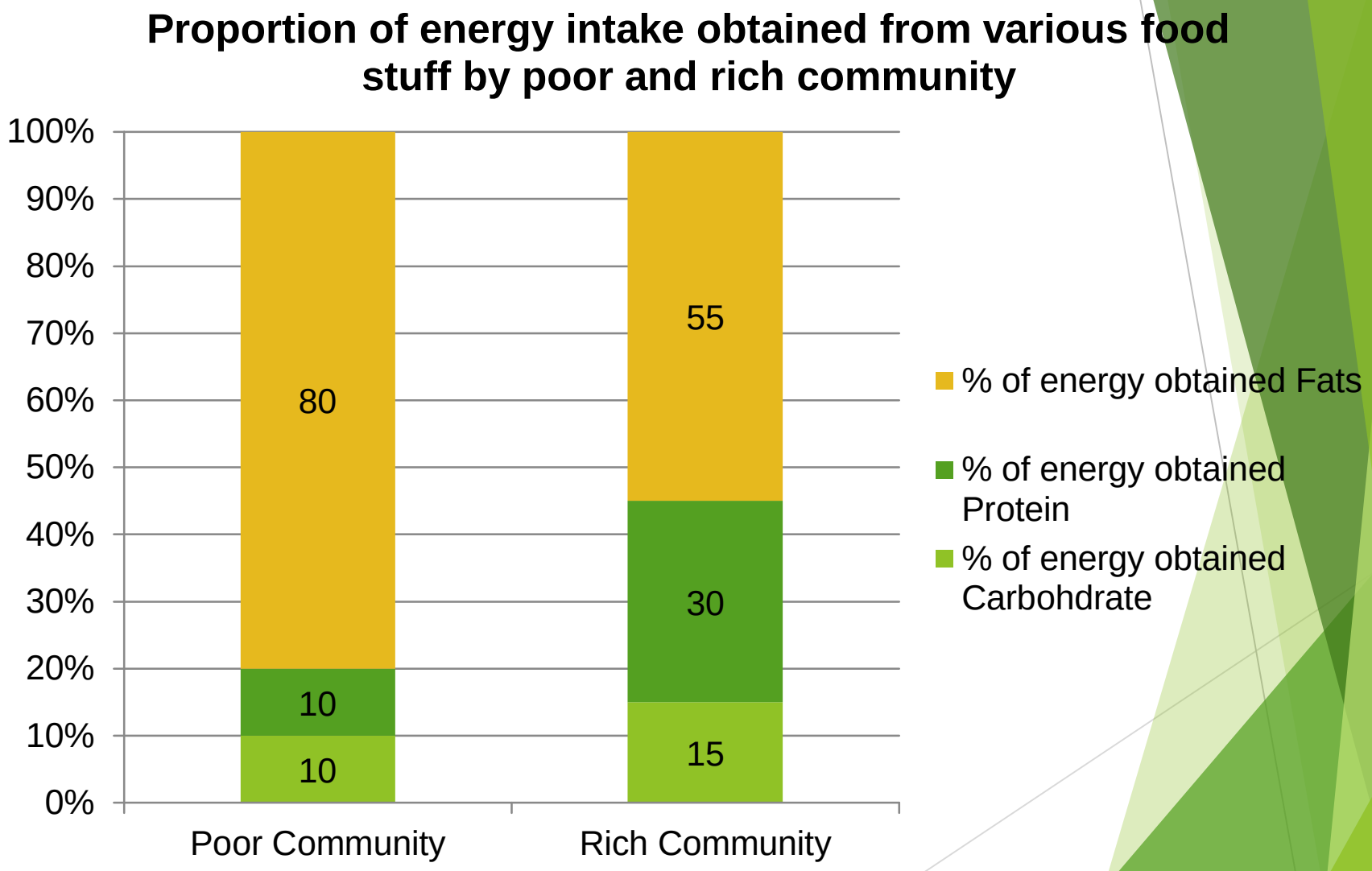
- **Multiple bar chart:** Each observation has more than one value, represented by a group of bars. Percentage of males and females in different countries, percentage of deaths from heart diseases in old and young age, mode of delivery (cesarean or vaginal) in different female age groups.

Multiple or Compound diagram



- Component bar chart : subdivision of a single bar to indicate the composition of the total divided into sections according to their relative proportion.
- For example two communities are compared in their proportion of energy obtained from various food stuff, each bar represents energy intake by one community, the height of the bar is 100, it is divided horizontally into 3 components (Protein, Fat and carbohydrate) of diet, each component is represented by different color or shape.

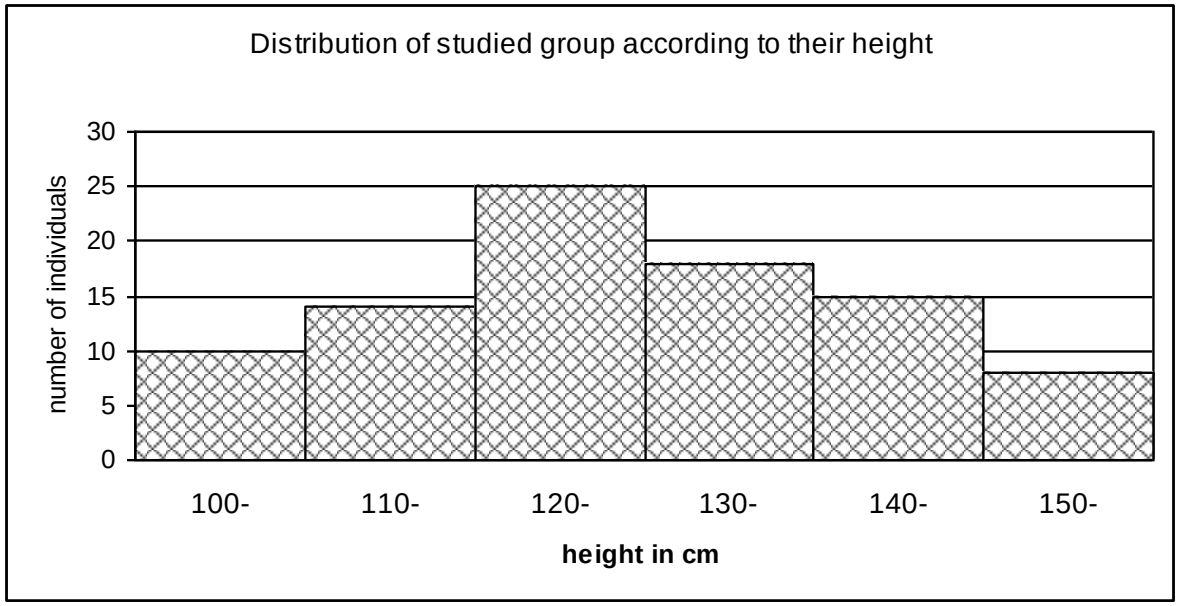
Component or proportional bar diagram



Histogram:

- It is very similar to the bar chart with the difference that the rectangles or bars are adherent (without gaps).
- It is used for presenting class frequency table (continuous data).
- Each bar represents a class and its height represents the frequency (number of cases), its width represent the class interval.

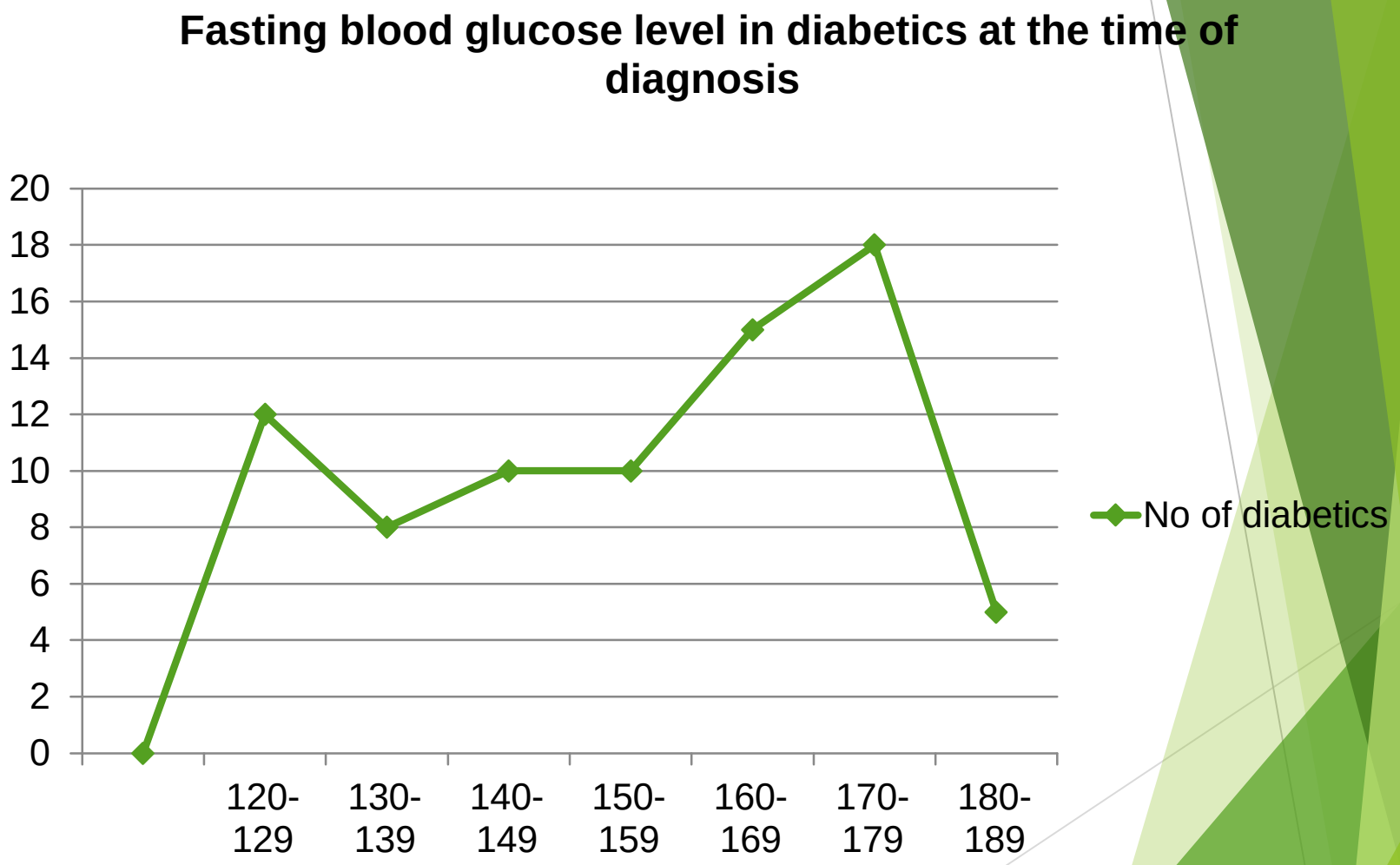
Histogram


Distribution of studied group according to their height
number of individuals
30
25
20
15
10
5
0
100-
110-
120-
130-
140-
150-
height in cm

Frequency Polygon

- Derived from a histogram by connecting the mid points of the tops of the rectangles in the histogram.
- The line connecting the centers of histogram rectangles is called frequency polygon.
- We can draw polygon without rectangles so we will get simpler form of line graph.
- A special type of frequency polygon is the Normal Distribution Curve.

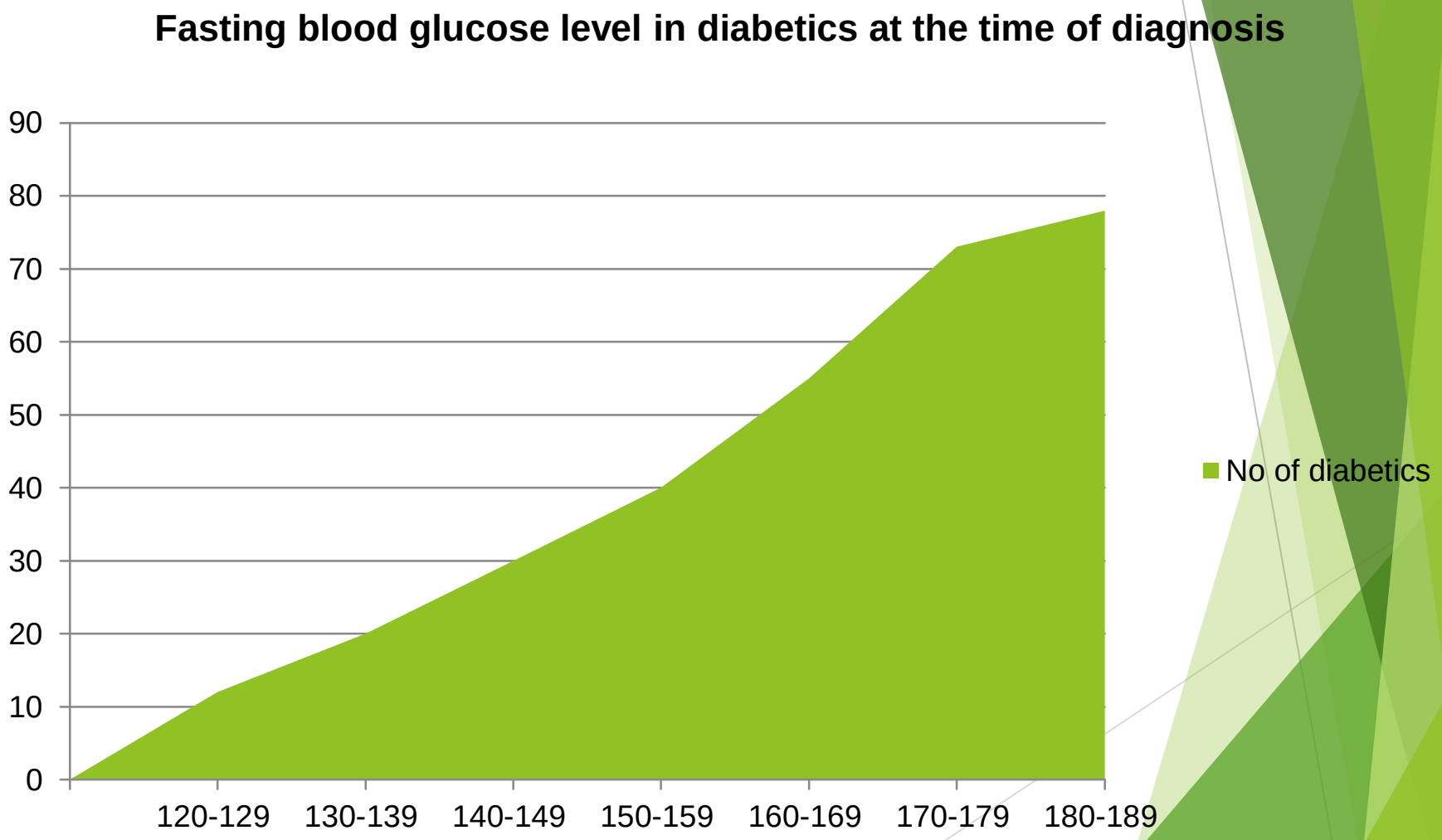
Frequency polygon



Cumulative frequency diagram or O'give

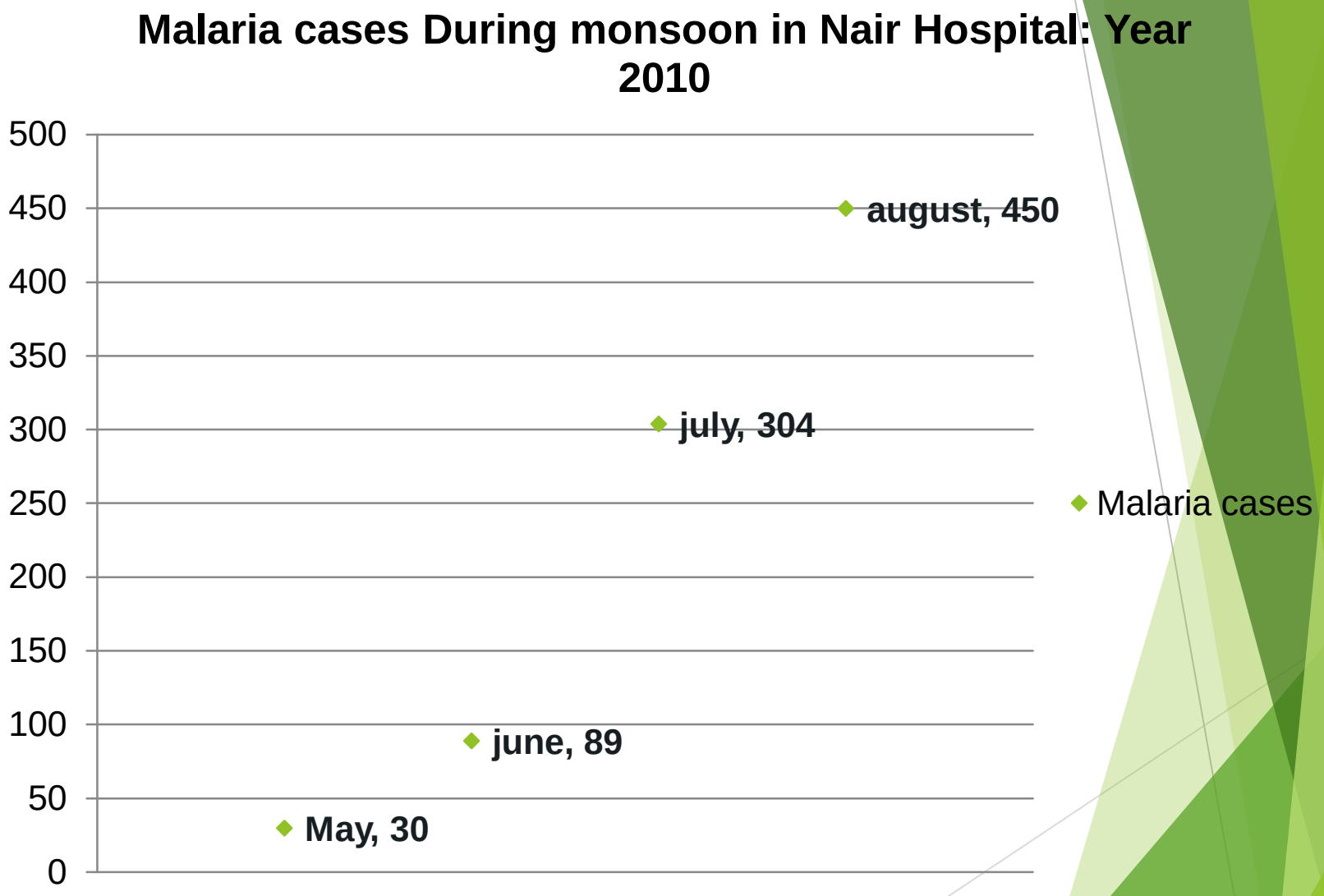
- Here the frequency of data in each category represents the sum of data from the category and the preceding categories.
- Cumulative frequencies are plotted opposite the group limits of the variable.
- These points are joined by smooth free hand curve to get a cumulative frequency diagram or Ogive.

O’give:


Fasting blood glucose level in diabetics at the time of diagnosis
90
80
70
60
50
40
30
20
10
0
120-129
130-139
140-149
150-159
160-169
170-179
180-189
No of diabetics

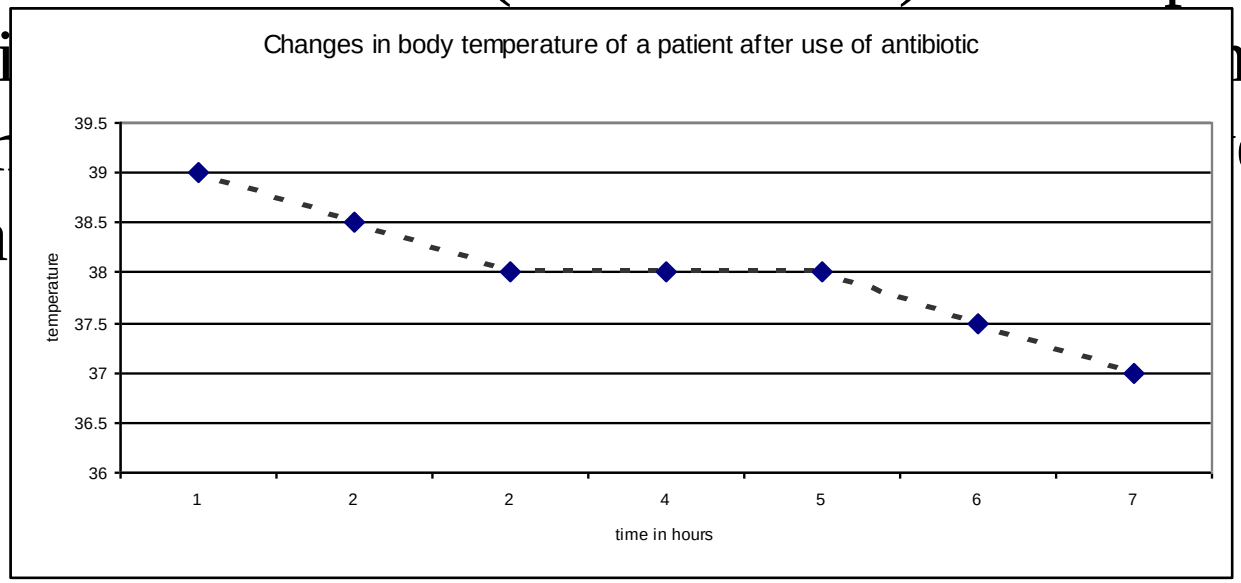
Scatter/ dot diagram

- Also called as Correlation diagram ,it is useful to represent the relationship between two numeric measurements, each observation being represented by a point corresponding to its value on each axis.
- In negative correlation, the points will be scattered in downward direction, meaning that the relation between the two studied measurements is controversial i.e. if one measure increases the other decreases
- While in positive correlation, the points will be scattered in upward direction.


Malaria cases During monsoon in Nair Hospital: Year 2010
500
450
400
350
300
250
200
150
100
50
0
august, 450
july, 304
june, 89
May, 30
Malaria cases

Line diagram:

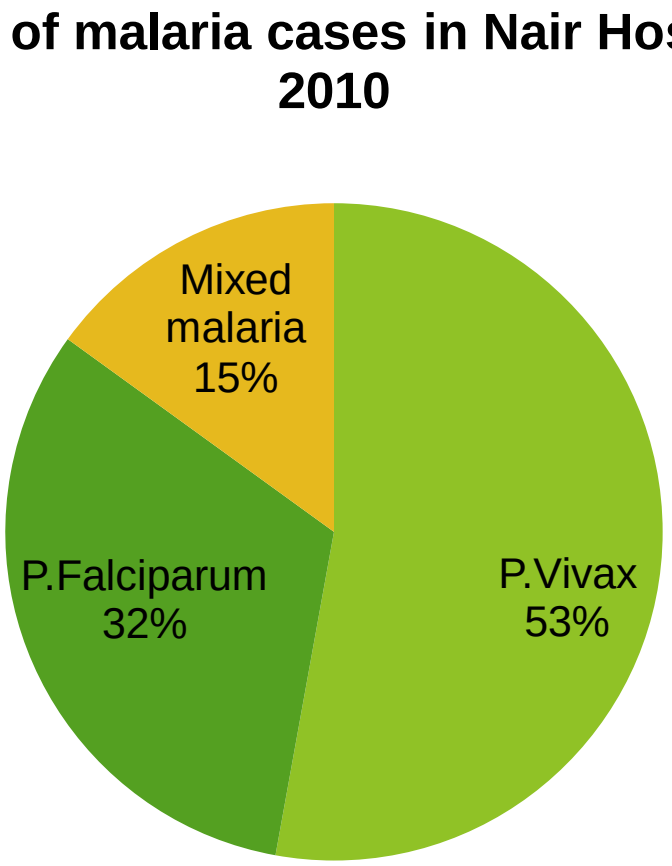
It is diagram showing the relationship between two numeric variables (as the scatter) but the points are joi n line or sm ents with the pa

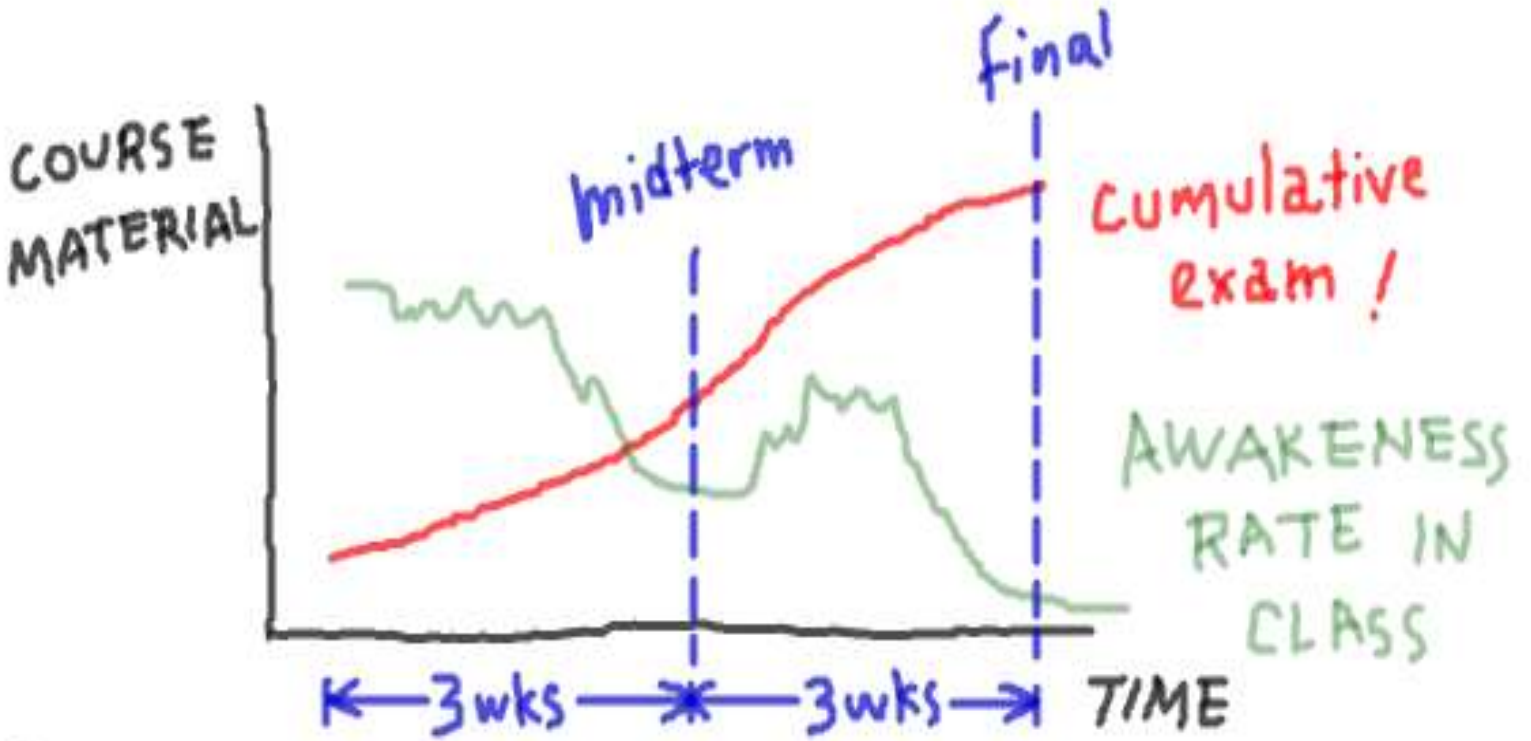


Pie diagram:

- Consist of a circle whose area represents the total frequency (100%) which is divided into segments.
- Each segment represents a proportional composition of the total frequency.

Pie diagram:


Distribution of malaria cases in Nair Hospital in july 2010
Mixed malaria 15%
P.Falciparum 32%
P.Vivax 53%


COURSE MATERIAL
Midterm
Final
cumulative exam!
AWAKENESS RATE IN CLASS
3wks
3wks
TIME
KAT

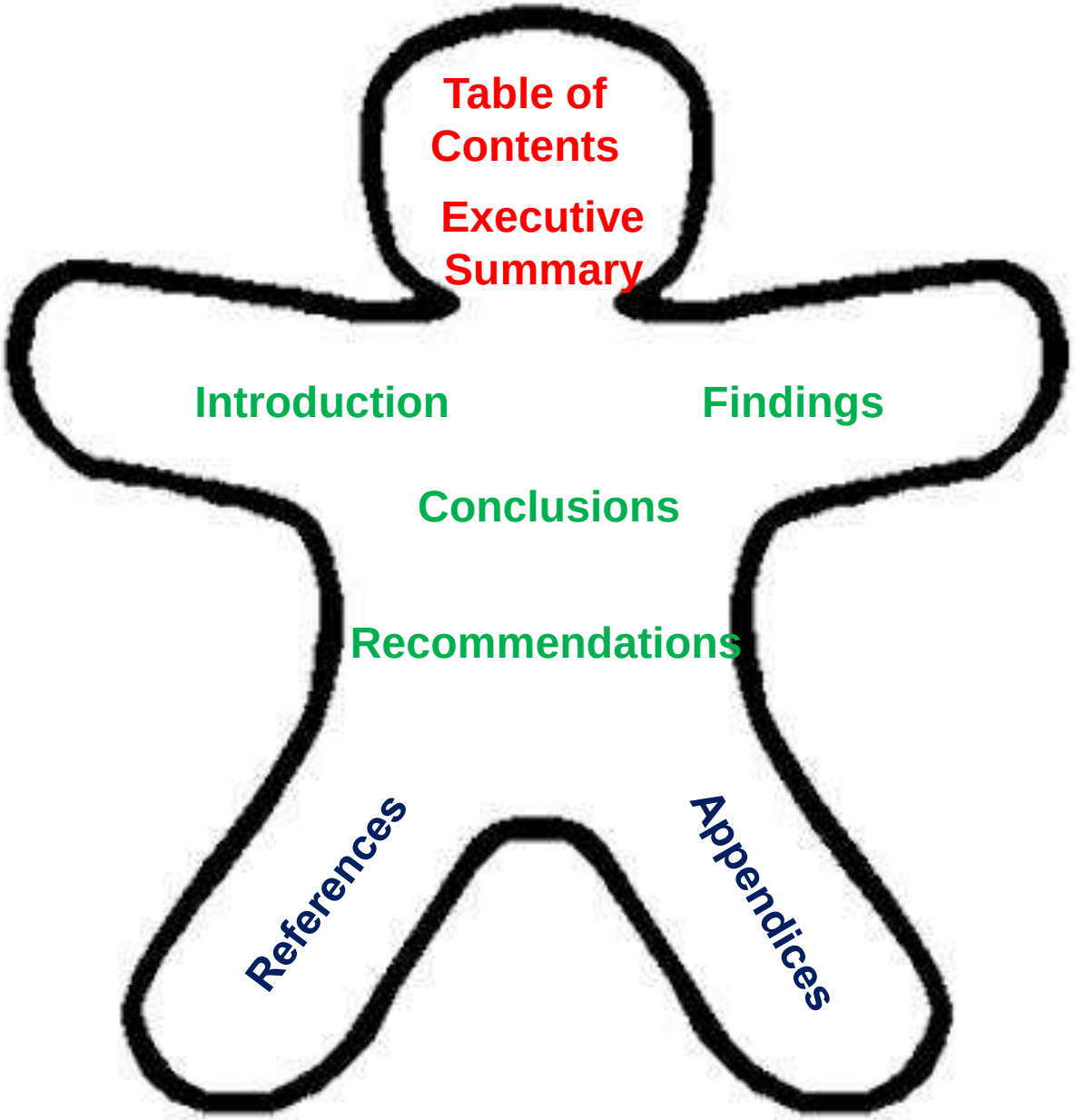

Parts of a report

PARTS OF A REPORT

- Title Page
- Table of Contents
- Executive Summary
- **Introduction**
- **Findings**
- **Conclusions**
- **Recommendations**
- Bibliography/References
- Appendices

Body of report

Title Page



PARTS OF A REPORT

- Title Page
- Table of Contents
- Executive Summary
- **Introduction**
- **Findings**
- **Conclusions**
- **Recommendations**
- Bibliography
- Appendices

Write this first before the rest of the report

ACTIVITY

- Get into your groups.

- Match the different parts of the report with their respective descriptions

PARTS OF A REPORT

Part	Description
Title Page	Title, Author's name, Date of submission
Table of Contents	List of sections, sub-sections, appendices, etc.
Executive Summary	Summary of entire report
Introduction	Purpose, Background, Methods of Investigation, Scope
Findings	Analysis of facts obtained
Conclusions	Deductions based on findings
Recommendations	Suggestions and advice based on conclusions
Bibliography/References	List of references
Appendices	Supplementary materials e.g. other supporting data

BODY OF REPORT

- Introduction
- Findings
- Conclusions
- Recommendations


Introduction

INTRODUCTION

- Four sections: **Purpose, Background, Method of Investigation, Scope**
- Take note of language conventions (i.e. typical words and phrases that are used)
- Uses present and past tense
- Format – numbered headings

INTRODUCTION

- **1.1 Purpose**
  - States the purpose of the report
  - Includes what the report will recommend

Example 1

The purpose of this report is to investigate the reasons behind the rise in computer gaming addiction among teenagers. The report will also recommend preventive measures for computer gaming addiction.

INTRODUCTION

Example 2

This report looks into the factors influencing students' behavior in lecture theatres and suggests ways to promote positive learning behavior among students.

Example 3

This report studies the causes of unhealthy eating among teenagers and recommends ways to promote more healthy eating habits.

QUIZ TIME

What tense is the Purpose section written in?

- Past tense
- Present tense
- Present and past tense

ANSWER

What tense is the Purpose section written in?

- Past tense
- **Present tense**
- Present and past tense

INTRODUCTION

1.2 Background

- Provides information on the problem or situation that gave rise to the investigation
- May refer to **secondary data**, e.g. newspaper report (i.e. data that was discovered by someone else)

INTRODUCTION

Example

A recent study on game technology (Tan, 2010) shows that nearly 75% of teenagers in Singapore play computer games regularly and the majority of them show signs of addiction. The rise in computer gaming addiction among teenagers is a growing concern and the Ministry of Media Development (MMD) would like to find out the reasons behind this trend.

The report was commissioned by the Director of Corporate Communications, Ms Julie Sim, on 31 May 2010.

QUIZ TIME

What tense is the Background section written in?

- Past tense
- Present tense
- Present and past tense

ANSWER

What tense is the Background section written in?

- Past tense
- Present tense
- **Present and past tense**

INTRODUCTION

1.3 Method of Investigation

- States how investigation was carried out, e.g. questionnaires issued to [how many people] for [how long]
- This is called **primary data** (i.e. data that is discovered by you, the writer of the report)
- May include references to secondary data

INTRODUCTION

Example

Questionnaires were issued to 100 teenagers from 25 educational institutions on 25 June 2010. Three teenagers who were former addicts were also interviewed to get more in-depth views. References were also made to books and newspaper articles.

QUIZ TIME

There are four sources of data.

Which is primary data? Which is secondary data?

Questionnaires were issued to 100 teenagers from 25 educational institutions on 25 June 2010. Three teenagers who were former addicts were also interviewed to get more in-depth views.

References were also made to books and newspaper articles.

ANSWER

PRIMARY DATA

Questionnaires were issued to 100 teenagers from 25 educational institutions on 25 June 2010. Three teenagers who were former addicts were also interviewed to get more in-depth views. References were also made to books and newspaper articles.

SECONDARY DATA

INTRODUCTION

1.4 Scope

- States the areas of investigation, e.g. reasons, consequences, etc., i.e. what information you need in order to meet your purpose
- First scope item is **respondents' profile**
- There should be at least 3 other scope items

INTRODUCTION

Example

Besides respondents' profile, this report looks into four possible reasons for the rise in gaming addiction among teenagers: boredom, stress, societal influence and addictive game features.

A Report on the Rise in Computer Gaming Addiction Among Teenagers

1. Introduction

1.1 Purpose

The purpose of this report is to investigate the reasons behind the rise in computer gaming addiction among teenagers. The report will also recommend preventive measures for computer gaming addiction.

1.2 Background

A recent study on game technology (Tan, 2010) shows that nearly 75% of teenagers in Singapore play computer games regularly and the majority of them show signs of addiction. The rise in computer gaming addiction among teenagers is a growing concern and the Ministry of Media Development (MDD) would like to find out the reasons behind this trend.

The report was commissioned by the Director of Corporate Communications, Ms Julie Sim, on 31 May 2010.

1.3 Method of Investigation

Questionnaires were issued to 100 teenagers from 25 educational institutions on 25 June 2010. Three teenagers who were former addicts were also interviewed to get more in-depth views. References were also made to books and newspaper articles.

1.4 Scope

Besides respondents' profile, this report looks into four possible reasons for the rise in gaming addiction among teenagers: boredom, stress, societal influence and addictive game features.

A Report on the Rise in Computer Gaming Addiction Among Teenagers

TITLE

1. Introduction

Numbered heading – whole number

1.1 Purpose

Numbered sub-heading – numerical-decimal

The purpose of this report is to investigate the reasons behind the rise in computer gaming addiction among teenagers. The report will also recommend preventive measures for computer gaming addiction.

1.2 Background

A recent study on game technology (Tan, 2010) shows that nearly 75% of teenagers in Singapore play computer games regularly and the majority of them show signs of addiction. The rise in computer gaming addiction among teenagers is a growing concern and the Ministry of Media Development (MDD) would like to find out the reasons behind this trend.

The report was commissioned by the Director of Corporate Communications, Ms Julie Sim, on 31 May 2010.

1.3 Method of Investigation

Questionnaires were issued to 100 teenagers from 25 educational institutions on 25 June 2010. Three teenagers who were former addicts were also interviewed to get more in-depth views. References were also made to books and newspaper articles.

1.4 Scope

Besides respondents' profile, this report looks into four possible reasons for the rise in gaming addiction among teenagers: boredom, stress, societal influence and addictive game features.

ACTIVITY

- Group Work

- Write out the Introduction based on your group report topic
- Include all sections of the Introduction
- Remember to format it correctly including title, heading and sub-headings

HOMEWORK

- Research information about your group topic
- Revise your Introduction section
- Think about possible questions for the questionnaire for your group topic