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PE-6 ASSESSMENT AND EVALUATION IN LEARNING

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1.1. Measurement - Meaning And Concept

Measurement is the process of quantifying or determining the magnitude, extent, size, or amount of something. It involves the assignment of numbers or symbols to objects, events, or phenomena, according to certain rules or standards.
The concept of measurement is fundamental across various disciplines including mathematics, physics, engineering, economics, and the natural sciences. It enables us to understand, compare, and communicate information about the properties or characteristics of objects, processes, or systems.

In essence, measurement involves three key components:

- **Measurable Quantity**: This is the attribute or characteristic of an object or phenomenon that we wish to quantify. It could be length, mass, time, temperature, volume, energy, or any other physical or abstract property.
- **Unit of Measurement**: This is the standardized quantity used as a reference for comparison in the measurement process. Units provide a consistent framework for expressing the magnitude of the measured quantity. Examples include meters (for length), kilograms (for mass), seconds (for time), and degrees Celsius (for temperature).
- **Measurement Instrument**: This is the tool or device used to perform the measurement. It could be as simple as a ruler or stopwatch, or as complex as a scientific instrument like a spectrophotometer or an accelerometer. The choice of measurement instrument depends on the specific quantity being measured and the desired level of accuracy.
- Measurement allows us to make sense of the world around us by providing a means to quantify and analyze various phenomena. It plays a crucial role in scientific research, engineering, commerce, and everyday life.

1.1. Evaluation - Meaning And Concept

Evaluation refers to the systematic assessment or appraisal of something to determine its value, significance, quality, or effectiveness. It involves collecting and analyzing information to make judgments or draw conclusions about the object of evaluation. Evaluations can vary widely in scope, ranging from individual performance assessments to the overall effectiveness of programs, policies, products, or systems.
The concept of evaluation is integral to decision-making processes in various fields, including education, healthcare, business, government, and social services. It serves several purposes:

- **Assessment**: Evaluation helps to assess the performance, outcomes, or

impact of a particular intervention, initiative, or activity. This assessment can be used to identify strengths, weaknesses, opportunities, and threats.

- **Improvement**: By identifying areas for improvement, evaluation provides insights that can inform strategies for enhancing performance, optimizing resources, or refining processes.
- **Accountability**: Evaluation contributes to accountability by providing evidence of whether resources are being used effectively and whether goals and objectives are being achieved. This information is important for stakeholders, including funders, policymakers, and the general public.
- **Learning**: Evaluation promotes learning by facilitating reflection, knowledge sharing, and continuous improvement. It provides feedback that can inform future decision-making and guide the development of best practices.
- Evaluation can take various forms, including:
- **Formative Evaluation**: Conducted during the development or implementation of a program or intervention to provide feedback for improvement.
- **Summative Evaluation**: Conducted after the completion of a program or intervention to assess its overall effectiveness or impact.
- **Process Evaluation**: Focuses on the implementation process to assess fidelity, adherence to protocols, and the quality of delivery.
- **Outcome Evaluation**: Examines the results or outcomes of a program or intervention to determine its effectiveness in achieving intended goals and objectives.

evaluation plays a critical role in evidence-based decision-making, organizational learning, and continuous improvement across a wide range of contexts.

1.2. Steps Of Evaluation Process.

Introduction:

In every walk of life the process of evaluation takes place in one or the other form. If the evaluation process is eliminated from human life then perhaps the aim of life may be lost. It is only through evaluation that one can discriminate between good and bad. The whole cycle of social development revolves around the evaluation process.

In education how much a child has succeeded in his aims, can only be determined through evaluation. Thus there is a close relationship between evaluation and aims.

Steps of evaluation process:

(i) Identifying and Defining General Objectives:

In the evaluation process first step is to determine what to evaluation, i.e., to set down educational objectives. What kind of abilities and skills should be developed when a pupil studies, say, Mathematics, for one year? What type of understanding should be developed in the pupil who learns his mother tongue? Unless the teacher identifies and states the objectives, these questions will remain unanswered.

The process of identifying and defining educational objectives is a complex one; there is no simple or single procedure which suits all teachers. Some prefer to begin with the course content, some with general aims, and some with lists of objectives suggested by curriculum experts in the area.

(ii) Identifying and Defining Specific Objectives:

It has been said that learning is the modification of behaviour in a desirable direction. The teacher is more concerned with a student's learning than with anything else. Changes inbehaviour are an indication of learning. These changes, arising out of classroom instruction, are known as the learning outcome.

What type of learning outcome is expected from a student after he has undergone the teaching-learning process is the first and foremost concern of the teacher. This is possible only when the teacher identifies and defines the objectives in terms of behavioural changes, i.e., learning outcomes

(iii) Selecting Teaching Points:

The next step in the process of evaluation is to select teaching points through which the objectives can be realised. Once the objectives are set up, the next step is to decide the content (curriculum, syllabus, course) to help in the realisation of objectives.

For the teachers, the objectives and courses of school subjects are ready at hand. His job is to analyse the content of the subject matter into teaching points and to find out what specific objectives can be adequately realised through the introduction of those teaching points.

(iv) Planning Suitable Learning Activities:

In the fourth step, the teacher will have to plan the learning activities to be

provided to the pupils and, at the same time, bear two things in mind—the objectives as well as teaching points. The process then becomes three dimensional, the three co-ordinates being objectives, teaching points and learning activities. The teacher gets the objectives and content readymade.

He is completely free to select the type of learning activities. He may employ the analytico-synthetic method; he may utilise the inducto-deductive reasoning; he may employ the experimental method or a demonstration method; or he may put a pupil in the position of a discoverer; he may employ the lecture method; or he may ask the pupils to divide into groups and to do a sort of group work followed by a general discussion; and so on. One thing he has to remember is that he should select only such activities as will make it possible for him to realize his objectives

(v) Evaluating:

In the fifth step, the teacher observes and measures the changes in the behaviour of his pupils through testing. This step adds one more dimension to the evaluation process. While testing, he will keep in mind three things-objectives, teaching points and learning activities; but his

focus will be on the attainment of objectives. This he cannot do without enlisting the teaching points and planning learning activities of his pupils.

Here the teacher will construct a test by making the maximum use of the teaching points already introduced in the class and the learning experiences already acquired by his pupils. He may plan for an oral lest or a written test; he may administer an essay type test or an objective type of lest; or he may arrange a practical test

(vi) Using the Results as Feedback:

The last, but not the least, important step in the evaluation process is the use of results as feedback. If the teacher, after testing his pupils, finds that the objectives have not been realized to a great extent, he will use the results in reconsidering the objectives and in organizing the learning activities.

He will retrace his steps to find out the drawbacks in the objectives or in the learning activities he has provided for his students. This is known as feedback. Whatever results the teacher gets after testing his pupils should be utilized for the betterment of the students.

Conclusion:

Evaluation plays a vital role in teaching learning experiences. It is an integral part of the instructional programmers. It provides information's on the basis of which many educational decisions are taken. We are to stick to the basic function of evaluation which is required to be practiced for pupil and his learning processes.

Meaning of Evaluation

Evaluation is a broader term than the Measurement. It is more comprehensive than mere inclusive than the term Measurement. It goes ahead of measurement which simply indicates the numerical value. It gives the value judgement to the numerical value. It includes both tangible and intangible qualities.

Different educationist has defined evaluation as following:

James M. Bradfield:

Evaluation is the assignment of symbols to phenomenon, in order to characterize the worth or value of a phenomenon, usually with reference to some cultural or scientific standards.

Norman E. Gronlund and Robert L. Linn:

Evaluation is a systematic process of collecting, analyzing and interpreting information to determine the extent to which pupil's are achievement instructional objectives.

Principles of Evaluation:

Evaluation is a systematic process of determining to what extent instructional objectives has been achieved. Therefore evaluation process must be carried out with effective techniques.

The following principles will help to make the evaluation process an effective one:

1. It must be clearly stated what is to be evaluated:

A teacher must be clear about the purpose of evaluation. He must formulate the instructional objectives and define them clearly in terms of student's observable behaviour. Before selecting the achievement measures the intended learning out comes must be specified clearly.

A variety of evaluation techniques should be used for a comprehensive evaluation:

It is not possible to evaluate all the aspect of achievement with the help of a single technique. For the better evaluation the techniques like objective tests, essay tests, observational techniques etc. should be used. So that a complete' picture of the pupil achievement and development can be assessed.

An evaluator should know the limitations of different evaluation techniques:

Evaluation can be done with the help of simple observation or highly developed standardized tests. But whatever the instrument or technique may be it has its own limitation. There may be measurement errors. Sampling error is a common factor in educational and psychological measurements. An achievement test may not include the whole course content. Error in measurement can also be found due to students guessing on objective tests. Error is also found due to incorrect interpretation of test scores.

The technique of evaluation must be appropriate for the characteristics or performance to be measured:

Every evaluation technique is appropriate for some uses and inappropriate for another. Therefore while selecting an evaluation technique one must be well aware of the strength and limitations of the techniques.

5. Evaluation is a means to an end but not an end in itself:

The evaluation technique is used to take decisions about the learner. It is not merely gathering data about the learner. Because blind collection of data is wastage of both time and effort. But the evaluation is meant for some useful purpose.

1.3. Formative Evaluation, Summative Evaluation, Continuous AndComprehensive Evaluation.

1. Formative evaluation:-

Formative evaluation is an assessment process used during the development or implementation of a project, program, or intervention. Its primary purpose is to provide feedback and gather insights to improve the quality and effectiveness of the project while it's still in progress. Unlike summative evaluation, which assesses the outcomes or results at the end of a project, formative evaluation

focuses on ongoing feedback and adjustments.

Formative evaluation typically involves:

1. Continuous Feedback: Gathering feedback from stakeholders, participants, or experts throughout the development or implementation process. This feedback can be qualitative or quantitative and helps identify areas for improvement.

2. Iterative Improvement: Making adjustments and refinements based on the feedback received. This iterative process allows for course corrections and ensures that the project stays aligned with its goals.

3. Monitoring Progress: Tracking the progress of the project against predefined benchmarks or goals. This helps assess whether the project is on track and whether any adjustments are needed to achieve the desired outcomes.

4. Identifying Strengths and Weaknesses: Assessing both the strengths and weaknesses of the project to capitalize on what's working well and address areas that need improvement.

5. Stakeholder Involvement: Engaging stakeholders throughout the evaluation process to ensure that their perspectives and insights are considered.

formative evaluation serves as a tool for continuous improvement, helping to enhance the quality and effectiveness of projects or programs while they are still in development or implementation.

2. Summative evaluation:-

Summative evaluation is an assessment process conducted at the end of a project, program, or intervention to determine its overall effectiveness and impact. Unlike formative evaluation, which focuses on providing feedback and making improvements during the development or implementation phase, summative evaluation assesses the outcomes and results achieved.

Key aspects of summative evaluation include:

1. Assessing Outcomes: Summative evaluation looks at the outcomes or results of a project or program to determine whether it has achieved its intended goals and objectives. This assessment may include both quantitative measures (such as changes in behaviour, knowledge, or performance) and qualitative measures (such as participant feedback or stakeholder perceptions).

2. Comparing Against Standards: Evaluators often compare the outcomes of the project against predetermined standards or benchmarks to determine its success. These standards may be set by stakeholders, industry best practices, or regulatory requirements.

3. Decision Making: The findings from summative evaluation can inform decision making regarding the continuation, modification, or discontinuation of the project or program. It provides stakeholders with valuable insights into the overall effectiveness and impact of the initiative.

4. Accountability: Summative evaluation serves as a tool for accountability, helping stakeholders assess whether resources were used effectively and whether the project delivered value for the investment.

5. Reporting and Communication: The results of summative evaluation are typically communicated through formal reports or presentations to stakeholders, funders, and other interested parties. These reports summarize the findings and recommendations based on the evaluation findings.

summative evaluation provides a comprehensive assessment of the outcomes and impact of a project or program, helping stakeholders make informed decisions about its future direction and allocation of resources.

3. Continuous and Comprehensive Evaluation (CCE):

Continuous and Comprehensive Evaluation (CCE) is an educational assessment system that aims to assess students' learning continuously throughout the academic year rather than relying solely on one final examination at the end of the year. It encompasses various assessment techniques to evaluate different aspects of students' learning, including their academic performance, co-curricular activities, and personal growth.

Key features of Continuous and Comprehensive Evaluation include:

1. Continuous Assessment: Instead of relying solely on end-of-year examinations, CCE involves regular assessments conducted throughout the academic year. These assessments may take the form of quizzes, assignments, projects, presentations, and class participation, among others.

2. Formative Assessment: CCE emphasizes formative assessment, which focuses on providing feedback to students to help them improve their learning. Teachers use formative assessment techniques to monitor students' progress, identify areas of weakness, and provide timely interventions or support.

3. Summative Assessment: While the emphasis is on continuous assessment, CCE also includes summative assessments, typically at the end of each term or semester. These assessments provide a summary of students' overall performance and may include traditional examinations or standardized tests.

4. Comprehensive Evaluation: CCE takes into account various aspects of students' development, including academic achievement, life skills, values, and attitudes. It aims to provide a holistic picture of students' abilities and progress, rather than focusing solely on academic performance.

5. Feedback and Remediation: CCE emphasizes providing constructive feedback to students based on their performance in assessments. Teachers use this feedback to guide students' learning and provide additional support or remediation when needed.

6. Reduced Stress: By distributing assessments throughout the year and providing opportunities for continuous improvement, CCE aims to reduce the stress associated with high-stakes examinations and promote a more positive learning environment.

Continuous and Comprehensive Evaluation aims to shift the focus of assessment from merely ranking students based on their performance in exams to fostering continuous learning, skill development, and holistic development. It recognizes that students have diverse learning styles and abilities and seeks to provide multiple opportunities for them to demonstrate their knowledge and skills.

1.4: Grade and Grading system: Meaning, Types (Absolute and comparative or Relative Grading), Merits and Limitations

Introduction:

Evaluation is a powerful and potential process to know the direction in which the children are developing. Evaluation is considered to be one the most important components of education process that helps in assessing the performance of children in a teaching- learning context. The usual practice of assessment in schools is through examinations. One the major drawback of our examination system is reporting students' performance in terms marks. In order to minimize the limitations of present day examinations system, a major reform concerns transforming the marking system into a grading system.

History of Grading System:

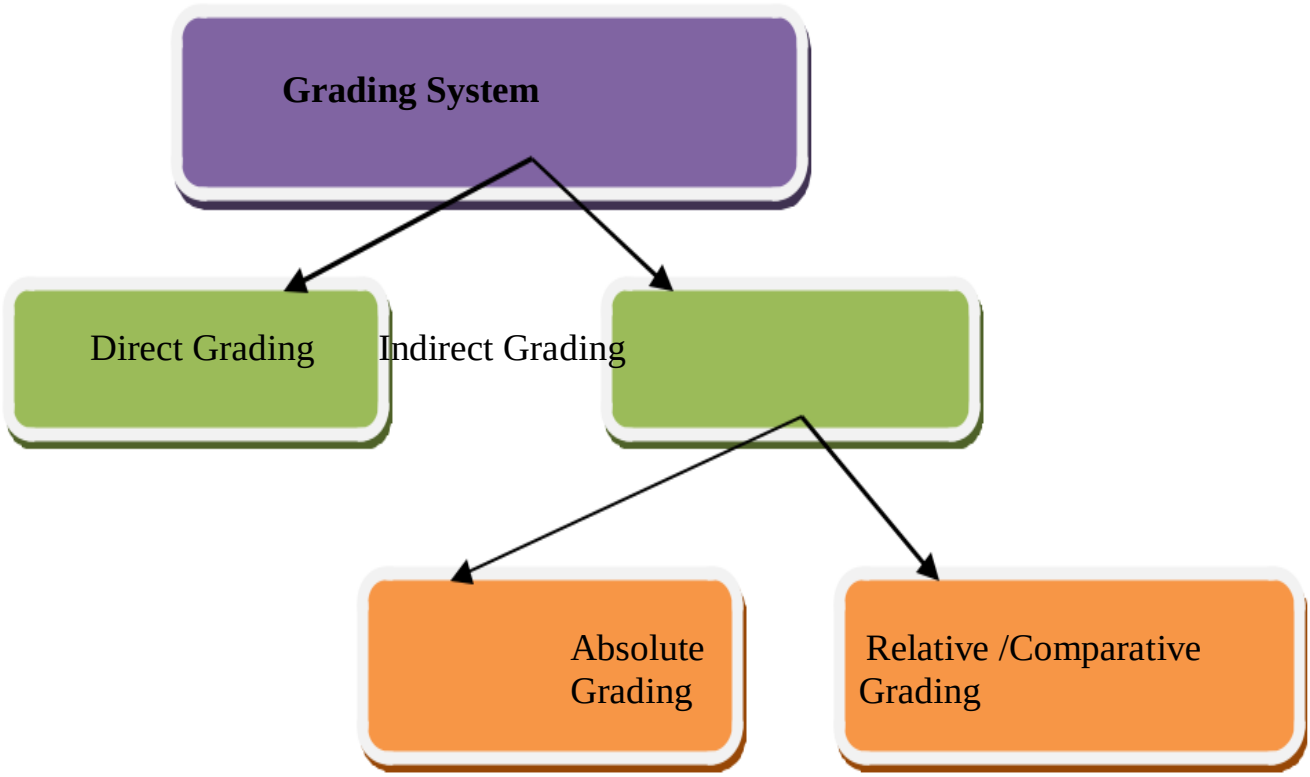
The ancient Greeks used assessments as formative and not evaluative learning tools. Harvard required exit exams in 1646 to attain a degree. And in 1785, Yale president Ezra Stiles implemented the first grading scale in the United States based on four descriptions: Optimi, Second Optimi, Inferiores, and Perjores.

Concept of Grading System:

Grading is a process of classifying students based on their performance into groups with the help of predetermined standards, expressed in a symbolic form i.e., letters of English alphabet. As these grade and corresponding symbols are pre-determined and well defined, the entire stakeholder would understand them uniformly and consistently. While developing the grading system, it is of utmost significance that the meaning of each grading symbol be clearly spelt out. Inspire of strict of strict adherence to the pre – determined stipulations, there may be inter examiner and intra – examiner variations. Pre determination is only in terms of standards of categorization and to give a common meaning to the letter symbols that signify grades. Hence strict adherence of examiners to the pre-defined meaning of the grade system would not curtail their freedom in expressing the students' performance.

Sometimes the grade awarded may be compared within and between groups. In this type of comparison not only the grades awarded by a particular teacher but also the grades awarded by different teachers would be compared. This helps in ascertaining the position of students with reference to a group. Comparing grades awarded by a single teacher (intra- group) and by, different teacher (inter-group) with reference to a larger group is considered as norm-referenced. This would help in location the position of a student in a larger group. Hence, norm -referenced measures would help in comparing the grades awarded by different teachers and institutions. Thus, the grades may be used for communicating the students' performance with reference to specified criteria and also the relative position of students with reference to their peer group.

Types of Grading System:



On the basis of the reference point of awarding grades, grades are classified as Direct and Indirect; it is also divided into two as Absolute and Relative. The reference point in former classification is an approach and in the latter, a standard of judgment. Absolute and relative grading come under indirect grading. For better understanding of these their scheme of classification is depicted in the following above figure.

1. Direct Grading:

The process of assessing students' performance qualitatively and expressing it in terms of letter grades directly is called direct grading. This type of grading can be used for assessment of students' performance in both scholastic and co- scholastic areas. However, direct grading is mostly preferred in the assessment of co-scholastic learning outcomes. While evaluation co- scholastic learning outcomes, the important factors are listed first and then a student's performance is expressed in a letter grade. This type of grading minimizes inter-examiner variability and is easy to use when compared to indirect grading. Direct grading has a limitation that it does not have transparency and diagnostic value and does not encourage competition to the extent required.

2. Indirect Grading:

In indirect grading, student performance is first assessed in terms of marks and then they are transformed into letter grades. Different modes may be followed while transforming the marks into grades. On the basis of the mode of transformation of marks into grades, there are two types of grading, viz. absolute grading and relative grading. The meaning and relevance of these two types of indirect grading are explained below.

2.1 Absolute Grading:

Let us now examine the methodology of awarding grades in terms of absolute standards. As has been pointed out earlier, absolute grading is based on a pre-determined standard that becomes the reference point for students' performance. In absolute grading, the marks are directly converted into grade on the grades on the basis of a pre-determined standard. Absolute grading can be on a three- point, five-point or nine –point scale for primary, upper primary and secondary stages respectively.

Three-Point Scale:
Students are classified into three groups as above average, average and below

average on the basis of pre-determined range of score as shown in below table.

Three- tier classification and their meaning

Range of Marks	Grade	Description
60% and above	A	Above Average
30%-Less than 60%	B	Average
Below 30%	C	Below Average

Five - Point Scale:
Students are classified into five groups, distinction, first division, second division, and third division and unsatisfactory on the basis of pre-determined range of score as shown in below table.

Five- tier classification and their meaning

Range of Marks	Grade	Description
75% and Above	A	Distinction/Excellent
60%- Less than 75%	B	First Division/Good
45%- Less than 60%	C	Second Division/Average
33%- Less than 45%	D	Third Division/Below Average
Below 33%	E	Unsatisfactory/poor

Nine- Point Scale:
In absolute grading the range of absolute marks or percentage of marks need not necessarily be of equal size. The range of marks as a pre-determined standard for classifying students into different groups may be taken as arbitrary. In a nine- point grading scale, the students may be classified into nine groups, namely, outstanding, excellent, very good, good, above average, below average, marginal and unsatisfactory. An example of nine-point absolute grading is provided in below table.

Nine- tier classification and their meaning

Range of Marks	Grade	Description
90% and Above	A	Outstanding
80%- Less than 90%	B	Excellent
70%- Less than 80%	C	Very Good
60%- Less than 70%	D	Good
50%- Less than 60%	E	Above Average
40%- Less than 50%	F	Average
30%- Less than 40%	G	Below Average
20%- Less than 30%	H	Marginal
Below 20%	I	Unsatisfactory

2.2 Relative Grading:

Reflective grading involves comparing each student's performance to that of a specific reference group.

Relative grading successfully overcome problems of the variations in the mark yielding nature of different subjects, variations in the standards of function papers of different years and differences in the groups of examinees taking the examination in different years.

Relative grading referred to as "grading on the curve" because wherever any population of students is subjected to a particular test in written, oral or practical form and if their scores distributed on a graph the true level of achievement in this graphs would take the form of a symmetrical bell-shaped Normal probability curve.

Merits of Grading System:

Due to over-emphasis on examinations, both teaching and learning have become examination- centered. Teachers teach for examinations and students learn for examinations. Award of marks and declaration of results has become the main purpose of schooling. Actually, Examinations are meant to examine the process of learning. They help teachers to locate learning variations among children. Examinations also aim at helping children estimate their learning performance and accordingly improve their proficiencies. But these idealistic purposes of examinations have taken a back seat.

Securing marks rather than improving the levels of that attainment has become the

main objective of students. Teaching is a deliberate process of achieving instructional objectives and evaluation is a means of estimating the extent of their accomplishment. But due to the prevalence of marks consciousness, attainment of marks rather than assessment of instructional objectives have become all important.

As grading involves grouping the students according to their attainment levels, it help in categorizing the students as per their attainments of instructional objectives also.

One of the significant arguments in favour of the grading system is that it creates favourable conditions for classification of students' performance on a more convincing and justifiable scale.

In order to understand why grading is a better proposition than the marking system, it is necessary to look closely into the various procedures of scaling.
Grading is a far more satisfactory method than the numerical marking system.

The justification for the superiority of grading system over marking system is that it signifies individual learner's performance in the form of a certain level of achievement in relation to the whole group.

Limitation of Grading System

Grading system is considered as the most viable and systematic to assess the outcomes of teaching- learning process; it is not free from criticism due to several reasons which are listed below;

There is a possibility of different examiners interpreting the standard differently resulting in inter-examiner variability.

Grading stipulates strict adherence to pre-defined criteria.

In absolute grading, the students are put into different categories on the basis of predetermined range of scores.
Relative grading, though scientific is considered somewhat complicated for teachers, especially when they are not equipped to implement it in their classes.

Grades are often awarded without employing both multiple criteria and multiple sources of information.

The percentage of students belonging to different grades is pre-determined
The grades are not awarded on the basis of individual student‘s performance but are decided on the basis of performance of students in a larger group.

Lack of uniform policy on grading across different State Boards of Education creates a problem of compatibility of grade awarded on different criteria in different board examination.

2.1. Techniques OfAssessment (Concept, Merit &Demerit): Observation, Interview, Self-Assessment, Peer-Assessment And Sociometry:

Introduction:

Assessment is an integral part and ongoing process in the educational context. To learn effectively, students need to know as to how they are performing. Similarly, to be an effective teacher, you must be informed about what the student knows, feels, and can do, so that you can help him/her build on her/his skills, knowledge, and attitudes. Therefore, you and your students need continuous feedback on their progress and difficulties in order to plan appropriate learning activities and to make adjustments to those already planned. Assessment means the way by which teachers and other stakeholders involved in students' learning collect information systematicallyand then use it to know their level of achievement in academic, behavioural and social areas.

Assessing students' performance is an integral part of the teaching-learning process. When you assess your students, you collect information about their level

of performance where as in evaluation, you compare a student's achievement with other students with a set of standards. Effective assessment is a continuous process and it is not simply that has to be done at the end of a Unit. Evaluation is integrated into all aspects of the curriculum, thus providing both students and teachers useful and relevant data to gauge progress of students. Not only teachers but also students play an important role in assessing their own learning progress.

1.Observation: Concept

As prospective teachers, you might have observed students while they solve problems, interact with peers in different learning situations or in the playground. It provides insight into student learning and growth. Observation is used as a technique to evaluate various aspects of behaviour in controlled or uncontrolled situations. Through observation, behaviour is captured in a particular situation. It is a means of first-hand information as experienced at a specific moment. It is pre-planned and purposeful activity that provides immediate recording of events. With the help of observation checklists, teachers could record information quickly. The reliability of observation can be increased by repeated observation or through observation done by many individuals. While preparing observation checklist, the following points may be kept in mind:

- Write down the criteria to be observed
- Inform students about the criteria to be observed
- Determine the specific outcomes to assess
- Develop a data gathering system such as checklist or rubric or anecdotal points
- Target observation on one or two specific outcomes Record the date of observation
- Share observation details with individuals or target groups
- Use the collected information to modify your instruction.

Observation is an important technique of collecting information about people because people do not always do what they say. This statement is equivalentto the maxim in behavioural and social sciences that 'attitudes and behaviour are incongruent'. Generally, there are two types of observation: i) Participant observation, and ii) non-participant observation.

Participant observation:

In participant observation, the observer becomes a member of the group. The participant observer plays a dual role such as becoming a member of the group and observing the participants carefully. This kind of observation provides reliable

results. An advantage of this technique is that, for ethical reasons, the researcher can request permission to collect and record data as needed. In addition, the researcher can obtain feedback about his/her observations and tentative conclusions from the participants. A weakness is that the participants might not behave naturally because they are aware that they are being observed.

non-participant observation:

In non-participant observation, the observer observes the group passively from a distance without his/her presence in the group. Non-participant observation helps in recording and studying the behaviour of a particular person or group in detail. It is considered as an unobtrusive method of data collection to study focused aspects of a setting in order to answer specific questions within a study.

(Observation has been the first practice of assessment that we do in our classroom. Each observed incident, expression and reaction has useful data for teachers; hence the observation is an effective technique for us. Observation is the process in which one or more persons observe what is happening in a real-life situation, and he/she classifies and records pertinent happening according to pre-planned scheme. It is used to evaluate the overt behaviour use uniformly either American or British English i.e., spellings of words, etc. of individuals in both the controlled and uncontrolled situation. (Koul, 1997, p.170)

The observation schedules are the enumerations, listing of the facts or other data that are observed under observation process. Like questionnaires, the observation schedules are also classified as structured or unstructured. This can also be classified as participant and non-participant observation. In case the things to be observed are properly defined, the style of recording the observed information, standardized conditions of observation and the selection of pertinent data of observation then it is a structured observations (Kothari & Garg, 2014, p.91) and the schedule is a structured observation schedule. On the other hand, when these are not pre-determined aspects of observation, such observation schedules are unstructured schedules.**)**

Merits of observation:

1. Through observation the data are gathered from a natural setup.
2. The data observed are direct or first hand.
3. As the data are first hand or direct, while doing observation we can correlate what is being said and what is being shown.
4. Does not rely upon people's willingness or ability to provide information.

Demerits of observation:

1. The observation has also the following demerits:
2. The observation if not done with planning, then it will not bring out authentic information.
3. Observer's biases may affect the result.
4. There may come 'Hawthorne effect', that is when the person gets to know that he/she is being observed then the real problems may not be shared or shown.
5. Does not develop the understanding why people behave in a particular manner.

2. Interview

Interview assessment involves the evaluation of an individual's knowledge, skills, abilities, experiences, and suitability for a particular role or position through face-to-face or virtual interviews. Interview assessments are commonly used in recruitment, admissions processes, performance evaluations, and research studies. Several techniques are utilized in interview assessments, including:

- **Structured Interviews**: Structured interviews involve asking all candidates a predetermined set of questions in a standardized format. Questions are typically based on job-relevant competencies, experiences, and behaviors. Structured interviews allow for consistency in evaluation and facilitate comparisons between candidates.
- **Situational Interviews**: Situational interviews present candidates with hypothetical scenarios or work-related situations and ask how they would respond or handle the given situations. This technique assesses candidates' problem-solving abilities, decision-making skills, and knowledge of relevant practices or procedures.
- **Behavioral Interviews**: Behavioral interviews focus on past experiences and behaviors as indicators of future performance. Candidates are asked to provide specific examples of how they have dealt with challenges, achieved goals, or demonstrated relevant competencies in previous roles or situations. Behavioral interviews assess candidates' ability to apply their skills and experiences to the job at hand.

- **Competency-Based Interviews**: Competency-based interviews assess candidates' proficiency in specific competencies or skills required for the role. Interviewers ask targeted questions aimed at eliciting evidence of

candidates' abilities in areas such as communication, leadership, teamwork, problem-solving, and adaptability.

- **Panel Interviews**: Panel interviews involve multiple interviewers from different areas or levels within the organization conducting the interview together. Panel interviews allow for a broader perspective on candidates and provide opportunities for diverse viewpoints and expertise to be considered in the evaluation process.
- **Sequential Interviews**: Sequential interviews consist of multiple rounds of interviews with different interviewers or panels. Candidates may meet with individuals from various departments or levels of the organization in consecutive sessions. Sequential interviews allow for in-depth exploration of candidates' qualifications and fit with the organization.
- **Stress Interviews**: Stress interviews intentionally create challenging or high-pressure situations to assess candidates' ability to perform under stress. Interviewers may use probing questions, confrontational techniques, or unexpected scenarios to gauge candidates' resilience, confidence, and composure.
- **Role-Play Interviews**: Role-play interviews involve candidates simulating job-related scenarios or interactions with interviewers playing specific roles or characters. Role-play exercises assess candidates' interpersonal skills, communication abilities, and problem-solving capabilities in real-life situations.
- **Case Interviews**: Case interviews present candidates with real or simulated business cases or problems and ask them to analyze the situation, develop solutions, and present their recommendations. Case interviews assess candidates' analytical thinking, strategic planning, and decision-making skills.
- **Structured Rating Scales**: Interviewers may use structured rating scales or scoring rubrics to evaluate candidates' responses systematically. Rating scales typically include criteria related to communication skills, problem-solving abilities, relevant experiences, and overall fit with the role and organization.

By utilizing these techniques, interview assessments provide valuable information for selecting the most qualified candidates, identifying development needs, and making informed decisions in various contexts.

3.self - assessment

Self-assessment refers to the process by which individuals evaluate their own knowledge, skills, abilities, strengths, weaknesses, and performance. It involves reflection, introspection, and self-reflection to gain insight into one's

capabilities and areas for improvement. Various techniques can be used for self-assessment, including:

- **Self-Reflection**: This involves taking time to think critically about one's experiences, actions, and achievements. Self-reflection prompts may include questions like: What did I do well? What could I have done better? What did I learn from this experience?
- **Self-Questioning**: Asking oneself probing questions can help uncover areas of strength and areas needing improvement. Questions might focus on specific skills or knowledge relevant to a particular task or goal.
- **Self-Grading or Self-Scoring**: Individuals can assess their own performance using rubrics, checklists, or scoring criteria. They can compare their own work against established standards to gauge their proficiency.
- **Self-Testing**: This involves taking quizzes, tests, or practice exams to evaluate one's understanding of a subject or topic. Self-testing can help identify areas of weakness and guide further study.
- **Journaling or Diary Entries**: Keeping a journal or diary allows individuals to record their thoughts, feelings, experiences, and observations over time. Reviewing past entries can provide insights into personal growth and development.
- **Goal Setting and Progress Tracking**: Setting specific, measurable, achievable, relevant, and time-bound (SMART) goals helps individuals clarify their objectives and track their progress toward achieving them. Regularly reviewing goal progress can highlight areas needing attention.
- **Feedback Seeking**: Actively seeking feedback from others, such as peers, mentors, or supervisors, can provide valuable insights into one's performance and areas for improvement. Constructive feedback allows individuals to gain different perspectives and adjust their self-assessment accordingly.
- **SWOT Analysis**: This involves identifying strengths, weaknesses, opportunities, and threats relevant to achieving personal or professional goals. SWOT analysis helps individuals assess their internal capabilities and external factors that may impact their success.
- **360-Degree Feedback**: This involves gathering feedback from multiple sources, including supervisors, peers, direct reports, and others. 360-degree feedback provides a comprehensive view of one's strengths and areas for development from different perspectives.
- **Self-Reflection Tools and Assessments**: Various self-assessment tools and surveys are available to help individuals identify their personality traits, values, interests, and preferences. These tools can provide insights into areas of alignment with personal or professional goals.

By using these techniques, individuals can gain a better understanding of themselves, identify areas for growth, and take steps toward personal and professional development.

4.peer assessment

Peer assessment involves the evaluation of one's performance, work, or contributions by peers within a group or community. It can be a valuable tool for providing feedback, promoting learning, and fostering collaboration. Various techniques can be used for peer assessment, including:

- **Peer Review**: Peers evaluate and provide feedback on each other's work based on predetermined criteria or standards. This can be done anonymously or with attribution, depending on the context and preferences of the group.
- **Rubrics**: Peer assessment rubrics outline specific criteria and performance levels for evaluating a particular task or assignment. Peers use the rubric to assess each other's work and provide feedback based on established benchmarks.
- **Checklists**: Checklists provide a list of items or criteria to be evaluated. Peers mark off each item as they assess the work, ensuring that all aspects are considered in the evaluation process.
- **Rating Scales**: Peers assign numerical ratings or scores to various aspects of a task or performance based on predefined scales. This allows for quantifiable feedback and comparisons between different submissions.
- **Annotated Feedback**: Peers provide detailed comments, suggestions, or annotations on each other's work to explain their evaluations and offer guidance for improvement. This can include specific examples, explanations, or references to support feedback.
- **Peer Discussion**: Peers engage in discussions to review and critique each other's work collaboratively. This allows for the exchange of ideas, perspectives, and insights, leading to a deeper understanding of the subject matter and improved learning outcomes.
- **Peer Assessment Activities**: Peer assessment activities, such as peer editing, peer coaching, or peer teaching, involve active participation in the evaluation process. Peers not only assess each other's work but also provide support, guidance, and assistance as needed.
- **Self- and Peer-Assessment Combined**: Combining self-assessment with peer assessment allows individuals to reflect on their own work before receiving feedback from peers. This encourages self-awareness and accountability while also benefiting from the perspectives of others.

- **Structured Feedback Sessions**: Peers participate in structured feedback sessions where they take turns presenting their work and receiving feedback from the group. This ensures that each individual has the opportunity to both give and receive feedback in a supportive environment.
- **Training and Calibration**: Providing training and guidance on the assessment process, criteria, and expectations helps ensure consistency and fairness in peer evaluations. Calibration exercises can be used to align assessments among peers and promote reliability.

By incorporating these techniques, peer assessment can become an effective tool for promoting peer learning, fostering a culture of feedback, and enhancing overall academic or professional development.

5. Sociometry Assessment

Sociometry assessment is a technique used to measure social relationships and interactions within a group or community. Developed by Jacob L. Moreno, sociometry focuses on understanding the patterns of interpersonal connections, preferences, and dynamics among group members. Several techniques are commonly used in sociometry assessment, including:

- **Social Network Analysis (SNA)**: SNA is a quantitative method used to analyze the structure and patterns of social relationships within a group or network. By mapping out connections between individuals and identifying key network properties (e.g., centrality, density, cohesion), SNA provides insights into the social dynamics and influence patterns within the group.
- **Sociograms**: A sociogram is a visual representation of social relationships within a group, typically presented in the form of a diagram. Group members are represented as nodes, and their relationships (e.g., friendships, preferences, alliances) are depicted as lines or arrows connecting the nodes. Sociograms can reveal the structure of social networks and the strength of connections between individuals.
- **Choice-Based Sociometry**: In choice-based sociometry, individuals are presented with a set of options (e.g., group members, activities, roles) and asked to make choices based on their preferences. By analyzing individuals' choices, researchers can identify patterns of attraction, affiliation, or avoidance within the group.
- **Rating Scales**: Rating scales are used to assess individuals' perceptions of their relationships with others in the group. Participants may be asked to rate their level of closeness, trust, cooperation, or supportiveness with each group member using Likert scales or similar rating systems. Aggregated ratings can provide insights into the overall social climate and the quality of

interpersonal relationships within the group.

- **Role-Playing and Sociodrama**: Role-playing and sociodrama techniques involve enacting social scenarios or interactions within a group setting. Participants take on different roles and engage in improvisational activities to explore social dynamics, conflicts, or communication patterns. Observations and reflections during role-playing sessions can inform understanding of group dynamics and relationships.
- **Peer Nominations**: Peer nominations involve asking group members to nominate individuals who possess certain characteristics or fulfill specific roles within the group. For example, participants may be asked to nominate leaders, helpers, or friends based on their observations of group interactions. Aggregated nominations can identify individuals who are perceived as influential or central within the group.
- **Interviews and Focus Groups**: In-depth interviews and focus groups can be used to explore participants' experiences, perceptions, and feelings about their social relationships within the group. Open-ended questions and qualitative data analysis techniques allow researchers to uncover underlying themes, dynamics, and patterns of interaction.
- **Behavioral Observations**: Behavioral observations involve systematically observing and recording interactions, behaviors, and nonverbal cues within the group. Observers may use standardized coding schemes to categorize and analyze social behaviors, such as cooperation, conflict, leadership, or social support.

By employing these techniques, sociometry assessment can provide valuable insights into the structure, dynamics, and quality of social relationships within groups, organizations, or communities. These insights can inform interventions, interventions, and strategies aimed at promoting positive social connections, collaboration, and cohesion.

2.3. Psychological Test

*** Psychological Test**.

A psychological test can be defined as a systematic procedure designed to measure an individual's cognitive abilities, personality traits, emotions, and other psychological constructs. These tests are carefully constructed to ensure reliability and validity, allowing psychologists and researchers to gather accurate insights into a person's mental state. Just remember, not all tests are made the same, so it's best to use ones that are made by experts to get the most helpful information. This is where psychological tests come into play, serving as invaluable tools to unravel the mysteries of the human mind.

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Introduction to Psychological Testing

The history of psychological testing dates back to the late 19th century when the field of psychology was still in its infancy. Pioneers such as Alfred Binet and Charles Spearman laid the foundation for modern psychological testing by developing early intelligence tests and statistical techniques for analyzing test data.

Types of Psychological Testing

Psychological testing encompasses a wide range of assessments, cach tailored to measure specific aspects of human behavior and cognition. Some prominent types of psychological testing include:

Intelligence Tests: These tests gauge an individual's cognitive abilities, problem-solving skills, and overall intellectual potential. The most famous example is the IQ test.

* Personality Tests: These tests delve into an individual's personality

traits, behaviors, and emotional patterns. The Myers-Briggs Type

Indicator (MBTI) and the Big Five Personality Traits model are commonly used examples.

* Neuropsychological Tests: These assessments focus on identifying cognitive deficits caused by brain injuries or neurological conditions.
Clinical Assessment Tools: These tests aid in diagnosing mental health disorders, such as depression, anxiety, and schizophrenia.

Uses of Psychological Testing

The applications of psychological testing are manifold, ranging from clinical settings to educational institutions and even workplace environments. Some key uses of psychological testing include:

Clinical Diagnosis: Psychologists use tests to diagnose mental health disorders and plan appropriate treatments.

Educational Settings: Teachers and educators use tests to assess students' learning abilities, identify learning disabilities, and tailor teaching strategies accordingly.

* Career Guidance: Career counselors employ psychological tests to match individuals with suitable professions based on their skills, interests, and personality traits.

Criminal Justice System: Psychological tests aid in evaluating criminal offenders mental state, assessing their potential for rehabilitation, and determining their competency to stand trial.

*** Purpose of Psychological Testing**

The primary purpose of psychological testing extends beyond a mere understanding of an individual's characteristics. It serves to:

Predict Behavior: Tests can prediet how an individual might respond in

certain situations, aiding in making informed decisions. Provide Insights: Testing offers insights into an individual's strengths,

weaknesses, and potential areas for personal growth.

Scientific Research: Psychologists use tests to gather data for research. enabling them to draw conclusions about larger population trends.

*** Significance of Psychological Testing**

The significance of psychological testing lies in its ability to bring clarity to the intricate workings of the human psyche. By providing standardized and quantifiable data, psychological tests:

Enhance Objectivity: Testing introduces an element of objectivity to subjective matters, facilitating more accurate evaluations.
Guide Interventions: Test results guide psychologists in tailoring interventions that are most suited to an individual's needs. Improve Communication: Psychological tests aid in facilitating communication between professionals, educators, and individuals seeking help.

Conclusion

psychological tests serve as windows into the intricate workings of the human mind. From intelligence and personality assessments to aiding clinical diagnoses and career decisions, these tests illuminate various aspects of our psyche. The significance of psychological testing lies in its ability to enhance objectivity, guide interventions, and improve communication. While not crystal balls for predicting behavior, these tests play a crucial role in expanding our understanding of human behavior and cognition.

2.4. Different Type Of Test :

1. AchievementTest

MeaningofAchievementTest

Achievementtestsareusedby teacherstomeasureortesttheachievementsandsuccessachievedinanyparticularfield byastudent.Whateverthestudentlearnsinschooliscalledhisachievementandexamin ationsconductedtotestthatachievementarecalledachievementtests.
ClassificationofAchievementtests

Achievementtestscanbepreparedonthebasisofmethodlike:

StandardizedTest

Any testinwhichthesametestisgiveninthesamemannertoalltesttakers,andgradedinthesa me mannerforeveryone,isastandardizedtest.

TeacherMadeTest

Thetypeoftestthatisselfmadebyteachersaccordingtotheirnormsandstandards.

PrincipleofAchievementtests

Achievementtestsshouldmeasureclearlytheobjectivesthathavebeenformulated¢In ordertoconstructagoodtest,everyteachershouldbeabletoformulatecleargoalsspec iallyspecificinstructionalobjectives
Achievementtestshouldbeaccordingtothelevelofstudents
Achievementtestshouldincludethetypesoftestsitemsthataremostappropriateforme asuringthedesired learningoutcomes.
AchievementtestshouldbemadeasreliableaspossibleAchievementtestsshouldimpr ovestudentslearning.

CharacteristicsofaGoodAchievementTest

Now,whatmakesagoodachievementtest?Toshedlightonthecharacteristicsofagood achievementtestwearegoingtoconsiderfourqualitiesthatmakeanexcellenttest.

Reliability

Inanachievementtestreliability
referstohowconsistentlythetestproducesthesameresultswhen
itismeasuredorevaluated.
Foratesttobereliableitmeansthattheoutcomeofthetestistrustworthy.

Soforanachievementtesttobeconsideredaccurateandvalid,itmustbeconsistent.Itm ustmeasurewhatisintendedtomeasureinits truevalue.

Wecansaythatthedegreetowhichthetestisfreefromerrorisonecharacteristicofanach ievementtest.henatestisrepeated,ifthevalueisclosetowhatwasinitiallyobtained,the nitissaid to be reliable.

Notethatdifferenttypesofreliabilityareevaluatedusingdifferentmethods.

Thefirstonthelistishowconsistenttheresultsofthemeasurementsareoveracertainam ountof time.
Thesecondoneishowconsistentistheresultofthemeasurementwhenithasbeenevalua tedusingdifferentmethodsandinstruments.
Thelastwaytodeterminehowconsistentanachievementtestishowconsistentithasbee n withjust oneinstrumentormethodoftesting.

Validity

Oneimportantthingtoconsiderwhenconductinganevaluationassessmentishowmuchtheresultsofthetestwillservethepurposeforwhichitwasintended.Findinganansweretothisquestionisthebasisofvalidityinatest.Theprimaryfunctionofanytestisvalidity because atexthasnovalueifitisnot validhenceitwon'tproveuseful.

Thevalidityofatestinvolveswhatitisintendedtomeasureandhowconsistentitmeasuresit.

Forinstance,aneducatormightnotdeterminehowconversantastudentisinaparticularknowledgeareawithoutconductinganevaluationtest.

Ifthetestwasconductedandtheresultsdidnotmeasurewhatitwasintendedtomeasure, theeducatormightnotaccurately determinewhatthestrengthsofthestudentsare.Also,theeducatormightstruggletoknowwhetherthestudentisreadyforahigherlevelofinstruction.Wecaninferthatvalidityishowappropriatetheinterpretationmadefromtheresultofatestis,regarding aspecifictopic.

Objectivity

Objectivitycanaffectboththereliabilityandvalidityoftestresults.Theobjectivityofatestreferstothepercentageatwhichdifferentpeoplescoringatestcanarriveatthesamescore.Agood testmustbefreefrom personalerrorsandbias.

Achievementtestsmusthaveobjectivityinthescoringandininterpretingtheresults.Nopersonalfactorshouldaffectthescoringofthetest.Also,theinterpretationofthetestresultsshould beplainlyworededandeasytounderstand.

Finally,theresultsofthetestshouldmeanthesametoallthestudentsthattookpartinthetest.So,thereshouldbenopartialconfusion andnoambiguity.

Usability

Youcannotneglectthepracticalvalueofatest.Whendecidingonatest,considertheeaseofadministration,thetimerequiredtoadministerthetest,andhoweasyitistointerprettheresultof thetestandapplyit.

It must also be easy to use by all classroom teachers, so explicit instructions should be given.The test should have a specified time allocated to complete it and scores of the test should beeasyto interpret.

ConstructionofAchievementTest:

Anytestdesignedtoassesstheachievementinanysubjectwithregardtoasetofpredominated objectives

Majorstepsinvolvedintheconstructionofachievementtest

Planningoftest
PreparationofadesignforthetestPreparationoftheblueprintWritingofitems
PreparationoftheScoringkeyandmarkingschemePreparationof question-wiseanalysis

Planningoftest
BehavioralObjectivesofthetest
Determinethemaximumtimeandmaximummarks.

Preparationofadesignforthetest
ImportantfactorstobeconsideredindesignforthetestareWeightagetoobjectives
Weightagetocontent
WeightagetoformofquestionsWeightagetodifficultylevel.
Weightagetoobjectives
Thisindicateswhatobjectivesaretobetestedandwhatweightagehastobegiventoeach objective.

SI.No	Objectives	Marks	Percentage
1	Knowledge	3	12
2	Understanding	2	8
3	Application	6	24
4	Analysis	8	32
5	Synthesis	4	16
6	Evaluation	2	8
Total		**25**	**100**

WeightageofContent
Thisindicatesthevariousaspectsofthecontenttobetestedandtobegiventothesedifferentaspects

SI.No	Content	Marks	Percentage
1	Subtopic-1	15	60

2	Subtopic-2	10	40
Total		**25**	**100**

WeightagetoformofQuestions:Thisindicatestheformofquestionstobeincludedint hetestandtheweightagetobegivenforeachformofthequestions

Sl.No	**Formofquestions**	**No.ofQuestions**	**Marks**	**Percentage**
1	Objectivetype	14	7	28
2	Shortanswertype	7	14	56
3	Essaytype	1	4	16
Total		**22**	**25**	**100**

Weightagetodifficultylevel

Thisindicatesthetotalmarkandweightagetobegiventodifferentlevelofquestions.

Sl.No	**Formofquestions**	**Marks**	**Percentage**
1	Easy	5	20
2	Average	15	60
3	Difficult	5	20
Total		**25**	**100**

PreparationoftheBluePrint

BluePrintisathreedimensionalchartgivingtheplacementoftheobjectives,contentan dformof thequestions.

Objectives	**Knowledge**			**Under-standing**			**Application**			**Analysis**			**Synthesis**			**Evaluation**			**GrantTotal**
Form ofQtn	**O**	**SA**	**E**	**O**	**SA**	**E**	**O**	**SE**	**E**	**O**	**SA**	**E**	**O**	**SA**	**E**	**O**	**SA**	**E**	

Content																			
SubTopic-1	2 (4)			1 (2)			2 (4)	2 (1)				4 (1)		2 (1)			2 (1)		**15**
Sub Topic –2	1 (2)			1 (2)				2 (1)			4 (2)			2 (1)					**10**
TotalMarks	3	0	0	2	0	0	2	4	0	0	4	4	0	4	0	0	2	0	**25**
GrandTotal	**3**			**2**			**6**			**8**			**4**			**2**			

Note:O-Objectivetype,SA-shortanswertype,E-Essaytype

Thenumbersinsidethebracketindicatequestionnumberandoutsidebracketindicate marks.

WritingofItems

Preparationofthescoringkeyandmarkingscheme

InthecaseofObjectivetypeitemswheretheanswersareintheformofonewordorsymbolascoring keyand markingschemeis prepared.

Q.No	**Answer**	**Marks**
1	A	½
2	C	½
3	A	½
4	D	½
5	B	½

Inpreparingmarkingschemetheexaminerhastolistoutthevaluepointstobecrediteda ndfixup themarktobegiventoeachvaluepoint.

Q.No	**Valuepoints**	**Marks**	**TotalMarks**

1	Value Point – 1Value point – 2Valuepoint–3 Valuepoint–4	½ ½ ½ ½	**2**
2	Value Point – 1Value point – 2Valuepoint–3 Valuepoint–4	½ ½ ½ ½	**2**

PreparationofQuestion-wiseanalysis:

Q.No	**Content**	**Objectives**	**Form ofQuestions**	**DifficultyLevel**	**Marks**	**EstimatedTime (InMints)**
1	Subtopic–1	Knowledge	ObjectiveType	Easy	½	1
2	SubTopic–2	Understanding	ObjectiveType	Average	½	1
3	SubTopic–2	Application	ObjectiveType	Easy	½	1
4	SubTopic–1	Knowledge	ObjectiveType	Easy	½	1
5	SubTopic–2	Understanding	Objectivetype	Average	½	1
5	SubTopic–1	Analysis	Shortanswer	Average	2	3
6	SubTopic–1	Synthesis	ShortAnswer	Difficult	2	3

7	Subtopic–2	Application	Shortanswer	Easy	2	3
8	Subtopic–1	Analysis	Essay	Average	4	10

2. **DiagnosisTest** :

The process of determining the causes of educational difficulties is known as educational diagnosis. The scope of educational diagnosis is much larger than the use of tests and examinations. It is not proper to limit the scope of diagnosis to locating the causes that interfere with the ordinary academic prognosis of the pupils. An adequate diagnosis may involve the use of intelligence tests, both general and specific, and of diagnostic achievement types of laboratory apparatus for measuring sensory activity, co-ordination and the like. Other forms of appraisal such as rating scales, controlled observation, questionnaires and interviews can also be used for diagnosis in education

Importance of diagnosis

* A satisfactory level of diagnosis can be reached when the teacher has gained sufficient insight into the nature of the child's problem and enables him/her to plan appropriate corrective instruction.
* For attaining maximum effectiveness in teaching, diagnosis of a child's learning difficulties should be made as early as possible.
* When the nature, extent and causes of a child's retardation and acceleration are known, together with data on his/her capacity for learning, effective developmental or corrective teaching can be planned.

Monroe (1965) suggested two major aspects of diagnosis in teaching. They are:
(i) Determination of the extent to which desirable educational objectives are achieved.
(ii) Identification of factors that may be interfering with the optimum growth of the individual.
Diagnosis is an understanding of a present situation in terms of its causes, what has brought it about or in terms of what it will cause.

Ross(1956) suggested the five levels of diagnosis. They are:
(i) Who are the pupils having problem?
(ii) Where are the errors located?
(iii) Why did the errors occur?
(iv) What remedies are suggested?

(v) How can the errors be prevented?
The first four are grouped as corrective diagnosis and the fifth one is known as preventive diagnosis.

DIAGNOSTIC TEST

➤ Thorndike and Hagen (1970) suggested that a diagnostic test should provide a detailed picture of the strengths and Weaknesses of a pupil in a particular area. Any test that yields more than a single overall score is diagnostic.
Diagnosis has become an essential phase of developing plans of adaptational instruction to individual differences.

DIAGNOSTIC TEST

A diagnostic test is a test designed to locate specific learning deficiencies in case of specific individuals at a specific stage of learning so that specific efforts could be made to overcome those deficiencies.
➤ It helps the teachers in identifying the status of learner at the end of a particular lesson, unit or course of learning as to what specific teaching or learning points have been properly grasped by the learners.
DIAGNOSTIC VS ACHIEVEMENT TEST
In an achievement test, sampling of questions is not so exhaustive to cover each and every learning point as the content is generally large portion; whereas in a diagnostic test each learning point has several items, each cluster of such items forming a subset.

CHARACTERISTICS DIAGNOSIS

The following are the characteristics of educational diagnosis.
The diagnosis is essentially the task of locating more specifically those factors which bear more causal relation to the progress of learning of a pupil or a group of pupils. If educational diagnosis is to be a handmade to effective teaching.
The essence of educational diagnosis is the identification of some of the causes of learning difficulty and some of the potential educational assets so that, by giving proper attention to these factors, more effective learning may result.

Objective
Validity:
Validity refers to the evidence of causal factors to the attainment of the objectives. Investigations have shown that the attempt to diagnose children's difficulties in arithmetic by inspection of the test papers was reasonably valid

for detecting kinds of examples that they could or could not solve correctly but the method was not valid for determining the mental processes involved in the children's method of work. This shows that a method of diagnosis may be valid for discovering certain factors while not valid for determining other factors
Objectivity
Third characteristic of a satisfactory diagnosis is its objectivity. The elimination of widely varying personal judgments in diagnosis is essential if diagnostic procedures are to be used with any degree of precision. ReliabilityIncrease in reliability is related to the decrease in the fluctuation in conclusion that can be secured by providing a more adequate and representative sample of pupil reaction upon which the conclusions are based. The improvement of the reliability of any diagnosis involves the utilization of a more satisfactory sample ofpupil reaction as a basis for the diagnosis.

Level of Diagnosis
A diagnosis that locates only a very general area is obviously less useful than that defies the mistakes more precisely
Comparability
An interpretation of the results of a diagnosis usually rests upon the experience with similar data. Hence, diagnostic procedures that give comparable results are basic to intelligent interpretation. The progress of the pupil over a period of time is basic to the appraisal of the effect of remedial teaching.

Exactness
Some diagnostic tests give only vague results. Diagnostic test may be tried with typical classes to discover their exactness. The exactness may be increased by analysing the characteristics of the progress in learning more minutely and utilizing the symptom thus identified as the base of the diagnosis.

Comprehensiveness
Teachers make a very minute diagnosis in certain limited aspects of pupil activity and no diagnosis at all in other aspects. 'This incompleteness is dangerous because the attention of teacher and learner is apt to be directed primarily towards those things for which a thorough diagnosis has been made

Appropriateness
Certain desirable changes in boys and girls usually develop under a wide variety of educational environments without the necessity of giving very specific treatment. These are the changes that we consider characteristics of maturity. For such cases, an educational diagnosis is unnecessary and inappropriate. Any satisfactory diagnosis must be appropriate to the programme.

Practicability

Many of the most valid and reliable diagnostic procedures that have been developed are impracticable for use in all schools. New diagnostic procedures need to be developed that meet the other qualifications of a satisfactory diagnosis and that at the same time are capable of extensive use under school conditions.

Qualified Diagnosticians

A satisfactory diagnosis usually requires educational diagnosticians who are well qualified. The educational diagnostician, be he a specialist or a teacher, must understand the educational programme in connection with which the diagnosis is being made.

cook(1958:) has stated the following characteristics of an effective diagnostic test.

* Diagnostic test is specific type of test
* These are prepared by experts.
* It should be an integral part of the curriculum, emphasizing and clarifying the important objectives.
* It's test items should require response to be made to situation approximating as closely as possible to be functional
* It must be based on experimental evidence of learning difficulties
* It should reveal the mental processes of the learner sufficiently to detect point of error.
* It should suggest or provide specific remedial procedures for each error detected
* It should be designed to cover a long sequence of learning systematically
* It should be designed to check forgetting by constant review of difficult elements as well as to detect faulty learning
* It should reveal pupil's progress in objective terms.

3. Standardised Test

Meaning of Standardised Test:

Standardised tests are carefully constructed tests which have uniformity of procedure in scoring, administering and interpreting the test results. A standardised test is generally made by a professional tester or a group of testers.

Standardized tests are not restricted to use in a school or a few schools but to larger population, so that many schools can use such types of tests to assess their own performance etc. in relation to others and the general population for which the test has been standardised.

Generally these tests are "norm-referenced tests that measure the pupils' level of

achievement in various content and skill areas by comparing their test performance with the performance of other pupils in some general reference group."

C.V. Good:

A standardised test is a test for which content has been selected and checked empirically, for which norms have been established, for which uniform methods of administering and scoring have been developed and which may be scored with a high degree of objectivity.

V.H. Noll:

A standardised test is one that has been carefully constructed by experts in the light of acceptable objectives or purposes; procedure for administering, scoring and interpreting scores are specified in detail so that no matter who gives the test or where it may be given,the result should be comparable; and norms or average for different age or grade levels have been pre-determined.
Sometimes standardised tests are misunderstood and equated with provision of norms. It is not correct. Standardisation of a test is nowadays explained in more wide terms, though norms existence is a distinctive feature of a standardised test which help in the interpretation of the results.
It requires more thinking, planning, exact preparation, scoring, analysis and refinement. It is a complex and multidimensional work.
Standardised tests are those tests which are constructed by individual or by a group of individuals and are being processed and universalised for all the situations and for all the purposes.
A standardised test is widely acclaimed if its content is carefully designed, carefully phrased and simultaneously pretested. Standardised tests are prepared not for a particular local situation but for all the situations inside and outside the educational institutions.

Astandardised test is one which passes through the following process:

(i) Standardisation of the content and questions:
Due weightage is given to the content and objectives. Items are to be prepared according to the blue-print. Relevant items are included and irrelevant items are omitted, giving due consideration to item difficulty and discriminating value. Internal consistency is also taken into account.
(ii) Standardisation of the method of administration:
Procedure of test administration, conditions for administration, time allowed for the test etc., are to be clearly stated.
(iii) Standardisation of the scoring procedure:

To ensure objective and uniform scoring, the adequate scoring key and detailed instruction for method of scoring is to be provided.
(iv) Standardisation of interpretation:
Adequate norms to be prepared to interpreted the results. Test is administered over a large sample (representative one). Test scores are interpreted with reference to norms. Derivation of norms is an integral part of the process of standardisation.

Characteristics of Standardised Tests:

Some characteristics of these tests are:

1. They consist of items of high quality. The items are pretested and selected on the basis of difficulty value, discrimination power, and relationship to clearly defined objectives in behavioural terms.
2. As the directions for administering, exact time limit, and scoring are precisely stated, any person can administer and score the test.
3. Norms, based on representative groups of individuals, are provided as an aid for interpreting the test scores. These norms are frequently based on age, grade, sex, etc.
4. Information needed for judging the value of the test is provided. Before the test becomes available, the reliability and validity are established.
5. A manual is supplied that explains the purposes and uses of the test, describes briefly how it was constructed, provides specific directions for administering, scoring, and interpreting results, contains tables of norms and summarizes available research data on the test.

No two standardized tests are exactly alike. Each test measures certain specific aspects of behaviour and serves a slightly different purpose. There are some tests with similar titles measuring aspects of behaviour that differ markedly, whereas other tests with dissimilar titles, the measure the aspects of behaviour that are almost identical. Thus, one has to be careful in selecting a standardised test.

Uses of Standardised Tests:

1. Standardised test assesses the rate of development of a student's ability. It provides a basis for ascertaining the level of intellectual ability-strength and weakness of the pupils.
2. It checks and ascertains the validity of a teacher-made test.
3. These tests are useful in diagnosing the learning difficulties of the students.
4. It helps the teacher to know the casual factors of learning difficulties of the students.
5. Provides information's for curriculum planning and to provide remedial coaching for educationally backward children.
6. It also helps the teacher to assess the effectiveness of his teaching and

school instructional programmes.

7. Provides data for tracing an individual's growth pattern over a period of years.
8. It helps for organising better guidance programmes.
9. Evaluates the influences of courses of study, teacher's activities, teaching methods and other factors considered to be significant for educational practices.

Unit-3

3.1. Nature of data :- grouped and ungrouped

ungrouped data

When the data has not been placed in any categories and no aggregation/summarization has taken placed on the data then it is known as ungrouped data. Ungrouped data is also known as raw data.

grouped data

When raw data have been grouped in different classes then it is said to be grouped data.

For example, consider the following :

Height of students:
(171,161,155,155,183,191,185,170,172,177,183,190,139,149,150,150,152,158,159,174,178,179,190,170,143,165,167,187,169,182,163,149,174,174,177,181,170,182,170,145,143): This is raw/ungrouped data.

The following table shows the grouped data from the above mentioned raw data

Height Intervals(in cms)	No of students(F)	Class Midpoint(M)	F*M	Cummulative Frequency
131-140	1	135	135	1
141-150	7	145	1015	8
151-160	5	155	775	13
161-170	9	165	1485	21
171-180	9	175	1575	30
181-190	10	185	1850	41
Total	41		6835	

Mean(F*M/F) = 166.70

Before we study more about grouped and ungrouped data it is important to understand what do we mean by "**Central Tendencies**"?

As the names suggest, central tendencies have something to do with the center. Central tendency is the central location in a probability distribution. There are many measures for central tendencies like mean, mode, median, interquartile range, percentiles, geometric mean, harmonic mean, etc. The most common measures of central tendencies used are discussed below.

Understanding the measures of central tendencies of ungrouped data.

(i) MODE: The most frequently occurring item/value in a data set is called mode. Bimodal is used in the case when there is a tie b/w two values. Multimodal is when a given dataset has more than two values with the same occurring frequency.

eg 7,11,14.25,15,15,15,15,15,19,19,29,81. Mode is 15

(ii)MEDIAN: The median of a dataset is described as the middlemost value in the ordered arrangement of the values in the dataset.

NOTE: For an odd number of the dataset, the median is the middle value. For an even number of the dataset, the median is the average of the two middle values.

eg 15,11,14,3,21,17,22,16,19,16,5,7,9,20,4

Let's arrange this data in ascending order

3,4,5,7,8,9,11,14,15,16,16,17,19,19,20,22,22. The median is n+1/2 = 17+1/2 = 18/2 = 9

Advantage of Median : It is not influenced by larger values. It remain immune to outliers.

"The data must be at least ordinal for the median to be meaningful"

(iii)MEAN: Also known as the arithmetic average. It is calculated by the summation of all values divided by the number of values.

eg, The mean of "15,11,14,3,21,17,22,16,19,16,5,7,9,20,4" is 13.26667.

(iv)PERCENTILE: This form of central tendency divides a group of data into 100 parts. The nth percentile of a dataset is described as

n values below that “nth value” and (100-n) values above that “nth value”.

Now, let’s see how to calculate percentiles.

STEP 1: Arrange the data in ascending order.

STEP 2: The ith percentile location is :

$i = (P/100)*N$

i: percentile position

N: total no. in the dataset

P: the percentile of interest.

STEP: Determining the location by either (a) or (b)

(a) If ‘i’ be a whole number, then the percentile is at average the ‘i’ and ‘i+1’ position.

(b) If ‘i’ is not a whole number, then percentile value is at ‘i+1’ position.

eg. Suppose we want to determine the 70th percentile of 1450 numbers.

i = (70/100)*1450

i = 1015

P = 1015th number + 1016th number/2

(v) QUARTILE: This form of central tendency divides a group into four sub-parts.

First Quartile =25th percentile

Second Quartile =50th percentile

Third Quartile = 75th percentile

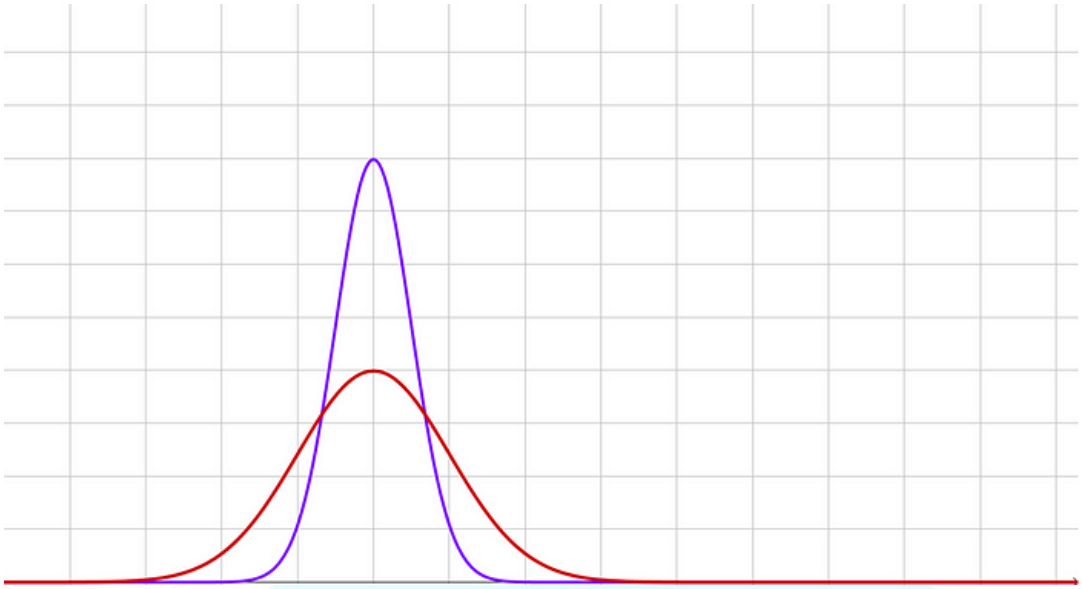
Fourth Quartile = 100th percentile.

NOTE: The second quartile is equal to the median of the data.

Understanding the measures of variability of ungrouped data.

The measure of variability describes the spread or scatter of the dataset.

NOTE: The variability aspect of any data enables us to a better description of the data.



Both curves have the same mean but their scatter is different.

(i) RANGE: The difference b/w the largest value and the smallest value in a dataset is called the range of the dataset. The range is also a representation of the end/extreme values.

Range helps in the construction of control charts on the data.

(ii) INTERQUARTILE RANGE: The interquartile range is the difference b/w the first and third quartile.

It comes in handy because users are more interested in the middle values than the extreme ends.

(iii) MEAN ABSOLUTE DEVIATION: It is the average of the absolute values of deviations around the mean of the dataset.

X	X-Mean	|X-Mean|
2	-7.4	7.4
5	-4.4	4.4
7	-2.4	2.4
15	5.6	5.6
18	8.6	8.6
MEAN = 9.4		28.4
Mean Absolute Deviation = |X-Mean|/n = 5.68		

(iv) VARIANCE: It is the square of deviations about the arithmetic mean for a set of numbers.

X	X-Mean	|X-Mean|	(|X-Mean|)^2
2	-7.4	7.4	54.76
5	-4.4	4.4	19.36
7	-2.4	2.4	5.76
15	5.6	5.6	31.36
18	8.6	8.6	73.96
MEAN = 9.4		28.4	185.2
Variance = (X-Mean)^2/n = 37.04			

NOTE: The final result is expressed in terms of the squared unit of measurement.

(v) STANDARD DEVIATION: It is the square root of the variance.

eg, the standard deviation of the data in the above example is 6.086

NOTE: Standard deviations are used in computing confidence intervals and hypothesis testing. The standard deviation has the same unit as the raw data.

“The real usage of standard deviation can be understood through the Empirical rule and Chebyshev’s Theorem. Both will be discussed in detail in coming up blogs”

(vi) COEFFICIENT OF VARIATION: It is the ratio of the standard deviation to the mean of the data.

eg The coefficient of variation in the above example is (6.086/9.4)*100=64.7.

Calculating measures of central tendencies of grouped data.

Consider the following data:

Class Interval	Frequency(f)	Class Midpoint(m)	f*m	Cummulative Frequency
1 to 3	4	2	8	4
3 to 5	12	4	48	16
5 to 7	13	6	78	29
7 to 9	19	8	152	48
9 to 11	7	10	70	55
11 to 13	5	12	60	60

Mean = $\sum fx/n = 6.93$

Median = $i+(N/2 — C.W)/MED = 7.105$

Mode = The mode of group data is the frequency of the modal class. The max frequency in the above example is for intervals 7to9 i.e 19. Hence, the mode is 8

Abbreviations :
f: frequency
N: total frequency
CW: class width

i: initial point(N/2 will give us the location of the median value, i.e 30 in the above example). 29 entries will fit up to class interval “7 to 9”. Hence, the value of ‘i’ is 7.

MED: the frequency of the class where the median exists. For the above example the value of MED=19.

2.1. Frequency Distribution

Assume you are collecting the data about weights of all students in your class. Definitely, there will be many students that share the same weight. In such a case, we can say that some weight values occur frequently. Thus we can construct a statistical frequency series out of this data according to a frequency distribution.

Frequency Series

A frequency distribution is the part of a broader type of statistical series, which is frequency series. A frequency series is simply a series that contains frequency. Before discussing a frequency series, there are certain terms of absolute importance which are as follows:

Frequency

Frequency is basically the number of times a data item occurs in the series. In other words, it deals with how frequent a data item is in the series. For example, if the weight of 5 students in a class is exactly 65 kg, then the frequency of data item 65kg is 5.

Class Frequency

Generally, we construct various classes that have a range of values from the data. The class frequency is the number of times the items corresponding to a class interval repeat in the series. In simple words, it is the frequency of a class. For example, if there are 10 students weighing 50-60 kg, then the class frequency for the class 50-60 is 10.

Tally Bars

We generally use tally bars to count the frequency in a series. Whenever an item occurs in a series, it is represented by a '|'. This is an item occurs 4 times then it is represented as ||||. One important point to remember is that we represent the fifth occurrence by crossing the four tally bars. This is the four and cross method.

- **Discrete Series or Frequency Array:** In this type, there are no class intervals with a specific range of data items. Instead, there are data items with their exact value and corresponding frequency. Definitely, we use this when the data collected is very small.

Weight	Tally bars	Frequency
50					3
67			1
79			1

- **Frequency Distribution:** Here, we mention various class intervals with a range of values for data intervals with their respective class frequencies. We will be studying further about this below.

Frequency Distribution

In a frequency distribution series, we make use of various class intervals to represent the range of values of the data under consideration. The class intervals are framed according to the lowest and maximum value of the given data. Also, these class intervals have an upper and lower value.

Whenever an item occupies the range between upper and lower values of a class interval, it is written against the corresponding class interval using a tally bar.

Further, a major difference between frequency array and frequency distribution series is that in frequency array the X-variable or the basis of classification (weight of students in our example) generally assumes discrete values. Whereas, in a frequency distribution, the X-variable or the basis of classification assumes continuous values.

Weight	Tally bars	Frequency
40-50	||	2
50-60	||||	4
60-70	|||	3

Types of Frequency Distribution

The frequency distribution is further classified into five. These are:

Exclusive Series

In such a series, for a particular class interval, all the data items having values ranging from its lower limit to just below the upper limit are counted in the class interval. In other words, we do not include the items that have values less than the lower limit, equal to the upper limit and greater than the upper limit.

Note that here the upper limit of a class repeats itself in the lower limit of the next interval. This is the most used type of frequency distribution.

Weight	Frequency
40-50	2
50-60	10
60-70	5
70-80	3

Inclusive Series

On the contrary to exclusive series, an inclusive series includes both its upper and lower limit. Of course, this means that we do not include the items with values less than the lower limit and greater than the upper limit.

Marks	Frequency
10-19	5
20-29	13
30-39	6

Open End Series

In an open-end series, the lower limit of the first class in the series and the upper limit of the last class in the series is missing. Instead, there is 'below the lower limit' of the first class and 'lower limit and above the lower limit' of the last class.

Age	Frequency
Below 5	4
5-10	6

10-20	10
20 and above	8

Cumulative Frequency Series

In a cumulative frequency series, we either add or subtract the frequencies of all the preceding class intervals to determine the frequency for a particular class. Further, the classes are converted into either ‘less than the upper limit’ or ‘more than the lower limit’.

Mid-Values Frequency Series

A mid-value frequency series is the one in which we have the mid values of class intervals and the corresponding frequencies. In other words, the mid values represent the range of a particular class interval. To determine the upper and lower limits of a class represented by its mid-value we can use the following formulas:

Lower Limit= m – (1\2)×i

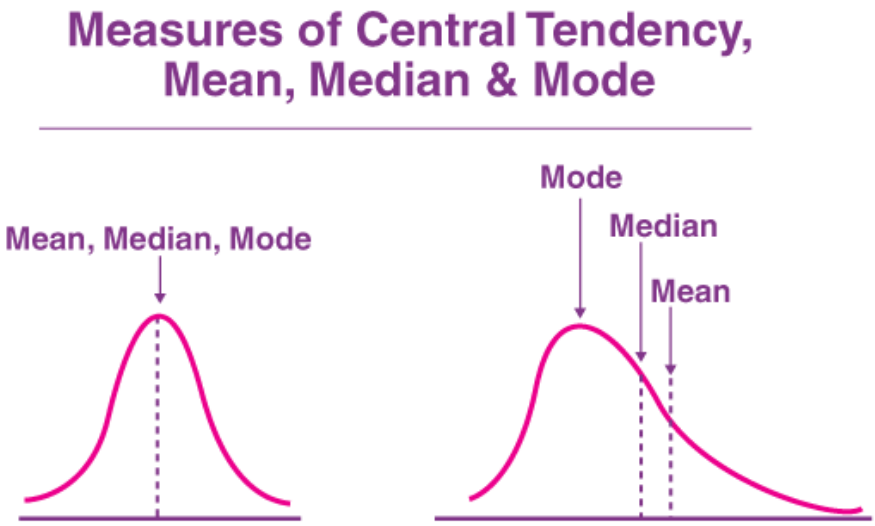
Upper Limit= m – (1\2)×i

Here, m= The mid value of the class

i= Difference between the mid-values

3.2. Measure of central tendency :

Introduction to Mean, Median and Mode: Often in statistics, we tend to represent a set of data by a representative value which would approximately define the entire collection. This representative value is called the measure of central tendency, and the name suggests that it is a value around which the data is centred. These central tendencies are mean, median and mode.



We are all interested in cricket but have you ever wondered during the match why the run rate of the particular over is projected and what does the run rate mean? Or, when you get your examination result card, you mention the aggregate percentage. Again what is the meaning of aggregate? All these quantities in real life make it easy to represent a collection of data in terms of a single value. It is called Statistics.

Statistics deals with the collection of data and information for a particular purpose. The tabulation of each run for each ball in cricket gives the statistics of the game. The representation of any such data collection can be done in multiple ways, like through tables, graphs, pie-charts, bar graphs, pictorial representation etc.

Now consider a 50 over ODI match going between India and Australia. India scored 370 runs by the end of the first innings. How do you decide whether India put a good score or not? It's pretty simple, right; you find the overall run rate, which is good for such a score. Thus, here comes the concept of mean, median and mode in the picture. Let us learn in detail each of the central tendencies.

Measures of central tendency

The measures of central tendencies are given by various parameters but the most commonly used ones are mean, median and mode. These parameters are discussed below.

What is Mean?

Mean is the most commonly used measure of central tendency. It actually represents the average of the given collection of data. It is applicable for both continuous and discrete data.

It is equal to the sum of all the values in the collection of data divided by the total number of values.

Suppose we have *n* values in a set of data namely as x_1, x_2, x_3, …, x_n, then the mean of data is given by:

$x^{-}=x1+x2+x3+……..+xnn$

It can also be denoted as:

$x^{-}=\sum i=1nxin$

For grouped data, we can calculate the mean using three different methods of formula.

Direct method	**Assumed mean method**	**Step deviation method**
Mean $x—=\sum i=1nfixi\sum i=1nfi$ Here, $\sum f_i$ = Sum of all frequencies	Mean $(x—)=a+\sum fidi\sum fi$ Here, a = Assumed mean $d_i = x_i – a$ $\sum f_i$ = Sum of all frequencies	Mean $(x—)=a+h\sum fiui\sum fi$ Here, a = Assumed mean $u_i = (x_i – a)/h$ h = Class size $\sum f_i$ = Sum of all frequencies

What is Median?

Generally median represents the mid-value of the given set of data when arranged in a particular order.

Median: Given that the data collection is arranged in ascending or descending order, the following method is applied:

- If number of values or observations in the given data is odd, then the median is given by $[(n+1)/2]^{th}$ observation.
- If in the given data set, the number of values or observations is even, then the median is given by the average of $(n/2)^{th}$ and $[(n/2)+1]^{th}$ observation.

The median for grouped data can be calculated using the formula,

$$Median = l + (N2 - cf f) \times h$$

What is Mode?

The most frequent number occurring in the data set is known as the mode.

Consider the following data set which represents the marks obtained by different students in a subject.

Name	Anmol	Kushagra	Garima	Ashwini	Geetika	Shakshi
Marks Obtained (out of 100)	73	80	73	70	73	65

The maximum frequency observation is 73 (as three students scored 73 marks), so the mode of the given data collection is 73.

We can calculate the mode for grouped data using the below formula:

$$Mode = l + (f1 - f02f1 - f0 - f2) \times h$$

Mean Median and Mode

2,276

Measure of Central Tendency for an Ungrouped Data

1,516

Example of Mean, Median and Mode

Let us see the difference between the mean median and mode through an example.

Example: The given table shows the scores obtained by different players in a match. What is mean, median and mode of the given data?

S.No	Name	Runs Scored
1	Sachin	80
2	Yuvraj	52
3	Virat	40
4	Sehwag	52
5	Rohit	70
6	Harbhajan	1
7	Dhoni	6

Solution:

i) The mean is given by:

$x^{-}=\sum i=1nn$
$x^{-}=80+52+40+52+70+1+67$
$x^{-}=43$
The mean of the given data is 43.

ii) To find out the median let us first arrange the given data in ascending order

Name	Harbhajan	Dhoni	Virat	Yuvraj	Sehwag	Rohit	Sachin
Runs	1	6	40	52	52	70	80

As the number of items in the data is odd. Hence, the median is $[(n+1)/2]^{th}$ observation.

$\Rightarrow$ Median = $[(7+1)/2]^{th}$ observation = 52

iii) Mode is the most frequent data, which is 52.

Relation of Mean Median Mode

The relation between mean, median and mode that means the three measures of central tendency for moderately skewed distribution is given the formula:

Mode = 3 Median – 2 Mean

This relation is also called an empirical relationship. This is used to find one of the measures when the other two measures are known to us for certain data. This relationship is rewritten in different forms by interchanging the LHS and RHS.

Range

In statistics, the range is the difference between the highest and lowest data value in the set. The formula is:

Range – Highest value – Lowest value

Solved Problem

Question: Find the mean, median, mode and range for the given data:

90, 94, 53, 68, 79, 94, 53, 65, 87, 90, 70, 69, 65, 89, 85, 53, 47, 61, 27, 80

Solution:

Given,

90, 94, 53, 68, 79, 94, 53, 65, 87, 90, 70, 69, 65, 89, 85, 53, 47, 61, 27, 80

Number of observations = 20

Mean = (Sum of observations)/ Number of observations

= (90 + 94 + 53 + 68 + 79 + 94 + 53 + 65 + 87 + 90 + 70 + 69 + 65 + 89 + 85 + 53 + 47 + 61 + 27 + 80)/20

= 1419/20

= 70.95

Therefore, mean is 70.95.

Median:

The ascending order of given observations is:

27, 47, 53, 53, 53, 61, 65, 65, 68, 69, 70, 79, 80, 85, 87, 89, 90, 90, 94,94

Here, n = 20

Median = 1/2 [(n/2) + (n/2 + 1)]th observation

= 1/2 [10 + 11]th observation

= 1/2 (69 + 70)

= 139/2

= 69.5

Thus, the median is 69.5.

Mode:

The most frequently occurred value in the given data is 53.

Therefore, mode = 53

Range = Highest value – Lowest value

= 94 – 27

= 67

Practice Questions

1. The points scored by a Kabaddi team in a series of matches are as follows:
   17, 2, 7, 27, 15, 5, 14, 8, 10, 24, 48, 10, 8, 7, 18, 28
   Find the mean, median and mode of the points scored by the team.
2. The following observations have been arranged in ascending order. If the median of the data is 63, find the value of x. 29, 32, 48, 50, x, x + 2, 72, 78, 84, 95
3. A survey conducted on 20 households in a locality by a group of students resulted in the following frequency table for the number of family members in a household:

family size	1 – 3	3 – 5	5 – 7	7 – 9	9 – 11
Number of families	7	8	2	2	1

Find the mode of this data.

Unit-3.3. Measure Of Dispersion :- Average , Standard Deviation

contents

- Introduction Of measures of dispersion.
- Definition of Dispersion.
- Range
- Quartile deviation.
- Mean deviation.
- Standard deviation.
- Variance.
- Coefficient of variance.
- Summary.
- References.

INTRODUCTION

- The Measures of central tendency gives us a birds eye view of the entire data they are called averages of the first order,
- it serve to locate the centre of the distribution but they do not reveal how the items are spread out on either side of the central value.
- The measure of the scattering of items in a distribution about the average is called dispersion.

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- The measures of dispersion are also called averages of the second order because they are based on the deviations of the different values from the mean or other measures of central tendency which are called averages of the first order.

Introduction

- So far we have looked at ways of summarising data by showing some sort of average (central tendency).
- But it is often useful to show how much these figures differ from the average.
- This measure is called **dispersion**.

DEFINITION

- In the words of Bowley "Dispersion is the measure of the variation of the items"

According to Conar "Dispersion is a measure of the extent to which the individual items vary"

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Purpose of Measuring Dispersion

- A measure of dispersion appears to serve two purposes.
- First, it is one of the most important quantities used to characterize a frequency distribution.
- Second, it affords a basis of comparison between two or more frequency distributions.
- The study of dispersion bears its importance from the fact that various distributions may have exactly the same averages, but substantial differences in their variability.

- *Measures of dispersion* are descriptive statistics that describe how similar a set of scores are to each other
  - The more similar the scores are to each other, the lower the measure of dispersion will be
  - The less similar the scores are to each other, the higher the measure of dispersion will be
  - In general, the more spread out a distribution is, the larger the measure of dispersion will be

Measures of dispersion

- *There are ways of showing dispersion:*
  - Range
  - Inter-quartile range
  - Semi- interquartile range (quartile deviation)
  - Coefficient of quratile deviation
  - Mean deviation
  - Standard deviation
  - Variance
  - Coefficient of variation

The Range

- The *range* is defined as the difference between the largest score in the set of data and the smallest score in the set of data, $X_L - X_S$

- What is the range of the following data:
  4 8 1 6 6 2 9 3 6 9

- The largest score (X_L) is 9; the smallest score (X_S) is 1; the range is $X_L - X_S = 9 - 1 = 8$

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When To Use the Range

- The range is used when
  - you have ordinal data or
  - you are presenting your results to people with little or no knowledge of statistics
- The range is rarely used in scientific work as it is fairly insensitive
  - It depends on only two scores in the set of data, X_L and X_S
  - Two very different sets of data can have the same range:
    1 1 1 1 9 vs 1 3 5 7 9

The Inter-Quartile Range

- The inter-quartile range is the range of the middle half of the values.
- It is a better measurement to use than the range because it only refers to the middle half of the results.
- Basically, the extremes are omitted and cannot affect the answer.

Example

- To calculate the inter-quartile range we must first find the **quartiles**.
- There are three quartiles, called Q1, Q2 & Q3. We do not need to worry about Q2 (this is just the median).
- Q1 is simply the middle value of the bottom half of the data and Q3 is the middle value of the top half of the data.

Example

- We calculate the **inter quartile** range by taking Q1 away from Q3 (**Q3 – Q1**).

Remember data must be placed in order

10 – 25 – 45 – 47 – 49 – 51 – 52 – 52 – 54 – 56 – 57 – 58 – 60 – 62 – 66 – 68 – 70 - 90

Because there is an even number of values (18) we can split them into two groups of 9.

Q1

IR = Q3 - Q1 , IR = 62 - 49. IR = 13

Q3

QUARTILE DEVIATION

- It is the second measure of dispersion, no doubt improved version over the range. It is based on the quartiles so while calculating this may require upper quartile (Q_3) and lower quartile (Q_1) and then is divided by 2. Hence it is half of the deference between two quartiles it is also a semi inter quartile range.

The formula of Quartile Deviation is

- $(Q\ D) = \frac{Q_3 - Q_1}{2}$

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The Semi-Interquartile Range

- The *semi-interquartile range* (or *SIR*) is defined as the difference of the first and third quartiles divided by two
  - The first quartile is the 25^{th} percentile
  - The third quartile is the 75^{th} percentile
- $SIR = (Q_3 - Q_1) / 2$

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COFFICIENT OF QURATILE DEVIATION

- The relative measure of dispersion corrsponding to quartile deviation is known as the cofficent of quartile deviation.
- QD =Q3-Q1/Q3+Q1
- This will be always less than one and will be positive as Q3>Q1.
- Smaller value of cofficient of QD indicates lesser variability.

MEAN DEVIATION

- Mean Deviation is also known as average deviation. In this case deviation taken from any average especially Mean, Median or Mode. While taking deviation we have to ignore negative items and consider all of them as positive. The formula is given below

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MEAN DEVIATION

The formula of MD is given below

$$MD = \frac{\Sigma d}{N}$$ (deviation taken from mean)

$$MD = \frac{\Sigma m}{N}$$ (deviation taken from median)

$$MD = \frac{\Sigma z}{N}$$ (deviation taken from mode)

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STANDARD DEVIATION

- The concept of standard deviation was first introduced by Karl Pearson in 1893. The standard deviation is the most useful and the most popular measure of dispersion. Just as the arithmetic mean is the most of all the averages, the standard deviation is the best of all measures of dispersion.

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STANDARD DEVIATION

- The standard deviation is represented by the Greek letter (sigma). It is always calculated from the arithmetic mean, median and mode is not considered. While looking at the earlier measures of dispersion all of them suffer from one or the other demerit i.e.
- Range –it suffer from a serious drawback considers only 2 values and neglects all the other values of the series.

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STANDARD DEVIATION

- Quartile deviation considers only 50% of the item and ignores the other 50% of items in the series.
- Mean deviation no doubt an improved measure but ignores negative signs without any basis.
- Karl Pearson after observing all these things has given us a more scientific formula for calculating or measuring dispersion. While calculating SD we take deviations of individual observations from their AM and then each squares. The sum of the squares is divided by the number of observations. The square root of this sum is knows as standard deviation.

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MERITS OF STANDARD DEVIATION

- Very popular scientific measure of dispersion
- From SD we can calculate Skewness, Correlation etc
- It considers all the items of the series
- The squaring of deviations make them positive and the difficulty about algebraic signs which was expressed in case of mean deviation is not found here.

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DEMERITS OF STANDARD DEVIATION

- Calculation is difficult not as easier as Range and QD
- It always depends on AM
- It cannot be calaulated for quliatative data.

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Standard Deviation

- The standard deviation is one of the most important measures of dispersion. It is much more accurate than the range or inter quartile range.

- It takes into account all values and is not unduly affected by extreme values.

What does it measure?

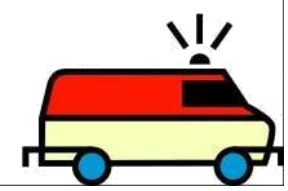
- It measures the **dispersion** (or **spread**) of **figures around the mean**.

- A **large number** for the standard deviation means there is a **wide spread** of values around the mean, whereas a **small number** for the standard deviation implies that the values are grouped **close together** around the mean.

The formula

$$\sigma = \sqrt{\{\sum (x - \ddot{x})^2 / n\}}$$

This is the symbol for the standard deviation



Standard Deviation

- Standard deviation is the positive square root of the mean-square deviations of the observations from their arithmetic mean.

Population

$$\sigma = \sqrt{\frac{\sum (x_i - \mu)^2}{N}}$$

Sample

$$s = \sqrt{\frac{\sum (x_i - \bar{x})^2}{N-1}}$$

$$SD = \sqrt{\text{variance}}$$

Standard Deviation for Group Data

- SD is : $$s = \sqrt{\frac{\sum f_i (x_i - \bar{x})^2}{N}}$$ Where $$\bar{x} = \frac{\sum f_i x_i}{\sum f_i}$$

- Simplified formula

$$s = \sqrt{\frac{\sum fx^2}{N} - \left(\frac{\sum fx}{N}\right)^2}$$

example

- We are going to try and find the standard deviation of the minimum temperatures of 10 weather stations in Britain on a winters day.

The temperatures are:

5, 9, 3, 2, 7, 9, 8, 2, 2, 3 (°Centigrade)

To calculate the standard deviation we construct a table like this one:

x	$\ddot{x}$	$(x - \ddot{x})$	$(x - \ddot{x})^2$
$\sum x =$ $\ddot{x} = \sum x/n =$			$\sum(x - \ddot{x})^2 =$ $\sum(x - \ddot{x})^2/n =$ $\sqrt{\sum(x - \ddot{x})^2/n} =$

There should be enough space here to fit in the number of values. Eg: there are 10 temperatures so leave 10 lines.

x = temperature --- $\ddot{x}$ = mean temperature --- $\sqrt{}$ = square root
$\sum$ = total of --- ^{2} = squared --- n = number of values

Next we write the values (temperatures) in column x (they can be in any order).

x	$\ddot{x}$	$(x - \ddot{x})$	$(x - \ddot{x})^2$
5 9 3 2 7 9 8 2 2 3			
$\sum x =$ $\ddot{x} = \sum x/n =$			$\sum(x - \ddot{x})^2 =$ $\sum(x - \ddot{x})^2/n =$ $\sqrt{\sum(x - \ddot{x})^2/n} =$

x = temperature --- $\ddot{x}$ = mean temperature --- $\sqrt{}$ = square root
$\sum$ = total of --- ^{2} = squared --- n = number of values

Add them up (∑x)

Calculate the mean (ẍ)

x	ẍ	(x - ẍ)	(x - ẍ)²
5 9 3 2 7 9 8 2 2 3			
∑x = 50 ẍ = ∑x/n = 50/10 = 5			∑(x - ẍ)² = ∑(x - ẍ)²/n = √∑(x - ẍ)²/n =

x = temperature --- ẍ = mean temperature --- √ = square root
∑ = total of --- ² = squared --- n = number of values

Write the mean temperature (ẍ) in every row in the second column.

x	ẍ	(x - ẍ)	(x - ẍ)²
5 9 3 2 7 9 8 2 2 3	5 5 5 5 5 5 5 5 5 5		
∑x = 50 ẍ = ∑x/n = 50/10 = 5			∑(x - ẍ)² = ∑(x - ẍ)²/n = √∑(x - ẍ)²/n =

x = temperature --- ẍ = mean temperature --- √ = square root
∑ = total of --- ² = squared --- n = number of values

now

Subtract each value (temperature) from the mean. It does not matter if you obtain a negative number.

x	ẍ	(x - ẍ)	(x - ẍ)²
5	5	0	
9	5	4	
3	5	-2	
2	5	-3	
7	5	2	
9	5	4	
8	5	3	
2	5	-3	
2	5	-3	
3	5	-2	
∑x = 50			∑(x - ẍ)² =
ẍ = ∑x/n = 50/10 = 5			∑(x - ẍ)²/n =
			√∑(x - ẍ)²/n =

x = temperature --- ẍ = mean temperature --- √ = square root

∑ = total of --- ² = squared --- n = number of values

and then

Square (²) all of the figures you obtained in column 3 to get rid of the negative numbers.

x	ẍ	(x - ẍ)	(x - ẍ)²
5	5	0	0
9	5	4	16
3	5	-2	4
2	5	-3	9
7	5	2	4
9	5	4	16
8	5	3	9
2	5	-3	9
2	5	-3	9
3	5	-2	4
∑x = 50			∑(x - ẍ)² =
ẍ = ∑x/n = 50/10 = 5			∑(x - ẍ)²/n =
			√∑(x - ẍ)²/n =

x = temperature --- ẍ = mean temperature --- √ = square root

∑ = total of --- ² = squared --- n = number of values

then

Add up all of the figures that you calculated in column 4 to get $\sum (x - \ddot{x})^2$.

x	$\ddot{x}$	$(x - \ddot{x})$	$(x - \ddot{x})^2$
5	5	0	0
9	5	4	16
3	5	-2	4
2	5	-3	9
7	5	2	4
9	5	4	16
8	5	3	9
2	5	-3	9
2	5	-3	9
3	5	-2	4
$\sum x =$ 50			$\sum (x - \ddot{x})^2 =$ 80
$\ddot{x} = \sum x/n =$ 50/10 = 5			$\sum (x - \ddot{x})^2/n =$
			$\surd\sum (x - \ddot{x})^2/n =$

x = temperature --- $\ddot{x}$ = mean temperature --- $\surd$ = square root
$\sum$ = total of --- ^{2} = squared --- n = number of values

and

Divide $\sum (x - \ddot{x})^2$ by the total number of values (in this case 10 – weather stations)

x	$\ddot{x}$	$(x - \ddot{x})$	$(x - \ddot{x})^2$
5	5	0	0
9	5	4	16
3	5	-2	4
2	5	-3	9
7	5	2	4
9	5	4	16
8	5	3	9
2	5	-3	9
2	5	-3	9
3	5	-2	4
$\sum x =$ 50			$\sum (x - \ddot{x})^2 =$ 80
$\ddot{x} = \sum x/n =$ 50/10 = 5			$\sum (x - \ddot{x})^2/n =$ 8
			$\surd\sum (x - \ddot{x})^2/n =$

x = temperature --- $\ddot{x}$ = mean temperature --- $\surd$ = square root
$\sum$ = total of --- ^{2} = squared --- n = number of values

finally

Take the square root (√) of the figure to obtain the standard deviation. (Round your answer to the nearest decimal place)

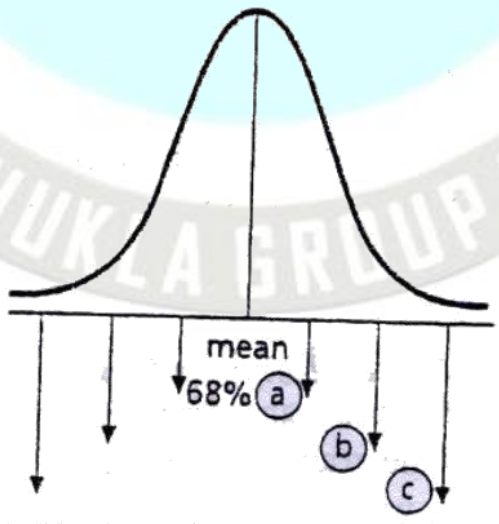
x	ẍ	(x - ẍ)	(x - ẍ)²
5	5	0	0
9	5	4	16
3	5	-2	4
2	5	-3	9
7	5	2	4
9	5	4	16
8	5	3	9
2	5	-3	9
2	5	-3	9
3	5	-2	4
∑x = **50** ẍ = ∑x/n = **50/10 = 5**			∑(x - ẍ)² = **80** ∑(x - ẍ)²/n = **8** √∑(x - ẍ)²/n =

x = temperature --- ẍ = mean temperature --- √ = square root
∑ = total of --- ² = squared --- n = number of values

Why?

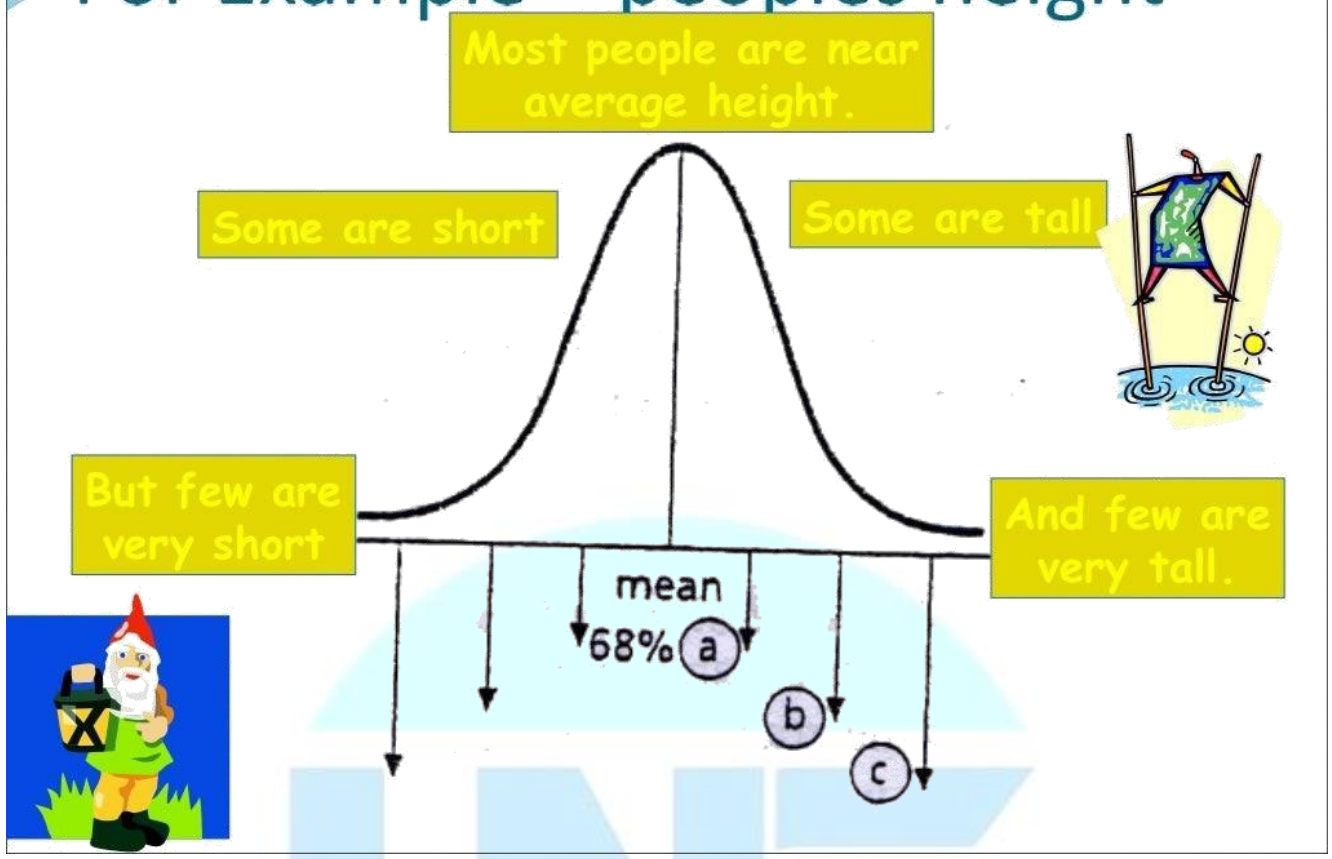
- Standard deviation is much more useful.
- For example our 2.8 means that there is a **68%** chance of the temperature falling within ± 2.8°C of the mean temperature of 5°C.
- That is **one** standard deviation away from the mean. Normally, values are said to lie between one, two or three standard deviations from the mean.

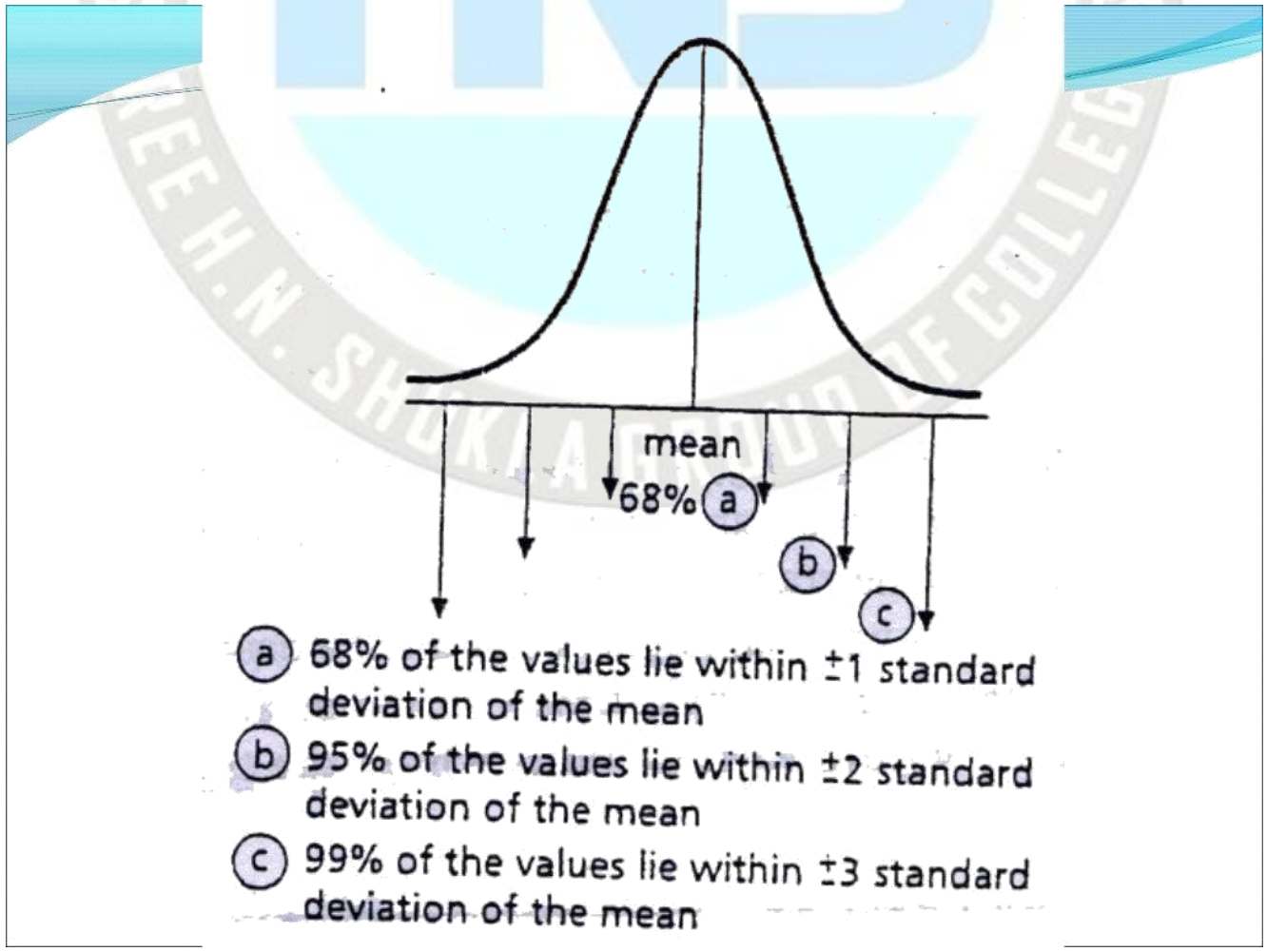
Where did the 68% come from?



- This is a normal distribution curve. It is a bell-shaped curve with most of the data cluster around the mean value and where the data gradually declines the further you get from the mean until very few data appears at the extremes.

For Example – peoples height

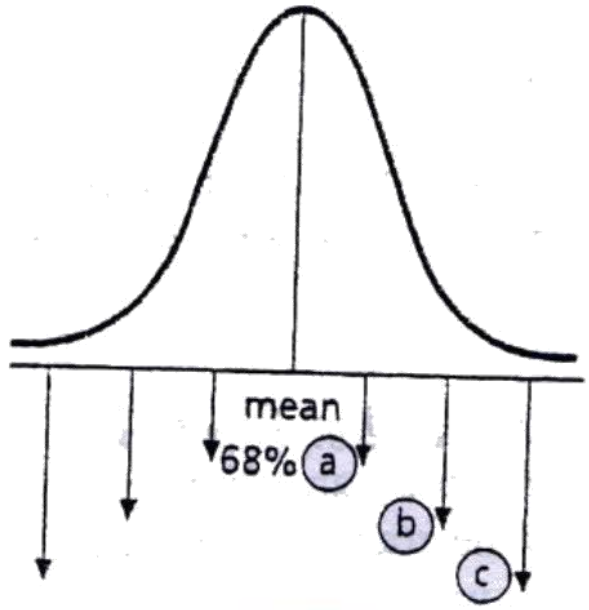




a 68% of the values lie within ±1 standard deviation of the mean

b 95% of the values lie within ±2 standard deviation of the mean

c 99% of the values lie within ±3 standard deviation of the mean



If you look at the graph you can see that most of the data (68%) is located within 1 standard deviation on either side of the mean, even more (95%) is located within 2 standard deviations on either side of the mean, and almost all (99%) of the data is located within 3 standard deviations on either side of the mean.

Example-1: Find Standard Deviation of Ungroup Data

Family No.	1	2	3	4	5	6	7	8	9	10
Size (x_i)	3	3	4	4	5	5	6	6	7	7

Here, $\bar{x} = \frac{\sum x_i}{n} = \frac{50}{10} = 5$

Family No.	1	2	3	4	5	6	7	8	9	10	Total
x_i	3	3	4	4	5	5	6	6	7	7	50
$x_i - \bar{x}$	-2	-2	-1	-1	0	0	1	1	2	2	0
$(x_i - \bar{x})^2$	4	4	1	1	0	0	1	1	4	4	20
x_i^2	9	9	16	16	25	25	36	36	49	49	270

$$s^2 = \frac{\sum (x_i - \bar{x})^2}{n-1} = \frac{20}{9} = 2.2, \qquad s = \sqrt{2.2} = 1.48$$

Example-2: Find Standard Deviation of Group Data

x_i	f_i	$f_i x_i$	$f_i x_i^2$	$x_i - \bar{x}$	$(x_i - \bar{x})^2$	$f_i (x_i - \bar{x})^2$
3	2	6	18	-3	9	18
5	3	15	75	-1	1	3
7	2	14	98	1	1	2
8	2	16	128	2	4	8
9	1	9	81	3	9	9
Total	10	60	400	-	-	40

$$\bar{x} = \frac{\sum f_i x_i}{\sum f_i} = \frac{60}{10} = 6 \qquad s^2 = \frac{\sum f (x_i - \bar{x})^2{}_i}{n-1} = \frac{40}{9} = 4.44$$

Variance

- *Variance* is defined as the average of the square deviations or square of standared deviation of set of observation

$$\sigma^2 = \frac{\sum (X - \mu)^2}{N}$$

What Does the Variance Formula Mean?

- Variance is the mean of the squared deviation scores
- The larger the variance is, the more the scores deviate, on average, away from the mean
- The smaller the variance is, the less the scores deviate, on average, from the mean

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The coefficient of variation

(This will seem easy compared to the standard deviation!)

Coefficient of variation

- The coefficient of variation indicates the spread of values around the mean by a percentage.

$$\text{Coefficient of variation} = \frac{\text{Standard Deviation} \times 100}{\text{mean}}$$

Things you need to know

- The **higher** the Coefficient of Variation the **more widely** spread the values are around the mean.
- The purpose of the Coefficient of Variation is to let us compare the spread of values between different data sets.

Example-: Comments on Children in a community

	Height	weight
Mean	40 inch	10 kg
SD	5 inch	2 kg
CV	0.125	0.20

- Since the coefficient of variation for weight is greater than that of height, we would tend to conclude that weight has more variability than height in the population.

SUMMARY

- The measures of variations are useful for further treatment of the Data collected during the study.
- The study of Measures of Dispersion can serve as the foundation for comparison between two or more frequency distributions.
- Standard deviation or variance is never negative.
- When all observations are equal, standared deviation is zero.
- when all observations in the data are increased or decreased by constant, standared deviation remains the same.

3.4.Correlation

Correlation refers to a process for establishing the relationships between two variables. You learned a way to get a general idea about whether or not two variables are related, is to plot them on a "scatter plot". While there are many measures of association for variables which are measured at the ordinal or higher level of measurement, correlation is the most commonly used approach.

Correlation in Statistics

This section shows how to calculate and interpret correlation coefficients for ordinal and interval level scales. Methods of correlation summarize the relationship between two variables in a single number called the correlation coefficient. The correlation coefficient is usually represented using the symbol r, and it ranges from -1 to +1.
A correlation coefficient quite close to 0, but either positive or negative, implies little or no relationship between the two variables. A correlation coefficient close to plus 1 means a positive relationship between the two variables, with increases in one of the variables being associated with increases in the other variable.
A correlation coefficient close to -1 indicates a negative relationship between two variables, with an increase in one of the variables being associated with a decrease in the other variable. A correlation coefficient can be produced for ordinal, interval or ratio level variables, but has little meaning for variables which are measured on a scale which is no more than nominal.
For ordinal scales, the correlation coefficient can be calculated by using Spearman's rho. For interval or ratio level scales, the most commonly used correlation coefficient is Pearson's r, ordinarily referred to as simply the correlation coefficient.

Correlation Measure

In statistics, Correlation studies and measures the direction and extent of relationship among variables, so the correlation measures co-variation, not causation. Therefore, we should never interpret correlation as implying cause and effect relation. For example, there exists a correlation between two variables X and Y, which means the value of one variable is found to change in one direction, the value of the other variable is found to change either in the same direction (i.e. positive change) or in the opposite direction (i.e. negative change). Furthermore, if the correlation exists, it is linear, i.e. we can represent the relative movement of the two variables by drawing a straight line on graph paper.

Correlation Coefficient

The correlation coefficient, r, is a summary measure that describes the extent of the statistical relationship between two interval or ratio level variables. The correlation coefficient is scaled so that it is always between -1 and +1. When r is close to 0 this means that there is little relationship between the variables and the farther away from 0 r is, in either the positive or negative direction, the greater the relationship between the two variables.
The two variables are often given the symbols X and Y. In order to illustrate how the two variables are related, the values of X and Y are pictured by drawing the scatter diagram, graphing combinations of the two variables. The scatter diagram is given first, and then the method of determining Pearson's r is presented. From the following examples, relatively small sample sizes are given. Later, data from larger samples are given.

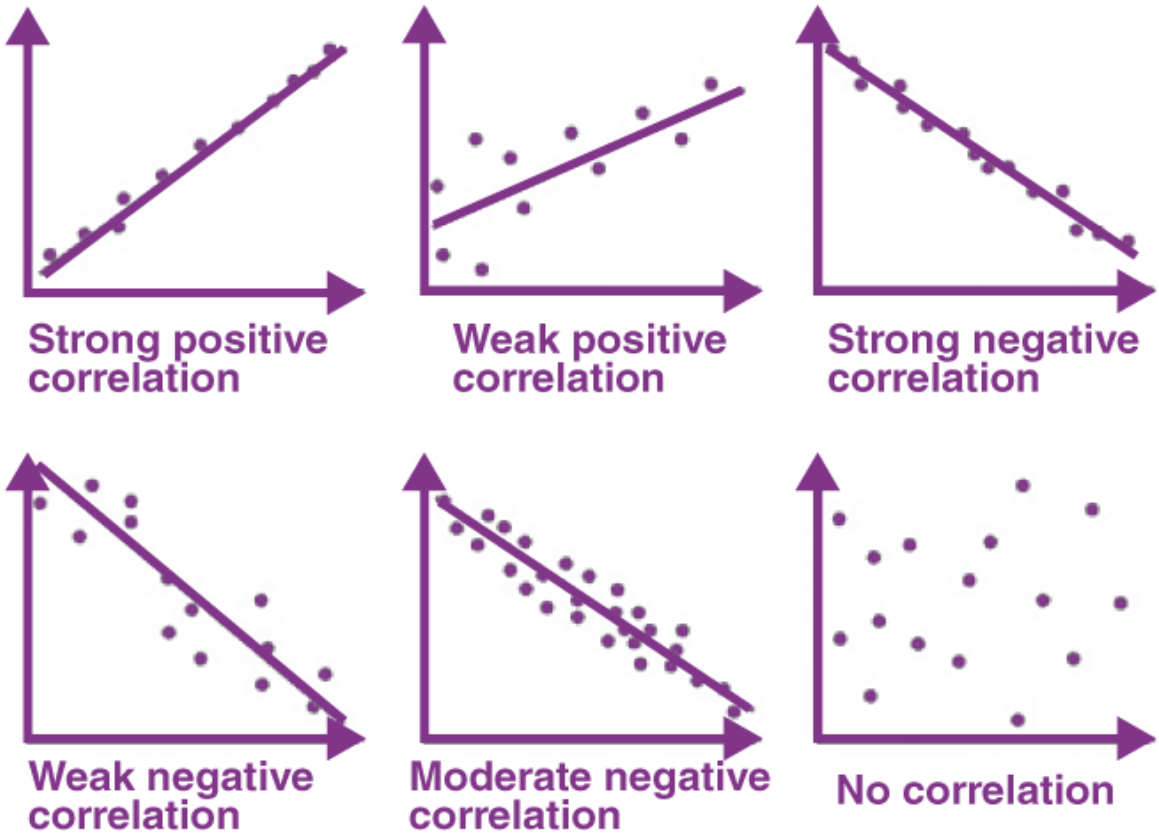
Scatter Diagram

A scatter diagram is a diagram that shows the values of two variables X and Y, along with the way in which these two variables relate to each other. The values of variable X are given along the horizontal axis, with the values of the variable Y given on the vertical axis.
Later, when the regression model is used, one of the variables is defined as an independent variable, and the other is defined as a dependent variable. In regression, the independent variable X is considered to have some effect or influence on the dependent variable Y. Correlation methods are symmetric with respect to the two variables, with no indication of causation or direction of influence being part of the statistical consideration. A scatter diagram is given in the following example. The same example is later used to determine the correlation coefficient.

Types of Correlation

The scatter plot explains the correlation between the two attributes or variables. It represents how closely the two variables are connected. There can be three such situations to see the relation between the two variables –

1. **Positive Correlation** – when the values of the two variables move in the same direction so that an increase/decrease in the value of one variable is followed by an increase/decrease in the value of the other variable.
2. **Negative Correlation** – when the values of the two variables move in the opposite direction so that an increase/decrease in the value of one variable is followed by decrease/increase in the value of the other variable.
3. **No Correlation** – when there is no linear dependence or no relation between the two variables.



Correlation Formula

Correlation shows the relation between two variables. Correlation coefficient shows the measure of correlation. To compare two datasets, we use the correlation formulas.

Pearson Correlation Coefficient Formula

The most common formula is the Pearson Correlation coefficient used for linear dependency between the data sets. The value of the coefficient lies between -1 to +1. When the coefficient comes down to zero, then the data is considered as not related. While, if we get the value of +1, then the data are positively correlated, and -1 has a negative correlation.

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$$

Where n = Quantity of Information
Σx = Total of the First Variable Value
Σy = Total of the Second Variable Value
Σxy = Sum of the Product of first & Second Value

Σx^2 = Sum of the Squares of the First Value
Σy^2 = Sum of the Squares of the Second Value

Linear Correlation Coefficient Formula

The formula for the linear correlation coefficient is given by;

$$r_{xy} = \frac{n\sum_{i=1}^{n} x_i y_i - \sum_{i=1}^{n} x_i \sum_{i=1}^{n} y_i}{\sqrt{n\sum_{i=1}^{n} x_i^2 - (\sum_{i=1}^{n} x_i)^2}\sqrt{n\sum_{i=1}^{n} y_i^2 - (\sum_{i=1}^{n} y_i)^2}}$$

Sample Correlation Coefficient Formula

The formula is given by:

$r_{xy} = S_{xy}/S_xS_y$

Where S_x and S_y are the sample standard deviations, and S_{xy} is the sample covariance.

Population Correlation Coefficient Formula

The population correlation coefficient uses σ_x and σ_y as the population standard deviations and σ_{xy} as the population covariance.

$r_{xy} = \sigma_{xy}/\sigma_x\sigma_y$

Pearson Correlation Formula
Correlation Coefficient Formula
Linear Correlation Coefficient Formula

Correlation Example

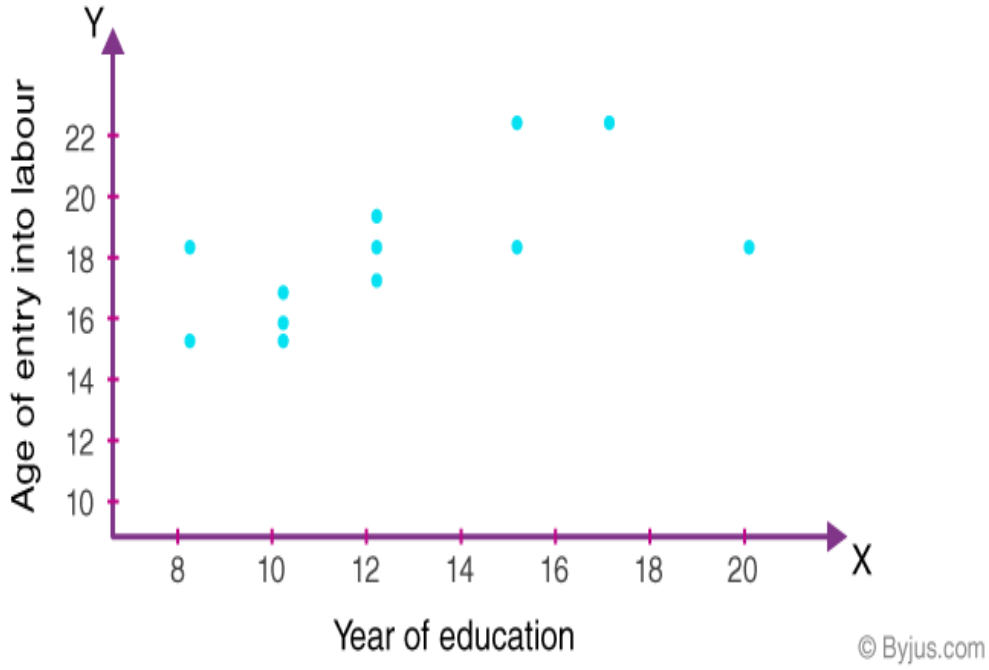
Years of Education and Age of Entry to Labour Force Table.1 gives the number of years of formal education (X) and the age of entry into the labour force (Y), for 12 males from the Regina Labour Force Survey. Both variables are measured in years, a ratio level of measurement and the highest level of measurement. All of the males are aged close to 30, so that most of these males are likely to have completed their formal education.

Respondent Number	Years of Education, X	Age of Entry into Labour Force, Y
1	10	16
2	12	17
3	15	18
4	8	15
5	20	18
6	17	22
7	12	19

8	**15**	**22**
9	**12**	**18**
10	**10**	**15**
11	**8**	**18**
12	**10**	**16**

Table 1. **Years of Education and Age of Entry into Labour Force for 12 Regina Males**

Since most males enter the labour force soon after they leave formal schooling, a close relationship between these two variables is expected. By looking through the table, it can be seen that those respondents who obtained more years of schooling generally entered the labour force at an older age. The mean years of schooling are $\bar{x}$ = 12.4 years and the mean age of entry into the labour force is $\bar{y}$= 17.8, a difference of 5.4 years.



This difference roughly reflects the age of entry into formal schooling, that is, age five or six. It can be seen through that the relationship between years of schooling and age of entry into the labour force is not perfect. Respondent 11, for example, has only 8 years of schooling but did not enter the labour force until the age of 18. In contrast, respondent 5 has 20 years of schooling but entered the labour force at the age of 18. The scatter diagram provides a quick way of examining the relationship between X and Y.

3.4. Percentile Rank (With Example)

Percentile rank is a common statistical measurement that you can use for everything from comparing standardized test scores to analyzing weight distribution in a sample. Statisticians often use percentile rank to get an idea of how a particular assessment score or result compares with others in a set. Additionally, understanding percentile rank can give you an insight into how well you're performing on any given assessment. In this article, we explore how to calculate percentile rank and range, and we offer examples to guide you.

What is percentile rank?

Percentile rank is a common metric statisticians calculate when scoring standardized tests and examinations. This measurement shows the percentage of scores within a norm group that is lower than the score you're measuring. For instance, if you take a standardized test and your score is greater than or equal to 90% of all other scores, your percentile rank is the 90th percentile.

It's also important to note that the percentile rank may not denote an actual test score or other assessment score. It only represents an item's rank against a larger group's places between 0 and 100.

Percentile rank formula

You can calculate the percentile rank using this formula:

Percentile rank = p / 100 x (n + 1)

In the equation, p represents the percentile and n represents the total number of items in the data set.

Calculating percentile

Before you can calculate percentile rank, you need to know the percentile of the item you're ranking. You can find the percentile of a specific score using this formula:

Percentile = (number of values below score) ÷ (total number of scores) x 100

For example, if a student scores 1,280 points out of 1,600 on the SATs, they can use this basic percentile formula to find out how their score compares with others in the set they're comparing.

To get the percentile rank, calculate the percentile of a specific assessment score. The steps below outline how to calculate the percentile using example test scores:

1. Put your data in ascending order

When calculating the percentile of a set of data, such as test scores, arrange the values in ascending order, starting with the lowest value and ending with the highest. As an example, use the data set of standardized test scores (77, 76, 88, 85, 87, 78, 80, 95, 90, 83, 89, 93, 75, 70, 67) for a student who wants to find their percentile with a score of 88. The values in this data set in ascending order are (67, 70, 75, 76, 77, 78, 80, 83, 85, 87, 88, 89, 90, 93, 95).

2. Divide the number of values below by the total number of values

Once your values are in ascending order, count the number of values that occur below the score you're measuring percentile for. Using the example scores from above (67, 70, 75, 76, 77, 78, 80, 83, 85, 87, 88, 89, 90, 93, 95) and the student's score of 88, the number of values that appear below 88 is 10. Then, count all the values in the entire data set. In this example, the number of all values in the data set is 15. Plug these values into the formula:

Percentile = (number of values below score) ÷ (total number of scores) x 100 = (10) ÷ (15) x 100

4. Multiply the result

Using the formula, calculate the quotient between the number of values below your score and the number of all the values in your data set. Multiply the result by 100 to get a percentage. With the previous test score example, calculate percentile:

Percentile = (number of values below score) ÷ (total number of scores) x 100 = (10) ÷ (15) x 100 = 0.66 x 100 = 66%

This result shows that the student's score of 88 is in the 66th percentile.

How to calculate percentile rank

When you know the percentile of a specific value, you can easily calculate the percentile rank using the percentile rank formula:

Percentile rank = p / [100 x (n + 1)]

Use the steps below to apply the formula for calculating percentile rank:

1. Find the percentile of your data set

Calculate the percentile of the data set you're measuring so you can calculate the percentile rank. As an example, assume you're calculating the percentile rank of a test score in the 80th percentile. The value 80 represents the percentile in this case, which you can use in the formula to find percentile rank. Substitute 80 for the p-value in the formula:

Percentile rank = (80) / [100 x (n + 1)]

2. Find the number of items in the data set

To find the n variable or the total number of values in your data set, simply count up the number of items you're working with. For instance, assume the above percentile is one of 25 test scores. The value 25 represents the n variable in the formula:

Percentile rank = 80 / [100 x (25 + 1)]

Add one to the total number of values in the data set to get this:

Percentile rank = 80 / [100 x (26)]

3. Multiply the sum of the number of items and one by 100

Once you add one to your n value, multiply this sum by 100. Using the previous example, find this value in the formula:

Percentile rank = 80 / (100 x 26) = 80 / 2,600

The sum of the value of all items in the data set and one gives a result of 260, and when you multiply this value by 100, the result is 26,000.

4. Divide the percentile by the product of 100 and n+1

Divide the resulting product of 100 and n+1 by the percentile value you found in the first step.

Using the example percentile of 80, this calculates as:

Percentile rank = 80 / (2,600) = 0.03 = 3rd percentile rank

How to calculate percentile range

The percentile range represents the difference between two specific percentiles. For instance, a census employee measuring survey data may calculate the percentile range between two types of demographics to compare various information. Typically, statisticians calculate the percentile range between the 10th and 90th percentiles, though you can calculate the range between any two percentiles. You can calculate the percentile range between the 10th and 90th ranking items in a data set using this operation:

(90th percentile) - (10th percentile)

Here are the steps to follow:

1. Find the percentile ranks of your values

If you know the percentile rank of two values, you can calculate the percentile range. For example, assume you measure the weight of 10 dogs and find one dog's weight of 15 pounds as the 10th percentile and another's weight of 125 pounds as the 90th percentile. Using these two example values, you can find the difference through subtraction.

2. Subtract the 10th from the 90th percentile

Once you know the percentile rank of each statistic you're measuring, find the percentile range by subtracting the value in the 10th percentile rank from the value in the 90th percentile rank. Using the previous example of dogs' weights, calculate the difference if 125 pounds is in the 90th percentile and 15 pounds is in the 10th percentile:

Percentile range = (90th percentile) - (10th percentile) = (125) - (15) = 110

3. Interpret your results

The percentile range simply compares two different percentile ranking items so you can get an idea of what the characteristics of your data are like. In the example of measuring the weight of different dogs, the percentile range of 110 means that 110 other possible weights can be above or below the average.

Percentile rank example

As an example of calculating percentile rank, assume a pediatrician wants to calculate the percentile rank for the weight distribution of 6-month-old infants:

Assume a pediatrician's office wants to know where a certain weight percentile ranks within their statistical information on healthy infant weight ranges at 6 months old. The pediatrician first finds the percentile of an infant's weight of 13.5 pounds by using the percentile formula when the number of values below 13.5 pounds is seven and the total number of measured 6-month-old weights is 42:

Percentile = (number of values below score) ÷ (total number of scores) x 100 = (7) ÷ (42) x 100 = 0.17 x 100 = 17

The 6-month-old infant's weight of 13.5 pounds is in the 17th percentile. Using this information, the pediatrician can then calculate the percentile rank out of all 42 weights they measured:

Percentile rank = p / [100 x (n + 1)] = (17) / 100 x (42 + 1) = (17) / 100 x (43) = 17 ÷ 4,300 = 3.95

The result of 3.95 indicates the infant's weight of 13.5 pounds is in the 3.95th percentile rank. This means that 3.95% of all weights out of the 42 the pediatrician measures are at or below the infant's weight of 13.5 pounds.

UNIT 4.1: Examination Reforms- CBSE, Choice Based Credit System.

(1) CONTINUOUS AND COMPREHENSIVE EVALUATION (CCE)

Continuous and Comprehensive Evaluation (CCE) system was introduced by the Central Board of Secondary Education (CBSE) in India to assess all aspects of a student's development on a continuous basis throughout the year. The assessment covers both scholastic subjects as well as co-scholastic areas such as performance in sports, art, music, dance, drama, and other cultural activities and social qualities.

- **What is Continuous and Comprehensive Evaluation?**

Evaluation is a continuous process and it is comprehensive in nature. The expression 'Continuous' refers to regularity in the evaluation process. Hence, evaluation is not only an end of the instructional activity, but a regular activity in the evaluation process and goes on right from the beginning of the instructional process till its end. Thus, it has a time dimension. It is carried out regularly and periodically at the end of a chapter or unit of teaching whereby the teacher gets regular feedback about students' learning.

Comprehensiveness of evaluation refers to evaluation of both scholastic and non-scholastic areas of learner's development. A school or a college aims at developing both cognitive and non-cognitive abilities of the learners. While evaluation of scholastic abilities is concerned with cognitive abilities of the learners, evaluation of non-scholastic abilities pertains to non-cognitive abilities of the learners.

Scholastic/cognitive abilities are concerned with knowledge, understanding, application, analysis, synthesis, evaluation and creativity of a learner, whereas non-scholastic/noncognitive abilities pertain to affective abilities (habits, attitudes, interests, aptitudes etc.) and psychomotor abilities (lab skills, drawing, painting etc.)

Thus, we can define continuous and comprehensive evaluation as evaluation which is carried out, on a regular basis, on all aspects of student learning - both scholastic and non-scholastic. It gives equal emphasis on both formative and summative evaluation and evaluation of both cognitive and non-cognitive outcomes.

Characteristics of Continuous and Comprehensive Evaluation:

1. It provides the teacher continuous awareness of the development and knowledge transaction of his students.
2. A teacher is able to direct his/her teaching based on the achievement of developmental objectives, e.g. growth of thinking process.
3. A teacher uses it as a diagnostic device to plan his/her remedial teaching or material on the basis of diagnosis of students' learning difficulties or inadequacies as found from regular testing.
4. It focuses on formative evaluation. Hence, a teacher can adopt her instructional strategies based on the feedback received on the attainment of intended learning outcomes.
5. It emphasizes both scholastic and non-scholastic aspects of students' performance.
6. It is meant to integrate teaching and evaluation and to test those skills and abilities, which cannot be tested through a written examination at the end of a course or programme.
7. It is used to improve both academic programme and student learning.
8. The evidence obtained from continuous and comprehensive evaluation may be analyzed and interpreted at three different levels as under:
9. Self-referenced - how the learner progresses in relation to his own self.
10. Criteria-referenced - how the learner progresses in relation to the criterion set by the teacher.
11. Norm-referenced -how the learner progresses in relation to the norms of the peer group. From the characteristics of continuous and comprehensive evaluation, it is seen that it embraces the following types of evaluation.

Evaluation of Scholastic Areas:

Scholastic subjects are assessed using two modes: Formative Assessment (FA) and Summative Assessment (SA). Formative Assessment usually comprises of Class Tests, Homework, Quizzes, Projects, and Assignments directed throughout the year. Summative Assessment measures how much a student has learnt from the class through an examination/test conducted at the end of a term.

For institutions following the CCE grading system, typically an academic year is divided into two terms. Each term will have two FAs and one SAs. The weightage allotted to each term and assessment is as follows.

	TERM 1			TERM 2		
	FA 1	FA 2	SA 1	FA 3	FA 4	SA 2
Weightage	10%	10%	30%	10%	10%	30%
Term Weightage	FA1+FA2+SA1=50%			FA3+FA4+SA2=50%		

Total: Formative Assessments (FA) = FA1+FA2+ FA3+FA4 = 40% Summative Assessments (SA) = SA1+SA2 = 60%

Scholastic Assessment grades are generally given on a 9 point grading scale.

Evaluation of Co-Scholastic Areas:

Co-Scholastic areas are assessed using multiple techniques on the basis of specific criteria. Assessment of co-scholastic areas is done at the end of the year, and grades are generally given on a 5 point grading scale.

Outcome, results and effect:

The outcome of the CCE system at the initial level varies. Though most of the schools implemented it quickly, teachers and students who were accustomed to the older system of evaluation and examination faced difficulties coping with the changes. The main aim of CCE is to reduce pressure on students who are unable to effectively participate in the educational system and leave it dejected and with low self-confidence. However, the system has also been criticised for focussing more on projects and activities than actual learning. Critics also state that students' workload has not actually gone down because even though exams have been reduced, stressed students wrestle with projects and oral tests all the year round. Students are required to participate in activities even if the syllabus is not covered. Despite these criticisms, the outcomes of this system were projected to be better that the rote learning of the previous system, which placed an undue emphasis on memory and facts instead of understanding and creating a learning environment.

(2) CHOICE BASED CREDIT SYSTEM (CBCS):

Majority of Indian higher education institutions have been following marks or percentage based evaluation system, which obstructs the flexibility for the students to study the subjects/courses of their choice and their mobility to different institutions. There is need to allow the flexibility in education system, so that students depending upon their interests and aims can choose interdisciplinary, intra-disciplinary and skill-based courses. This can only be possible when choice based credit system (CBCS), an internationally acknowledged system, is adopted.

What is choice based credit system?

The Choice Based Credit system (CBCS) is an educational model that offers students to decide for courses and subjects of their choice – core, elective

courses, open or global electives and skill based courses.

Choice-based implies that the learner has the choice to select the subjects that he/she would like to learn within the prescribed time period and the programme parameters. For example, a learner who wants to major in Accountancy wishes to study History may be permitted to study. The CBCS enables a student to obtain a degree by accumulating required number of credits prescribed for that degree. The number of credits earned by the student reflects the knowledge or skill acquired by him/her. The CBCS enables the students to earn credits across departments and provides flexibility in duration to complete a programme of study. The CBCS facilitates transfer of credits earned in different departments/centers of other recognized/accredited universities or institutions.

Features of CBCS:

- As highlighted by the UGC (2015), the features of CBCS are:
- Enhance learning opportunities of the learners.
- Match the learners' scholastic abilities and aspirations.
- Inter-institution transferability of learners (following the completion of a semester).
- Part-completion of an academic programme in the institution of enrolment and part-completion in a specialized (and recognized) institution.
- Improvement in educational quality and excellence.
- Flexibility for working learners to complete the programme over an extended period of time.
- Standardization and comparability of educational programmes across the country and global scenario as well.

Outline of Choice Based Credit System:

Core Course: A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.

Elective Course: Generally a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/ subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.

2.1 Discipline Specific Elective (DSE) Course: Elective courses may be offered

by the main discipline/subject of study is referred to as Discipline Specific Elective. The University/Institute may also offer discipline related Elective courses of interdisciplinary nature (to be offered by main discipline/subject of study).

2.2 Dissertation/Project: An elective course designed to acquire special/advanced knowledge, such as supplement study/support study to a project work, and a candidate studies such a course on his own with an advisory support by a teacher/faculty member is called dissertation/project.

2.3 Generic Elective (GE) Course: An elective course chosen generally from an unrelated discipline/subject, with an intention to seek exposure is called a Generic Elective. P.S.: A core course offered in a discipline/subject may be treated as an elective by other discipline/subject and vice versa and such electives may also be referred to as Generic Elective.

Ability Enhancement Courses (AEC): The Ability Enhancement (AE) Courses may be of

two kinds: Ability Enhancement Compulsory Courses (AECC) and Skill Enhancement

Courses (SEC). “AECC” courses are the courses based upon the content that leads to Knowledge enhancement; i. Environmental Science and ii. English/MIL Communication.

These are mandatory for all disciplines. SEC courses are value-based and/or skills based and are aimed at providing hands-on-training, competencies, skills, etc.

3.1 Ability Enhancement Compulsory Courses (AECC): Environmental Science, English Communication/MIL Communication.

3.2 Skill Enhancement Courses (SEC): These courses may be chosen from a pool of courses designed to provide value-based and/or skill-based knowledge. Introducing Research Component in Under-Graduate Courses Project work/Dissertation is considered as a special course involving application of knowledge in solving / analyzing /exploring a real life situation / difficult problem. A Project/Dissertation work would be of 6 credits. A Project/Dissertation work may be given in lieu of a discipline specific elective paper.

4.3:On-Line Exam And Open Book Examination:Concept, Need, Benefits

- **ONLINE EXAMINATION**

Concept of Online Examination:

Online examination, sometimes referred as e-examination, are the examination conducted through the internet or in an intranet (if within the organization) for a remote candidate(s). Dedicated software is used to manage the entire online examination system. Candidates have to sign up and create an account as per their student profile and sign in for its use for a limited time to answer the questions and after the time of expiry, the answer paper is disabled automatically and answers is sent to the examiner. The examiner evaluates answers, either through automated process or manually and the results are being sent to the candidate through email or made available in the website. Internet will be used as a media for disseminating and conducting tests. The progress reports can be printed at any point of time by just providing the necessary details of a candidate. Generally question banks are prepared for online examination. The online examination system is a web based application. The system can be modified and customized to suit the needs of any educational institution; primary and secondary schools, colleges, professional and vocational institutes, universities or coaching academies. This system aims at reducing costs associated with conducting examination over a period of time and achieving total automation of examination system and its related tasks like registration, publication of results, which leads to a very high degree of system efficiency.

Need of Online Examination:

1. Support high concurrency
2. To enable students to take exams anytime and anywhere
3. Realize the function of adding test questions and test paper online
4. Support test questions management, test paper management, easy to classify management
5. Add candidates online and manage candidate information
6. Achieve candidates' online answering on multiple platforms, such as computer and mobile phones
7. Realize automatic judgment and reduce manual output
8. Achieve online query result

Benefits of Online Examination:

1. Online Examination System is a computerized system which gives instant results and also saves time, save money.
2. It fully automates the previous manual process of taking written exams.
3. It is implemented by web based online examination software or through Intranet variance. It decreases the need of supervision during the exam is being examine or taken using web based Online Examination System gives a high level of clarity as opposite of traditional method. Most of Online Examination System gives the result and instantly
4. In high school, Online Examination:
5. System is able to reduce the workload of teachers by using automated test paper exams and marking schemes.
6. Students can study independently for example at home or any place.
7. The amount of time given at a particular question gives you the ability of "Quick Learning Quick Thinking".
8. The data in Online Examination System is regenerated repeatedly so that students have access to new data.

OPEN BOOK EXAM

Concept of Open Book Exam:

An "open book examination" is one in which examinees are allowed to consult their class notes, textbooks, and other approved material while answering questions. This practice is not uncommon in law examinations, but in other subjects, it is mostly unheard of. Radical and puzzling though the idea may sound to those who are used to conventional examinations, it is ideally suited to teaching programs that especially aim at developing the skills of critical and creative thinking.

Two Types of Open Book Examinations; one may think of two kinds of open book examinations, say the restricted type and the unrestricted type. In the restricted type of open book examinations, students are permitted to bring into the examination room one or more specific documents approved by the course instructor. In the restricted open book examination, students may be permitted to consult printed documents such as the logarithmic tables, dictionaries, or complete works of Shakespeare, but no handwritten material or printed documents which have not had prior approval. One may also need to make sure that the printed documents that students bring do not contain any scribbles on the margin. In this type of examination, the approved documents function more

or less as appendices to the question
paper itself. These examinations are not radically different from closed book examinations.

They do not present any special problems, irrespective of the nature of the course.

In the unrestricted type of open book examinations, students are free to bring whatever they like They may bring any books (with or without scribbles on the margin), lecture handouts of the course instructor, or their own handwritten notes. The use of such examinations presupposes certain teaching strategies and types of questions.

Need of Open Book Exam:

1. Develop conceptual understanding
2. Develop high order thinking
3. This exam relieve anxiety of students
4. This exam reduce academic integrity concerns
5. Development skill to appropriate implementation (information).

Benefits of Open Book Exam:

1. Students are not required to engage in parroting of concepts, if they understand the concept they would answer correctly. This will remove tension of examination which has become integral part of normal education system.
2. Those students who are intelligent but don't like to put in extra hard work in memorizing the concepts, facts and other data would enjoy this system.
3. It is highly likely that more and more students would continue their education as the passing percentage would go up+. Less demanding on memory (regurgitation of memorized materials) because it is no longer necessary for students to cram a lot of facts, figures and numbers for open-book examination.
4. Provides a chance for students to acquire the knowledge during the preparation process of gathering suitable learning materials rather than simply recalling or rewriting it
5. Enhances information retrieval skills of students through finding the efficient ways to get the necessary information and data from books and various resources
6. Enhances the comprehension and synthesizing skills of students because they need to reduce the content of books and other study materials into simple and handy notes for examination.

4.3. Academic Bank of Credits

The Ministry of Education (MoE) plays a crucial role in transforming and maintaining a quality educational system across Indian educational institutions. They have introduced several schemes and programs to evaluate and innovate the educational fields for quality assurance.

The ABC ID card is one such initiative that helps transform the education system strategically with a crucial approach toward student growth. Keep reading this article to learn more about ABC ID and its benefits.

- **What is ABC ID?**

ABC ID cards store the academic credits and information of students in a digital ID to keep them safe and secure. The NEP (National Education Policy) launched this program as an initiative from the UGC (University Grants Commission). The MoE (Ministry of Education) and MeitY (Ministry of Electronics and Information Technology) oversee this programme.

Students in India can obtain the Academic Bank of Credits (ABC) ID, a unique 12-digit code, to digitally manage, store, and access their academic credits, including certificates, diplomas, degrees, training details, and co-curricular achievements. The ABC ID acts as a link to DigiLocker, where students can securely store essential documents like exam mark sheets.

The ABC ID receives students' academic credits from institutions through the National Academic Depository. These credits awarded by registered institutions to a student for a programme will be stored digitally in the ABC, which can be shared or transferred from one institution to another upon students' consent. This streamlines the authentication for admissions or jobs, simplifying the verification of academic records.

ABC ID Full Form

Full form of ABC ID card is the Academic Bank of Credits. As the name suggests, itrecords higher educational credits earned by a student from UGC-recognised institutions, which can be transferred between institutions.

Purpose of ABC ID

Below are the purposes of ABC ID:

Academic Bank of Credit (ABC) will help open, close, and validate every student's academic account.

Apart from gathering students' academic credits, ABC ID verifies them and stores the credits to transfer or promote them as per requirements.

ABC ID will store credits earned by students from online and distance courses offered by the government of India.

Students can redeem the credits and seek direct admission at any university in the second year.

Benefits of ABC ID

Here are some of the notable benefits of Academic Bank of Credit ID:

ABC ID monitors students' academic performance continuously and comprehensively. Once the ABC ID is issued to the students, a permanent identifier is assigned to their name. The entire process begins from Class I to offer smooth and hassle-free academic tracking throughout every student's educational journey.

Traditional paper-based records may get damaged or lost, causing severe inconveniences. However, ABC ID is a digital way of storing students' academic records, which helps reduce the administrative burden.

These credit records help educators analyse the subject-specific weaknesses and expertise of a student through their ABC ID.

How to Create an ABC ID?

Here are the steps to follow while creating your ABC ID:

Step 1: Visit the DigiLocker portal. Existing users can log in by clicking on the 'Sign In' button, and new users can click on the 'Sign Up' button to create a new account and sign in.

Step 2: Use your username and password or Aadhaar number and mobile number to log in.

Step 3: After logging in, click on 'Search Documents'.

Step 4: Under 'Education and Learning', click on 'Academic Bank of Credits'.

Step 5: Next. select 'APAAR/ABC ID Card'.

Step 6: Enter the details such as your name, gender, date of birth, admission year, institution name, Identity Value, etc. After filling out all the required details and ticking the consent box, you need to click on the 'Get Document' button.

What is Identity Value in ABC ID?

As the name suggests, Identity Value in ABC ID is a unique data that helps differentiate each student in the ABC ID system. Also known as 'Identifier Value', this data includes an alphanumeric combination of the user's initials, date of birth, etc. The Identity Value is the student's roll number, registration number, admission number or enrolment number provided by the institution where the student is studying.

It helps track, manage, and recognise all the students' accounts in the ABC ID. The authorities can identify the data and keep them confidential to enhance the security and efficiency of the ABC ID system.

How to Create an ABC ID without DigiLocker?

Here are the steps to follow if you do not have an account on DigiLocker:

Step 1: Visit the official website of the Academic Bank of Credits.

Step 2: Click on the 'My Account' button available on the right side of the page and select 'Student'.

Step 3: Click on the 'Sign Up' button.

Step 4: You can create an account with your Aadhaar-linked mobile number.

Step 5: Enter the OTP you receive to register and sign in to DigiLocker.

Step 6: The 'Meri Pehchaan' dashboard will appear, and a window will pop up where you need to select the university you studied at or are studying at, the admission year,

and identity type from the drop-down menu.
Step 7: Enter your identity type and click ‘Submit’.

ABC ID Creation through QR Code Scanning
Here are the steps to follow while creating your ABC ID through QR code scanning:
Step 1: Visit the official website of the Academic Bank of Credits.
Step 2: Scan the QR code provided on the home page.
Step 3: Log in to the DigiLocker app.
Step 4: A form containing your name, gender, and DOB will open.
Step 5: Choose your Identity Type, Admission year, and Academic Institution from the list, and enter your Identity Value.
Step 6: Click on the ‘Get Document’ button. Your ABC ID will be generated.
Step 7: After creating your ABC ID successfully, you can find it under the ‘My Issued Documents’.

How to Download an ABC ID Card?
Here are the steps to follow to download your ABC ID card from DigiLocker after creating an ABC ID card:
Step 1: Visit the DigiLocker portal and enter your credentials to log in to your account.
Step 2: Click on the ‘Issued Documents’ option.
Step 3: Click on ‘Academic Bank of Credit ID’.
Step 4: Wait till your ID is fetched. Click on ‘Download’.
Step 5: A PDF file of your ABC ID will be downloaded.

Students can create their ABC ID account to keep a safe record of their academic credits. This enhances their scope and chances of educational and career choices. A student holding an ABC ID card can drop out of the institution at any time and redeem the semester credits to rejoin the institution afterward as per convenience. Thus, time spent in higher education will never be wasted.

4.4. PARAKH

National Assessment Centre- PARAKH (Performance Assessment, Review and Analysis of Knowledge for Holistic Development) was set up in NCERT as an independent constituent unit via Notification no. 1-4/2012-EC/ 101- 164 of NCERT dated 8th Feb, 2023, to fulfil the basic objectives of setting norms, standards, guidelines and implement activities related to student assessment along with other tasks as mandated by Para 4.4.1 of the National Education Policy (NEP) 2020.

There are four major areas of focus for PARAKH:

1. Capacity Development in Competency Based Assessment
2. Large-Scale Achievement Survey
3. Equivalence of School Boards
4. Holistic Progress Cards for the Foundational, Preparational, Middle and

Secondary Stages.

The activities undertaken under PARAKH include:

1. Capacity Development in Competency Based Assessment

Project Vidyasagar – PARAKH in collaboration with PhD Chamber of Commerce (PhDCC) is organizing a series of workshops in all the States/UTs of India for the Dissemination of Learning Competencies at Foundational, Preparatory, Middle and Secondary Levels as per National Curriculum Framework 2023 (NCF, 2023). The aim of this exercise is to familiarize the teacher educators and teachers with the pedagogical and policy changes that have been introduced with the NCF 2023 in order to ensure that the gaps in the implementation of competency-based learning-teaching are bridged

2. Large-Scale Achievement Survey

PARAKH, has been mandated to organize large-scale achievement surveys to periodically monitor and assess the educational of the country. As a part of its mandate, PARAKH worked with States/UTs in conducting the State Educational Achievement Survey on November 3, 2023, assessing learners from Grades 3, 6, and 9 to gauge competencies in Foundational Literacy, Foundational Numeracy, Language, and Mathematics at the end of foundational, preparatory, and middle stages with educational blocks as the units of assessment. Administered in 30 States/UTs, the assessment covered an approximate sample of 8 million learners. Rajasthan and Chhattisgarh conducted the assessment in December, on the 7th and 13th respectively, due to assembly elections. Including these states, the sample size increased to approximately 8.5 million.

3. Equivalence of School Boards

PARAKH is working with boards of school education to develop recommendations pertaining to examination reforms. Once equivalence is brought across all Boards of India, it will be possible to allocate credit points to all forms of learning, be it academic, vocational, or experiential.

In the pursuit of equivalence, PARAKH has conducted regional workshops between June and August, 2023. In these workshops, data was collected from the Boards in the domains of administration, curriculum, assessments and infrastructure. To collect data, two tools were used, namely the Equivalence Questionnaire and the Question Paper Template Analysis. After analyzing the collected data, a report was prepared highlighting the areas to be focused on for attaining equivalence. Two national level workshops in the months of November and December, 2023 were conducted post this. In these workshops all the Boards were invited to read the report and make relevant suggestions and comments on the same. After such deliberations the Policy Recommendations for equivalence are being drafted.

Through these measures PARAKH has embarked upon a journey of setting norms, standards, guidelines, and implementing activities pertaining to student assessment in its major areas. Over the course of time, a major change in these domains is aspired.

4. Holistic Progress Cards for the Foundational, Preparational, Middle and Secondary Stages.

Development and Dissemination of the Holistic Progress Card for Foundational, Preparatory, Middle and Secondary stages. 360-degree Holistic Progress Cards has been developed in order to aid assessment of Competency-Based learning-teaching by making assessments more comprehensive and holistic in nature.

PARAKH has completed the development of the Holistic Progress Cards (HPC) for the foundational, preparatory, and middle stages. Currently, efforts are underway to develop the HPC for the secondary stage to ensure competency-based and holistic assessments.