

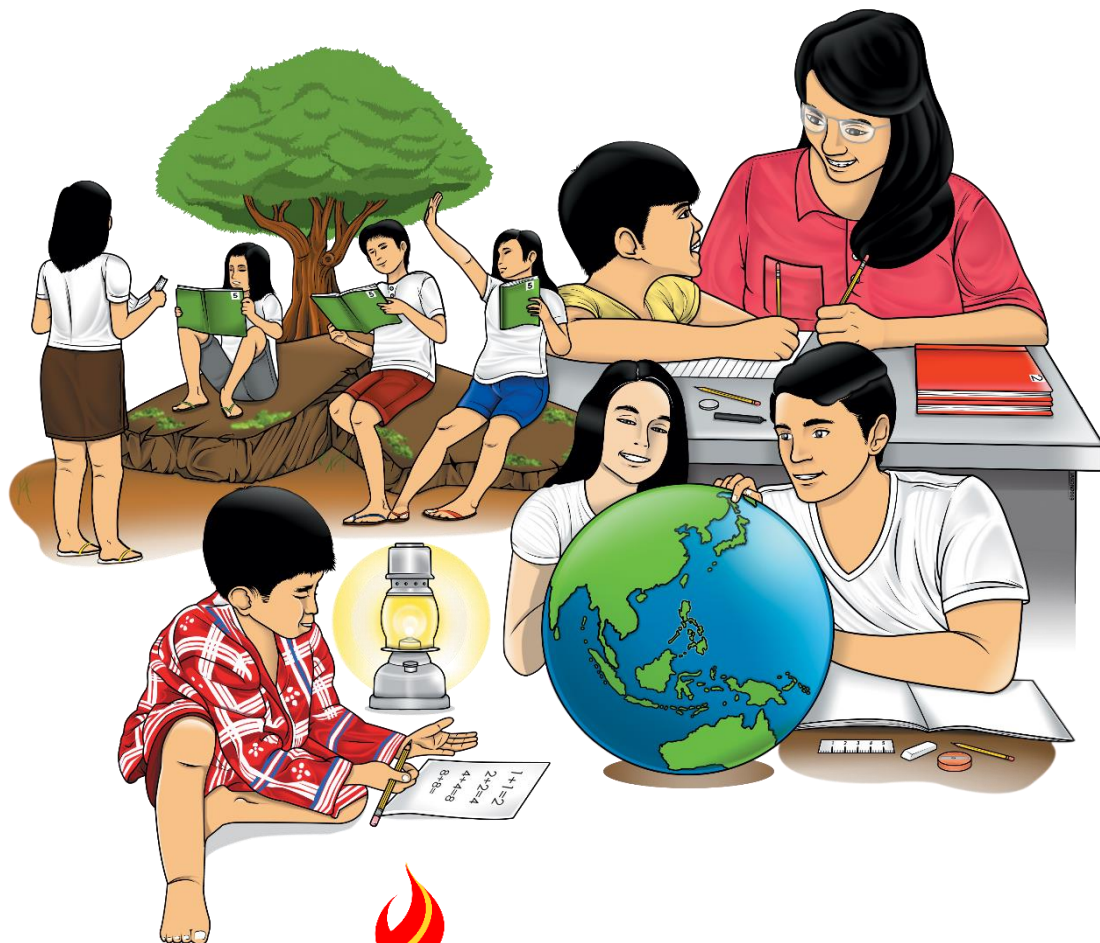
Senior High School



# PRACTICAL RESEARCH 2

## Quarter 2 - Module 2

### Data Collection, Presentation, and Analysis



**Practical Research 2- Senior High School**  
**Alternative Delivery Mode**  
**Quarter 2 - Module 2: Data Collection, Presentation, and Analysis**  
**First Edition, 2020**

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**Development Team of the Module:**

|                                       |   |  |
|---------------------------------------|---|--|
| <b>Authors:</b>                       | <b>Maria Eleonor C. Bañares, Rochelle A. Luzano, PhD,</b>                                 |  |
| <b>Reviewers:</b>                     | <b>Joel D. Potane, PhD</b><br><b>Warren I. Luzano, PhD</b><br><b>Shera May L. Gochuco</b> | <b>Kareen J. Agcopra, PhD</b><br><b>Cristina D. Abao</b><br><b>Ryan Z. Roa</b> |
| <b>Illustrator:</b>                   | <b>Ley Krystal C. Jayoma</b>  |  |
| <b>Layout &amp; Design Evaluator:</b> | <b>Allan H. Guibone</b>   |  |

**Management Team**

|                         |   |
|-------------------------|---|
| <b>Chairperson:</b>     | <b>Dr. Arturo B. Bayocot, CESO III</b><br>Regional Director   |
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| <b>Members:</b>         | <b>Dr. Bienvenido U. Tagolimot, Jr.</b><br>Regional ADM Coordinator<br><b>Dr. Marie Emerald A. Cabigas</b><br>Regional EPS, LRMDs |

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**Department of Education – REGION 10**

**Office Address** : Zone 1, Upper Balulang, Cagayan de Oro City 9000  
**Telephone** : (088) 880-7071, (088) 880-7072  
**E-mail Address** : [region10@deped.gov.ph](mailto:region10@deped.gov.ph)

**Senior High School**

# **Practical Research 2**

## **Quarter 2- Module 2**

### **Data Collection, Presentation, and Analysis**

# Introductory Message

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.



## ***What This Module is About***

As a researcher, it is important that you are knowledgeable about what type of data collection technique to use for a certain type of quantitative research study you are planning to pursue. The importance of data collection cannot be undermined since in the absence of correctly collected data, your research questions can remain unanswered, or the testing of research hypothesis is not possible.

This module gives an overview of factors to consider when choosing data collection method. It also shows a brief description on the different instruments available, its advantages and disadvantages, and guidelines on how to use the specific instrument suitable to the research questions and or objectives. Additionally, you will be exposed to the different statistical tool that you can possibly use to analyze the gathered data.

This is made simple and easy to understand yet contains the maximum and solid knowledge necessary for you to be able to accomplish the Chapter 4 of your research study. Furthermore, this module also contains examples and exercises for you to improve your learning. For enrichment, learners may contact anytime their teacher through messenger, FB, zoom, call or text at their own convenient time.

The following are the lessons contained in this module:

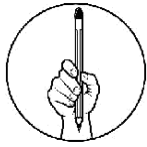
- Lesson 1 – Data Collection Instruments
- Lesson 2 – Data Presentation and Interpretation
- Lesson 3 – Using Statistical Techniques to Analyze Data



## ***What I Need to Know***

At the end of this module, you should be able to:

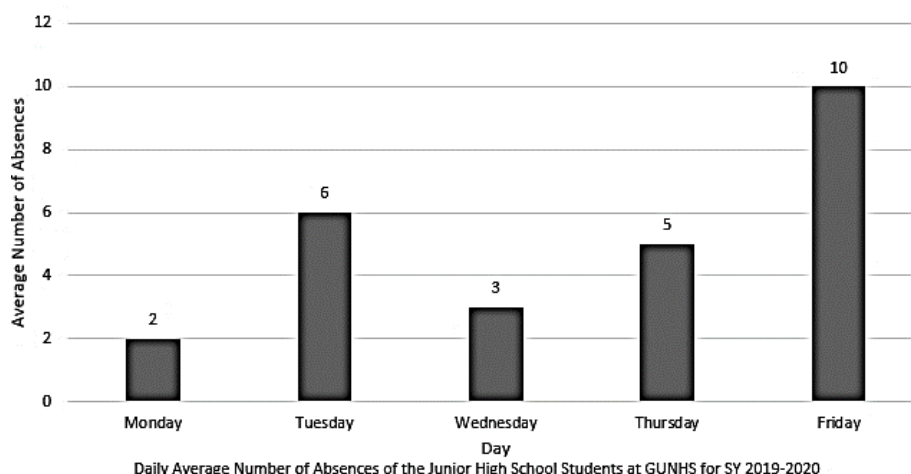
1. collect data using appropriate instruments (**CS\_RS12-Ild-g-1**);
2. present and interpret data in tabular and graphical forms (**CS\_RS12-Ild-g-2**); and
3. use statistical techniques to analyze data—study of differences and relationships limited for bivariate analysis (**CS\_RS12-Ild-g-3**).



## ***What I Know***

1. What data collection method involves tracking of changes during specified time period?  
A. Questionnaire  
B. Observation  
C. Interview  
D. Test
2. Which of the following is defined as an action that the researcher will do to obtain appropriate data?  
A. Data Interpretation  
B. Data Manipulation  
C. Data Collection  
D. Data Analysis
3. Which of these methods is the most expensive way to collect data per respondent?  
A. Personal  
B. Online  
C. Phone Call/Text  
D. Postal
4. The following are guidelines before conducting an interview. Which one is not?  
A. Check if your recording device worked well throughout the interview.  
B. Choose a comfortable venue with the least number of distractions.  
C. Prepare and rehearse your interview guide.  
D. Decide on the duration of the interview.
5. Which of the following should not be part of the informed consent form?  
A. Name of Researchers and the Institution affiliated with  
B. Name of Participants and the Institution affiliated with  
C. Anonymity of the participants and their responses  
D. Title of the study and purpose of the study
6. Participant observation can be performed covertly. What does it imply?  
A. Participants are not aware of the purpose of the observation.  
B. Participants are aware of the purpose of the observation.  
C. Participants are unmindful of the result of the research.  
D. Participants are aware of the result of the research.
7. Which of the following data processing techniques refers to ordering the data into a table?  
A. Arrangement  
B. Tabulation  
C. Editing  
D. Coding
8. Which correlation is the strongest?  
A. -1.0  
B. +.80  
C. -0.6  
D. +0.5
9. Which graph uses vertical bars to represent data?  
A. vertical graph  
B. pie chart  
C. line graph  
D. bar chart
10. In a two-tailed test, which should be rejected when the test value falls in any of the two critical regions?  
A. Alternative hypothesis  
B. Null hypothesis  
C. Type I error  
D. Type II error

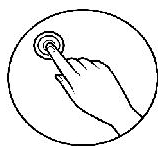
11. The guidance counselor of GUNHS tabulated the data about Junior High School students' daily absences and obtained the average per day. The graph below shows the result of her tabulation. What is the best interpretation of the graph?



- A. The graph shows that Friday has the highest recorded number of absences all throughout the school year.
- B. GUNHS students should undergo an intervention and participate in a “Time Management Seminar”.
- C. The graph shows that students from GUNHS are absentees.
- D. The graph shows that only few students are absent daily.
12. In which of the following situation does a Type I error occurs?
- A. The null hypothesis is accepted when it is false.
- B. The null hypothesis is accepted when it is true.
- C. The null hypothesis is rejected when it is false.
- D. The null hypothesis is rejected when it is true.
13. Which of the following is true about the significance level?
- A. It measures the probability of rejecting a correct null hypothesis.
- B. It is set after a statistical test is conducted.
- C. It is always set at 0.05.
- D. It results in a *p*-value.
14. When does a positive correlation occurs?
- A. When one variable goes up, and the other goes down.
- B. When two variables move in opposite directions.
- C. When two variables move in the same direction.
- D. When two variables remain constant.
15. What is the decision that you will make if the *p*-value is lower than the alpha level?
- A. Do not accept the null hypothesis.
- B. Do not reject the null hypothesis
- C. Accept the null hypothesis.
- D. Reject the null hypothesis.

## Lesson 1

# Data Collection Instruments



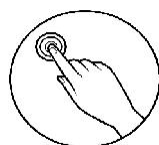
### *What's In*

Due to the COVID-19 global pandemic crisis, many are easily hook into sharing and believing fake news without processing and verifying the source. Daily figures of these cases are also gradually changing, creating misinformation and fear. People are anxious about what is happening, and tensions are inevitable due to security and health threats. Therefore, reliable sources of data and information are highly needed. The fundamental questions to ask are: What is data? Why researchers collect data? How is data collected? Who needs the collected data?

In this pandemic situation specifically, the following questions can be considered.

- How many Filipinos are positive of COVID-19?
- Does aspirin prevent the spread of COVID-19?
- How many percent of Filipinos are jobless when the lockdown began?
- How have the education sector embraced the new normal?

All these questions, and many more can be answered through data collection. As taught in the previous lesson, a researcher begins by identifying the research problem. Once the data gathering procedure has been implemented and data has been gathered, the next thing to do is to analyze and interpret them. Data is obtained with the aid of data collection instruments which will be the focus in this lesson.



### *What I Need to Know*

Collecting data is the first step you need to perform before you proceed in writing your data analysis and interpretation. **Data collection** is a systematic process of gathering relevant information, observations, or measurements. Whether you are performing research for academic purposes, government or business, data collection allows you to gain first-hand knowledge and original insights into your research problem. While methods and aims may differ between fields, the overall process of data collection remains largely the same. Before you begin collecting data, you need to consider: (1) the aim of the research; (2) the type of data that you will collect; and (3) the methods and procedures you will use to collect, store, and process the data.

**Quantitative research instruments** comprise observation, questionnaires, test, and interviews. On the other hand, data collection approaches for **qualitative research** usually involve: (a) direct interaction with individuals on a one-to-one basis, (b) and or direct interaction with individuals in a group setting.

When developing and utilizing a research instrument, the following steps are to be considered:

1. Define the aim of your research (research question).
2. Choose your data collection method.
3. Plan your data collection procedures.
4. Collect and verify your data.
5. Present your findings.

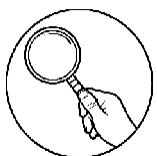


## What's New

### How do you collect your data?

Look at the different kinds of research instruments. Check all that seem helpful in answering your research questions. You may choose more than one.

| Data Collection Method   |  |
|--------------------------|--|
| <b>1. Questionnaires</b> |  |
| a. Structured            |  |
| b. Semi-structured       |  |
| c. Unstructured          |  |
| d. Face-to-face          |  |
| e. Online                |  |
| <b>2. Tests</b>          |  |
| a. Standardized          |  |
| b. Non-standardized      |  |
| c. Recall Questions      |  |
| d. Recognition Questions |  |
| e. Open-ended Questions  |  |
| f. Face-to-face          |  |
| g. Online                |  |
| <b>3. Interviews</b>     |  |
| a. Face-to-face          |  |
| b. Phone                 |  |
| c. Video                 |  |
| <b>4. Observations</b>   |  |
| a. Controlled            |  |
| b. Natural               |  |
| c. Participant           |  |



## What Is It

### Research Instruments

#### Questionnaires

A **questionnaire** is a research instrument that consists of a set of questions that aims to collect information from a respondent. A research questionnaire is typically a mix of close-ended questions and open-ended questions. Open-ended, long-form questions offer the respondent the ability to elaborate on their thoughts. The data collected from a data collection questionnaire can be both qualitative as well as quantitative in nature. A questionnaire may or may not be delivered in the form of a survey, but a survey always consists of a questionnaire.

The terms survey and questionnaire have different meanings. A questionnaire is an instrument used to collect data while a survey is a process of collecting, recording, and analyzing data. Questionnaires can be structured, semi-structured, or unstructured.

In quantitative research, questionnaires use the following approaches: (1) scale (usually Likert scale); and (2) conversion of responses into numerical values, e.g., strongly as 5, agree as 4, neutral as 3, disagree as 2, and strongly disagree as 1.

There are three structures of questionnaires:

1. Structured questionnaires employ closed-ended questions
2. Unstructured questionnaires, on the other hand, use open-ended
3. Semi-structured questionnaires are combinations of both the structured and unstructured ones.

#### **Advantages of Using Questionnaire**

1. Bulk data can be gathered in less time.
2. Online survey is quick and cost-effective.
3. Less chance of bias.
4. Respondents can answer the questionnaire without revealing their identity.
5. Easy analysis and visualization

#### **Disadvantages of Using Questionnaire**

1. Questionnaires may not be returned on time.
2. Questionnaires may be lost.
3. Understanding and interpretation of the questions varies by the participants.
4. Participants may not be able to complete the required responses.
5. Emotions and feelings are hard to convey.
6. Participants' answer may lack depth.

#### **Guidelines in Using Questionnaires for Data Collection**

1. Determine the data to be collected.
2. Determine the method to be used in administering the questionnaire such as face-to-face or online method.
2. Divide your questionnaire into two or three parts.
  - a. Personal information. This section which contains background information of the participants. (Names are optional)
  - b. Main section. This lists the specific questions or indicators.
  - c. Open-ended question section. This contains additional information that might be needed. (This applied only for quantitative research)
3. Make sure to provide specific and clear directions for respondents in answering the questionnaire.
4. Decide on the questionnaire structure, type of questions and response format. Evaluate the questions and options and make sure that they are aligned with specific research questions or objectives.
5. Decide on using simple terms, avoid negative statements, leading, biased, double barred, or sensitive questions and make a brief, clear, and concise questionnaire.
6. Begin with the general questions first followed by the specific ones.
7. Predetermined responses should match the nature of the questions.
  - a. If the content is about quality, use quality (excellent, very good, good, poor)  
Later, these responses will be translated into numerical values (e.g. five-point Likert scale)
  - b. If questions are about frequency, use frequency (always, frequently, sometimes, seldom, never)
  - c. If the content is about belief, use agreement (strongly agree , agree, neutral, disagree, strongly disagree)
  - d. If the questionnaire is about behavior, use extent (very great extent, great extent, moderate extent, small extent, none at all)
8. If possible, set an appointment before distributing the questionnaires.
9. Attach a cover letter to the questionnaire especially for agency connected respondents.
10. Contact participants who did not to return the questionnaire.
11. Tally and encode the data immediately once you have collected them. Keep a soft copy of your data.

## Tests

**Tests** are used for measuring various skills and types of behavior, personality, achievement, performance, as well as for describing some characteristics. It is also used to develop to measure specific knowledge, skill, or cognitive activity. There are two types of tests used in quantitative research: standardized test and non-standardized test.

**Standardized test** is a test that is given to a group of people such as students or professionals in a very consistent manner; meaning that the questions on the test are all the same, the time given to each test-taker is the same, and the way in which the test is scored is the same for all. It is considered as more reliable and valid. Examples are Licensure Exam, Achievement test, College/University Entrance Exam, Personality Tests, IQ test and the likes.

**Non-standardized test** is a test that allows for an assessment of an individual's abilities or performances but doesn't allow for a fair comparison of one individual to another. This test is very simple to use and may not be scored uniformly. It is administered to a certain set of people.

### Types of Test Questions

1. Recall Questions. It requires participants to recall information from memory (e.g., fill-in-the blank test, identification test, enumeration test, etc.)
2. Recognition Questions. It allows participants to select from given choices the best or correct choice (e.g., multiple-choice test, true or false test, yes or no test, etc.)
3. Open-ended Questions. It allows the participants more freedom in their responses, expressing their thoughts and insights (e.g., essay writing tests and other performance-based tests).

Here are elaborate types of test and examples:

#### 1. RECALL TESTS

- A. Identification- the participants will provide an answer to the question using simple memory recall.

Example: What do you call an angle whose measurement is 90 degrees?

- B. Enumeration- the participants will list down the answers or steps

Example: List down the steps in solving a problem.

- C. Cloze Test – the participants will supply an answer to the blank spaces.

Example: The graph of a quadratic function is a \_\_\_\_\_.

#### 2. RECOGNITION TESTS

- A. Matching Type- the participants will match the answers from column A to column B by drawing a line.

Example: Match the terminologies in Column A with their synonyms in Column B.

Column A

Column B

- \_\_\_1. Acute Angle  
\_\_\_2. Right Angle  
\_\_\_3. Obtuse Angle

- Measurement is  
A. 90 degrees  
B. less than 180 degrees but greater than 90  
C. less than 90 degrees but greater than 0

- B. Multiple Choice- the participants will choose the correct/best answer from the given options.

Example: Which of the following does NOT belong to the group?

- A. Acute Angle                      B. Right Angle  
B. Obtuse Angle                    D. Depressed Angle

- C. Dichotomous Type (True or False, Yes or No)- the participants will select only one option either yes or no or true or false.

Example: Write TRUE on the space before each number if the statement is correct and FALSE if it is incorrect.

\_\_\_\_\_1. 140 degrees angle is acute.

### 3. OPEN-ENDED TESTS

- A. Performance-based- the participants are expected to perform a given task.  
Example: Create a video presentation showing the step-by-step process of solving quadratic equations.
- B. Non-performance based- the participants may answer orally or in a written manner.  
Example: Explain the mathematical procedures you apply to transform the given quadratic equation to standard form.

### Interviews

**Quantitative interviews** are sometimes referred to as survey interviews (structured type) because they resemble survey-style question-and-answer formats where in a large sample sized is used. It may be recorded, but because questions tend to be closed ended, taking notes during the interview is less disruptive than it can be during a qualitative interview.

If a quantitative interview contains open-ended questions, however, recording the interview is advised. It may also be helpful to record quantitative interviews if a researcher wishes to assess possible interview effect which means that the responses of the participants may be affected by the behavior displayed by the researcher on the manner that the questions are presented. This type of interview uses a rating scale or rubric and responses are numerical.

**Qualitative interviews** are sometimes called intensive or in-depth interviews. These interviews are informal, unstructured, semi-structured or focus group discussions (FGD). The researcher has a particular topic about which he or she would like to hear from the respondent, but questions are open ended and may not be asked in the same way or in exactly the same order to each and every respondent.

In in-depth interviews, the primary aim is to hear from respondents about what *they* think is important about the topic at hand and to hear it in their own words. So, no rating scale or rubric is needed. Responses are non-numerical.

The questionnaire and quantitative interview are both highly structured, but here's a difference between the two:

In quantitative interviews, (1) the items are read to the participants; (2) participants and researchers may ask questions; (3) helpful to blind or uneducated participants while in questionnaires, (1) the participants read the questions and answer on their own; (2) the participants and researchers may not ask further questions; (3) not useful to blind or uneducated participants.

### Observation

**Observation** is way of gathering data which involves systematically selecting, watching, listening, reading, touching, and recording behavior and characteristics of living beings, objects, or phenomena. Observations can be controlled, natural, or participant. It can be used in quantitative research when the observable characteristics are quantitative in nature (e.g. length, width, height, weight, volume, area, temperature, cost, level, age, time, and speed).

Observation has greater flexibility in the observation method. However, observation may lack participant validity and may be prone to the **Hawthorne effect phenomenon** (when subjects of an experimental study attempt to change or improve their behavior simply because it is being evaluated or studied). Furthermore, it is more exhausting and time-consuming especially when observations need to be conducted for many years.

## Forms of Observation

- i. **Controlled observation** is a form of observation where researchers watch participants in a contained environment, such as a classroom or a laboratory. In a controlled study, the researcher pre-determines and controls the study variables and determines the location, the time, the participants, and the tools used to complete the study. It is usually used in experimental research and is done under a standard procedure. It provides more reliable data (obtained through structured and well-defined process). Lastly, the observer performs a non-participant role (i.e. does not interact with the participants).
- ii. **Natural Observation** is a form of observation that involves observing subjects in their natural environment. It can be used if conducting lab research would be unrealistic, cost-prohibitive, or would improperly affect the subject's behavior. It is carried out in a non-controlled setting. It has greater ecological validity (i.e. flexibility of the findings to be generalized to real-life contexts). Its major limitation is its strength to establish a causal relationship due to the presence of extraneous variables which can affect the behavior of the participants.
- iii. **Participant Observation** is a form of observation wherein the researcher becomes a complete observer or a participant in the study through the experience of spending time with a group of people and closely observing their actions, speech patterns, and norms, which in turn the researcher can gain an understanding. It allows the observer to become a member of the group or community that the participants belong to. It can be performed **covertly** (i.e., participants are not aware of the purpose behind the observation). It can be done also **overtly**, wherein participants know the intention or objectives of the observation.

## Different Roles of a Researcher during a Participant Observation

### 1. Complete Observer

This is a detached observer where the researcher is neither seen nor noticed by participants. It's one way of minimizing the Hawthorne Effect as participants are more likely to act natural when they don't know they're being observed.

### 2. Complete Participant

This is a fully embedded researcher, almost like a spy. Here the observer fully engages with the participants and partakes in their activities. Participants aren't aware that observation and research is being conducted, even though they fully interact with the researcher.

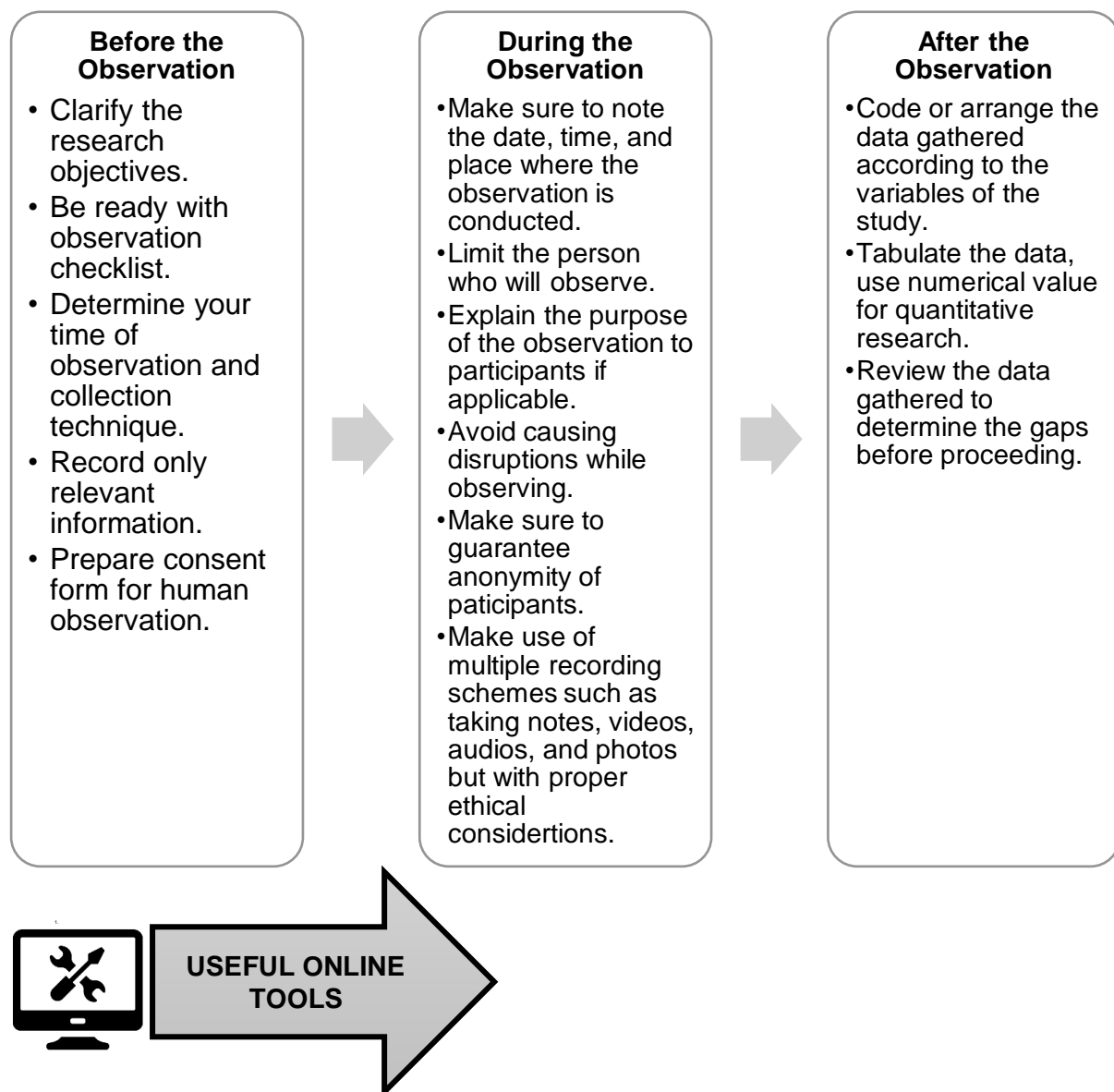
### 3. Observer as Participant

Here the researcher is known and recognized by the participants and in many cases, the participants know the research goals of the observer. There is some interaction with the participants, but the interaction is limited. The researcher's aim is to play a neutral role as much as possible.

### 4. Participant as Observer

Here the researcher is fully engaged with the participants. She is more of a friend or colleague than a neutral third party. While there is full interaction with participants, they still know that this is a researcher.


## Guidelines in Conducting an Observation



**Google Forms** are free online forms that allows the researcher to construct, administer, and analyze surveys.

### Step-by-step on how to use the google forms:

Step 1: Set up a new form or quiz

1. Go to [forms.google.com](https://forms.google.com).
2. Click Blank .
3. A new form will open.

Step 2: Edit and format a form or quiz (You can add, edit, or format text, images, or videos in a form.)

1. Edit your form.
2. Create a quiz/survey with Google Forms.
3. Choose where to save form responses.

Step 3: Send your form for people to fill out

1. When you are ready, you can send your form to others and collect their responses.

## Different Formats of Online Survey Tools (www.surveymizmo.com)

### 1. Radio Buttons

Gender

☒ Female

☐ Male

### 2. Checkboxes

Favorite Mall

☒ SM

☒ Ayala

☐ Gaisano

☒ Lim Ketkai

### 3. Drop Down Menus

Gender

Select one

Male

Female

Not specified

### 9. Image Select

Which one of these is not a cat?



### 4. Drag and Drop

Todo (4)

Started (0)

Completed (1)

Go to the gym  
LAST UPDATED 11:27:16 AM

Call Ollie  
LAST UPDATED 11:27:00 AM

Fix bike tyre  
LAST UPDATED 11:27:00 AM

Finish blog post  
LAST UPDATED 11:27:00 AM

Go to the gym  
LAST UPDATED 11:27:16 AM

Mow the lawn  
LAST UPDATED 11:27:13 AM


### 5. Likert Scale

Evaluate our brand in terms of the following statements:

|  | Strongly Disagree     | Disagree              | Neutral               | Agree                 | Strongly Agree        |
|--|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| I would recommend this brand to others.                              | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I have had a positive experience with this brand's customer service. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I would purchase from this brand again.                              | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

## 6. Slider Scale

\* 10. Would you recommend this webinar to a colleague/office mate?



## 7. Star Ranking

Please rate these super-heroes.

|                |   |   |   |   |   |
|----------------|---|---|---|---|---|
| Batman         | ★ | ★ | ★ | ☆ | ☆ |
| Superman       | ★ | ★ | ☆ | ☆ | ☆ |
| Spiderman      | ★ | ★ | ★ | ★ | ☆ |
| Captain Marvel | ★ | ★ | ★ | ★ | ☆ |

## 8. Net Promoter Score (NPS)

**How likely are you to recommend this to someone?**

|            |   |   |   |   |   |   |   |   |   |    |             |
|------------|---|---|---|---|---|---|---|---|---|----|-------------|
| 0          | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |             |
| Not Likely |   |   |   |   |   |   |   |   |   |    | Very Likely |

## 10. Matrix

| Province           | General Community Quarantine | Modified General Community Quarantine | Enhanced Community Quarantine |
|--------------------|------------------------------|---------------------------------------|-------------------------------|
| Misamis Oriental   | <input type="radio"/>        | <input type="radio"/>                 | <input type="radio"/>         |
| Bukidnon           | <input type="radio"/>        | <input type="radio"/>                 | <input type="radio"/>         |
| Agusan del Norte   | <input type="radio"/>        | <input type="radio"/>                 | <input type="radio"/>         |
| Camiguin           | <input type="radio"/>        | <input type="radio"/>                 | <input type="radio"/>         |
| Misamis Occidental | <input type="radio"/>        | <input type="radio"/>                 | <input type="radio"/>         |

## Ethical Considerations in Data Collection of Quantitative Research

Ethical considerations should always be practiced when conducting research. Researchers must ensure that respondents/ participants are treated fairly and properly especially during data collection. Consent form is a tool to be used that respects the right of every participant to be informed and to make voluntary participation during the data gathering.

**Informed Consent Form** is a document whose intent is that human participants can enter research freely (voluntarily) with full information about what it means for them to take part, and that they give consent before they participate the research. This form must be accomplished before gathering data from the participants. It must be signed both by the researcher and the participant as they agree to the conditions during the actual conduct of the data collection process. It usually contains the following:

1. Background of your study (Title of the Study, Purpose of the Study)
2. Name of Researchers and the Institution you are affiliated with
3. Data Collection Procedure
4. Possible discomfort or risk factors
5. Anonymity of the participants and their responses
6. Termination of Research (may refuse to participate anytime)
7. Authorization of the Participants (participants acknowledge the conditions that they will be subject to the study)

## **Sample Informed Consent**

### **RESEARCH SUBJECT INFORMED CONSENT**

#### **To the participants:**

Read this consent form and ask questions and clarifications before you decide to participate in this study or not. You are also free to ask questions during your participation in this research.

---

#### **Project Information**

Research Title: **IMPROVING SPEED AND ACCURACY IN MATH PROBLEM-SOLVING USING THE SINGAPOREAN METHOD AMONG GRADE 7 STUDENTS OF GuNHS-X**

Researcher: Rico A. Lopez

Phone: 09283434567/856-3454

School: Gulaman National High School-X

Department: Senior High School

#### **1. PURPOSE OF THIS RESEARCH STUDY**

You are asked to participate in a research study that seeks to offer a Singaporean Method in solving mathematical problems. The Singaporean method is a method that aims to develop speed and accuracy in solving problems in mathematics. Additionally, the study aims to determine the effectiveness of the Singaporean Method in solving mathematical problems.

Specifically, this study aims to answer the following questions: (1) Is there a significant difference between the learner's problem-solving skill during the pretest and the posttest? (2) Is there a significant difference between the scores of the learners in rating their problem-solving skill before and after introduced to the Singaporean Method? (3) Is there a significant difference in the problem-solving performance and the self-report scores between the control and experimental group?

#### **2. PROCEDURES**

You will be asked to use the workbook prepared by the Math Society and attend the math class at the Computer Laboratory. You will also be interviewed via Focus Group Discussion to obtain information regarding your reactions or responses to the approach. Specifically, you will be asked to do the following: (1) You will be asked to attend the Math class that uses the Singaporean approach for the whole term. (2) You will be interviewed by your math teacher for two (2) hours about your responses regarding the Singaporean approach of learning Mathematics and the challenges you encounter using this approach.

The expected duration of your participation is from October 2020 to January 2021.

#### **3. POSSIBLE RISKS OR DISCOMFORTS**

No possible risks can pose danger to you in any form during the conduct of this study. The implementation of the method may last for three (3) months or approximately 12 weeks and the interview may last for two hours.

**Cont.**

#### **4. POSSIBLE BENEFITS**

The findings of this research will benefit your teachers in expanding their teaching practices to effectively deal with developing a very potential problem-solving skill among its learners. This study is also useful for both public and private school administrators in the country in preparing a math curriculum with an intervention that is anchored upon the result of this study to develop and enhance the problem-solving skills among high school students.

#### **5. FINANCIAL CONSIDERATIONS**

No amount will be required from you during your participation in this study.

#### **6. CONFIDENTIALITY**

Your identity in this study will be treated with utmost confidentiality. The results will be published for academic purposes only. However, any data obtained as a result of your participation in this study may be checked by the sponsor, by the person conducting this study and or by the research panelists.

#### **7. TERMINATION OF RESEARCH STUDY**

You are free to choose whether or not to participate in this study. There will be no penalty if you choose not to participate. You may withdraw from your participation at any time without penalty.

#### **8. AVAILABLE SOURCES OF INFORMATION**

Any further questions you have about this study will be answered by the researcher.

#### **9. AUTHORIZATION**

I have read and understood this consent form, and I volunteer to participate in this research study. I understand that I will receive a copy of this form. I voluntarily choose to participate, but I understand that my consent does not take away any legal rights in the case of negligence or other legal fault by anyone who is involved in this study. I further understand that nothing in this consent form is intended to replace any applicable laws.

\_\_\_\_\_  
Participant's Signature Over Printed Name

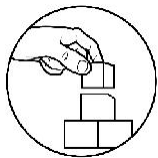
Date: \_\_\_\_\_

\_\_\_\_\_  
Parent's/Guardian's Signature Over Printed Name (*if underage*)

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

\_\_\_\_\_  
Researcher's Signature Over Printed Name

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



## What's More

### Activity 1: Answer Me!

Directions: Look at the questionnaire below. Answer the questions that follow by checking the box that best describes you.

| A Questionnaire to Review Your Study Habits                                 |                |       |           |          |                   |
|---|----------------|-------|-----------|----------|-------------------|
| Constructs  | Strongly Agree | Agree | Undecided | Disagree | Strongly Disagree |
| 1. I study where there is a good lighting.                                  |                |       |           |          |                   |
| 2. I study in a room where the temperature is cool.                         |                |       |           |          |                   |
| 3. The desk where I study is always clear from distractions.                |                |       |           |          |                   |
| 4. I use earplugs to minimize distracting sounds.                           |                |       |           |          |                   |
| 5. I study facing a wall.   |                |       |           |          |                   |
| 6. I don't do other things while I am studying.                             |                |       |           |          |                   |
| 7. I prepare ahead of time all the materials that I will need for studying. |                |       |           |          |                   |
| 8. I avoid wasting my time on Facebook, etc. in between my study time.      |                |       |           |          |                   |
| 9. I review my notes after class and use it for review.                     |                |       |           |          |                   |
| 10. I take breaks from time to time during study time.                      |                |       |           |          |                   |

### Activity 2: Write Me Down

Directions: Interview five (5) families in your barangay or other possible options may be presented depending on the current situation in your community. Create three (3) interview questions regarding their situation during the COVID-19 pandemic crisis. Make sure that the responses of your interview questions is quantifiable.

1. \_\_\_\_\_  
\_\_\_\_\_
2. \_\_\_\_\_  
\_\_\_\_\_

3. \_\_\_\_\_  
\_\_\_\_\_
4. \_\_\_\_\_  
\_\_\_\_\_
5. \_\_\_\_\_  
\_\_\_\_\_

### Activity 3: Quantitative or Not?

Directions: Which of the following can be considered as quantitative interview questions? Put a check (✓) the space provided before the number if the following questions illustrate quantitative nature and mark it with X if it is not.

- \_\_\_ 1. How often do you buy mobile accessories for social acceptance purposes?
- \_\_\_ 2. How regularly do you go to malls in a week?
- \_\_\_ 3. How much would you be willing to pay for a mobile app for dating?
- \_\_\_ 4. What are the differences in attitudes towards shopping between men and women?
- \_\_\_ 5. What is the difference in the number of telephone calls made between men and women?
- \_\_\_ 6. What is the relationship between a grade in math and level of class participation among Grade 7 students?
- \_\_\_ 7. What is the relationship between the number of COVID-19 cases and travel exposure?
- \_\_\_ 8. What is the relationship between job satisfaction and salary among public school teachers?
- \_\_\_ 9. Can you describe how you first became aware of the COVID-19 crisis?
- \_\_\_ 10. Can you talk about your thoughts on how the COVID\_19 pandemic affects a person, a family, a school, or a community?
- \_\_\_ 11. How do you see yourself today, in terms of the “new normal”?
- \_\_\_ 12. How does your family view your gender crisis?
- \_\_\_ 13. What does your school or community do to educate you about the COVID-19 pandemic crisis?
- \_\_\_ 14. Can you talk about whether or not you feel safe in your school or community after the enhanced community quarantine was lifted?
- \_\_\_ 15. Which factors mostly distort the approval rating of the president?

### Activity 4: Observe Me!

Directions: What type of observation is illustrated in the following observation notes? Write the letter of your choice on the space provided before the number. Choose from the choices below:

- |                            |                            |
|----------------------------|----------------------------|
| A. complete observer       | B. observer as participant |
| C. participant as observer | D. complete participant    |

- \_\_\_ 1. A doctor watching a patient's reaction to a medication.
- \_\_\_ 2. Pilots watching their monitors for airplane movements and locations.
- \_\_\_ 3. A biology teacher recording the daily data on bacteria growth at the Bio laboratory.
- \_\_\_ 4. A guidance counselor watching a friend's reaction to her *barkada*'s confession.
- \_\_\_ 5. An adviser watching her students work during independent work time.
- \_\_\_ 6. An online tutorial company manager observing the conversation of the interviewer and the applicant to determine the quality of their performance.
- \_\_\_ 7. A principal observing a math teacher gives a lesson to her class to evaluate her performance as an educator.





## ***What I Can Do***

Directions: Perform the following tasks. You may write or encode your answer in a long bond paper. Submit your output to your teacher for checking.

Decide on what type of data collection instrument you will use in obtaining data for your research study. Why will you use this specific data collection method?

Once you have decided on what data collection instrument to use, it is time to create your questions as a basis for data gathering. Make sure to align each of your questions or items to the research questions.

Write also a draft of your one-page informed consent.



## **Additional Activity**

Directions: Now that your data collection method and tool have been approved, it is now time to gather your data (float your questionnaire or test/ conduct your interview or observation). Make sure that your informed consent and questionnaire have been checked before distributing them to your participants. Reproduce your materials according to the target number of participants.

## Lesson 2

# Data Presentation and Interpretation



### *What's In*

In the previous lesson, you were presented with options as to how you will gather your data. Once the data are collected, you need to encode and organized them for systematic purposes. This will be the focused of this lesson. In this process, you will need to edit, code, tabulate and summarize information through graphs and tables for presentation and interpretation purposes. The process also allows the removal of unnecessary information.

Data presentation and analysis is one of the most essential part in your research study. An excellent data presentation can be potential for winning the hearts of the panelists, clients, or simply the readers. No matter how good your data, if it is not well presented, you will not be able to earn the preferences of those whom you are trying to persuade. Good data presentation matters.



### *What I Need to Know*

The following are the significant steps you need to take note in preparing and writing your data analysis after gathering the data:

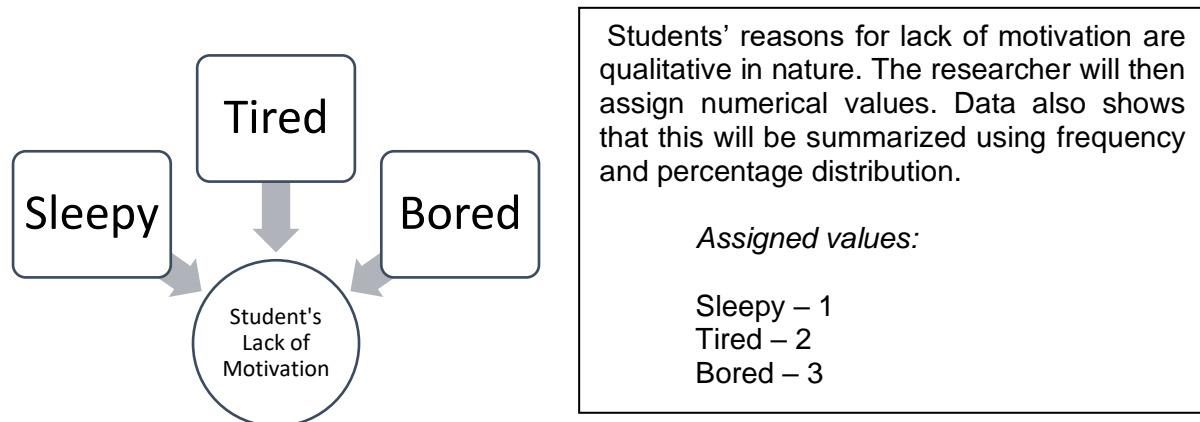
- (1) encode and organize your data for analysis according to the data asked by your research questions;
- (2) use your data for statistical tests you have identified in Module 4. You may ask assistance from your statistics and research teacher;
- (3) present the result in tabular or graphical form appropriate for your data and research purpose;
- (4) write the interpretation for each table or graph highlighting the significant results and its implications;
- (5) support your findings from relevant literature and studies you have cited in the Chapter 2 of your research paper; and
- (6) edit the grammatical and typographical errors in your interpretation. You may use [www.grammarly.com](http://www.grammarly.com) to edit your work.
- (7) Submit your work using the format given to you. Remember the institutional format of your school.

### **Techniques in Data Processing**

Remember to organize your data based on your research questions. The data processing involves three actions: editing, coding, and tabulation.

**Editing** raw data is the first step in analysis. Editing detects errors and omissions, corrects them whatever possible. Editor's responsibility is to guarantee that data are – accurate; consistent with the intent of the questionnaire; uniformly entered; complete; and arranged to simplify coding and tabulation.

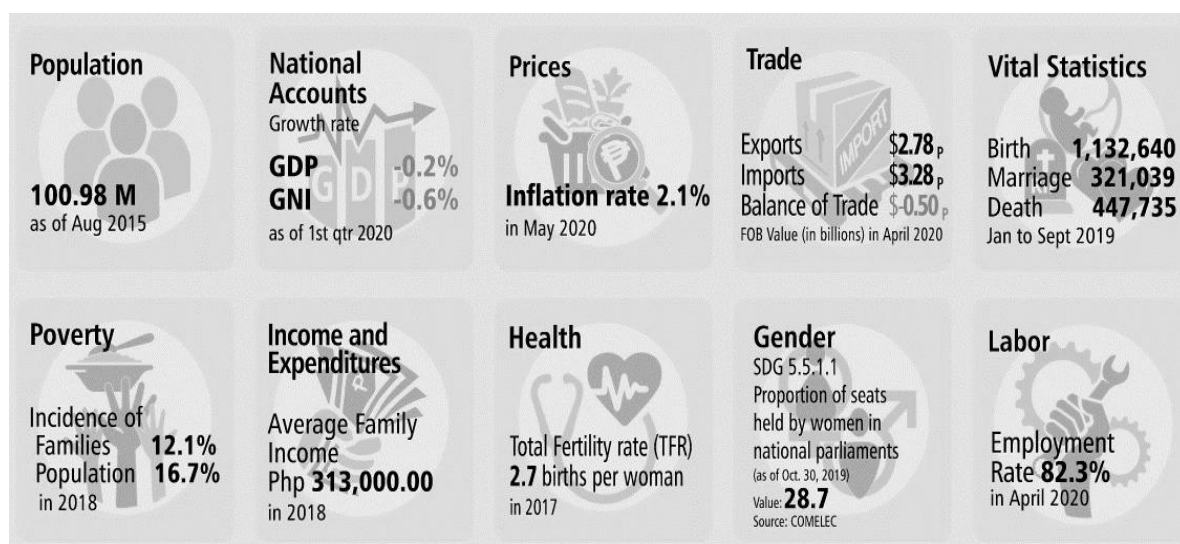
**Coding** refers to the process of assigning numerals or other symbols to answers so that responses can be put into a limited number of categories or classes. Such classes should be appropriate to the research problem under consideration. Coding is a process wherein the collected data are categorized and organized. It is usually done in qualitative research. In quantitative research, coding is done to assign numerical value to specific indicator especially if it is qualitative in nature. This numerical value will be useful when you are going to analyze your data using statistical tool. Just make sure that the categories created are aligned with your research questions. Consider the following example.



**Tabulation** is a system of processing data or information by arranging it into a table. With tabulation, numeric data is arrayed logically and systematically into columns and rows, to aid in their statistical analysis. The purpose of tabulation is to present a large mass of complicated information in an orderly fashion and allow viewers to draw reasonable conclusions and interpretations from them. In many studies, table is used to do this process. Tabulation can be done manually or electronically using MS Excel. The following digital tools can be used to tabulate your data like MS Excel, Minitab, or other digital tools. Correct arrangement of your data will be helpful during actual data analysis.



## What's New



Source: <https://psa.gov.ph/>

Look at the latest figures gathered by the Philippine Statistics Authority from a conducted census. Try to answer the questions that follow on how you are going to interpret the data.

1. How is the data presented?

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2. If you will be asked to present again the data, how will you arrange and label it? Use the space to draw your presentation of the data.



5. Write 3-5 sentences explanation of the data presented.

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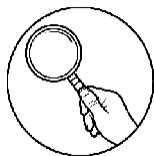
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## ***What Is It***

### **Presentation and Interpretation of Data**

The next step after editing, coding, and tabulating the data is to present them into graphical or visual presentation called non-prose materials. The purpose of presenting the data in this way is to make the outlined of the results more presentable. Non-prose materials are composed of graphs, bars, tables, charts, diagrams, illustrations, drawings, and maps. .

In quantitative research, tables and graphs are usually used. Standard format in presenting the data into a table or a graph like its title, labels, contents, and many more can be followed as well when school institutional format is not provided or identified. You may visit APA, CMOS, or MLA on how to do so.

### **Tables**

Table helps summarize and categorize data using columns and rows. It contains headings that indicate the most important information about your study.

To interpret the tables, one needs to do the following:

1. Analyze the connections among the details of the headings.
2. Check the unusual pattern of the data and determine the reason behind these.
3. Begin with the table number and the title.
4. Present the significant figures (overall results, high and low values, the unusual pattern).
5. Refrain from repeating again what's inside the table.
6. Support your findings with literature and studies that confirms or contrasts your results.
7. Establish the practical implications of the results. This will add value to your research findings.
8. End with a brief generalization.

### **Sample Interpretation for the Given Table**

#### **Sample 1**

**Table 1. Frequency and Percentage Distribution of Student's Overall Performance in Pre-Calculus Pretest**

| <b>Student's Overall Performance</b> | <b>f</b> | <b>%</b> |
|--------------------------------------|----------|----------|
| Outstanding                          | 2        | 5        |
| Very Satisfactory                    | 15       | 30       |
| Satisfactory                         | 33       | 66       |
| Unsatisfactory                       | 0        | 0        |
| Poor                                 | 0        | 0        |
| Total                                | 50       | 100      |

Cont.

Table 1 shows the summary of the overall adjectival rating in frequency and percentage of students in their pretest in Pre-calculus at Gulayan National High School for S.Y. 2019-2020. Results reveal that 66% of the students have satisfactory rating. Only 5% have outstanding rating. Overall, the data showed that the students at Gulayan National High School have fair ratings based on their pretest scores. This implies that most of the students do not have prior mastery on the concepts of this subject. Hence, teacher is expected to apply teaching strategies that will increase students' concepts of the subject. This result is supported by Ignacio (2016) that pretest scores especially if it is valid and reliable shows prior knowledge of the learners of the subject matter.

## Sample 2

Looking at Table 4, there is a significant relationship between the classroom interaction that facilitates positive discipline and sense belonging ( $r(39) = .973, p = 0.000$ ). The feeling of being safe and welcome in school is significantly related to how the teachers manage classroom interaction. This result is supported by the early studies on classroom management by Brophy and Avertson (1976) that though variety of teaching behaviors affect effective teaching; classroom management appeared to be one of the most critical aspects as viewed by students.

**Table 3. Correlation Analysis of Positive Discipline and Sense of Belonging**

| Variables             | Sense of Belongingness |        | Interpretation  |
|-----------------------|------------------------|--------|-----------------|
| Classroom Interaction | Pearson Correlation    | .973   | Significant     |
|                       | Sig. (2-tailed)        | .000** |                 |
| Use of Reinforcement  | Pearson Correlation    | .073   | Not Significant |
|                       | Sig. (2-tailed)        | .663   |                 |

\* $p < .05$ , \*\* $p < .01$

## Graphs

Graphs are visual representations which focuses on how a change in one variable affects to another. They are used to organize information to show patterns and relationships. A graph shows this information by representing it as a shape. Researchers and scientists often use tables and graphs to report findings from their research. In choosing what type of graph to use, determine the specific purpose of the presentation. Line Graph illustrates trends and changes in data over time, Bar Graph illustrates comparisons of amounts and quantities, while Pie Graph (Circle Graph) displays the relationship of parts to a whole.

### Sample Interpretation of a Bar Graph

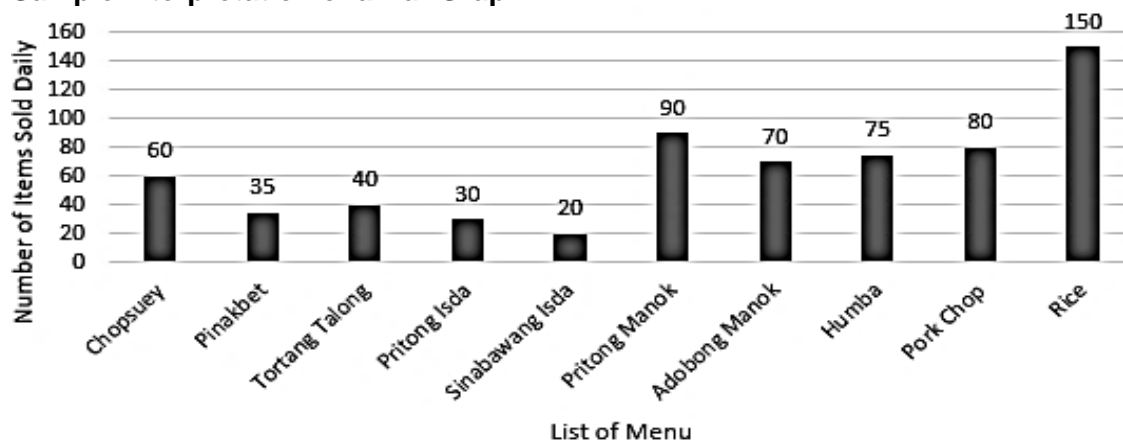
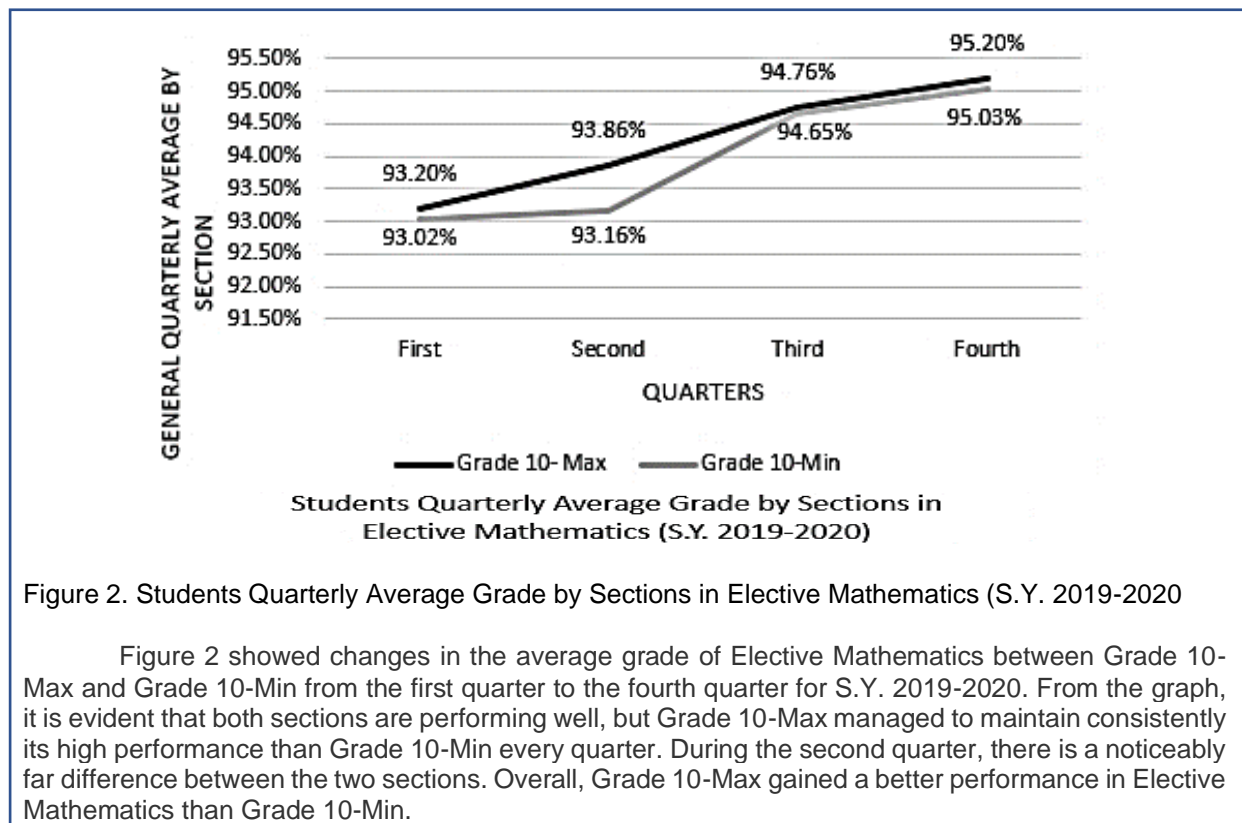


Figure 1. GRSHS-X Canteen Lunch Menu

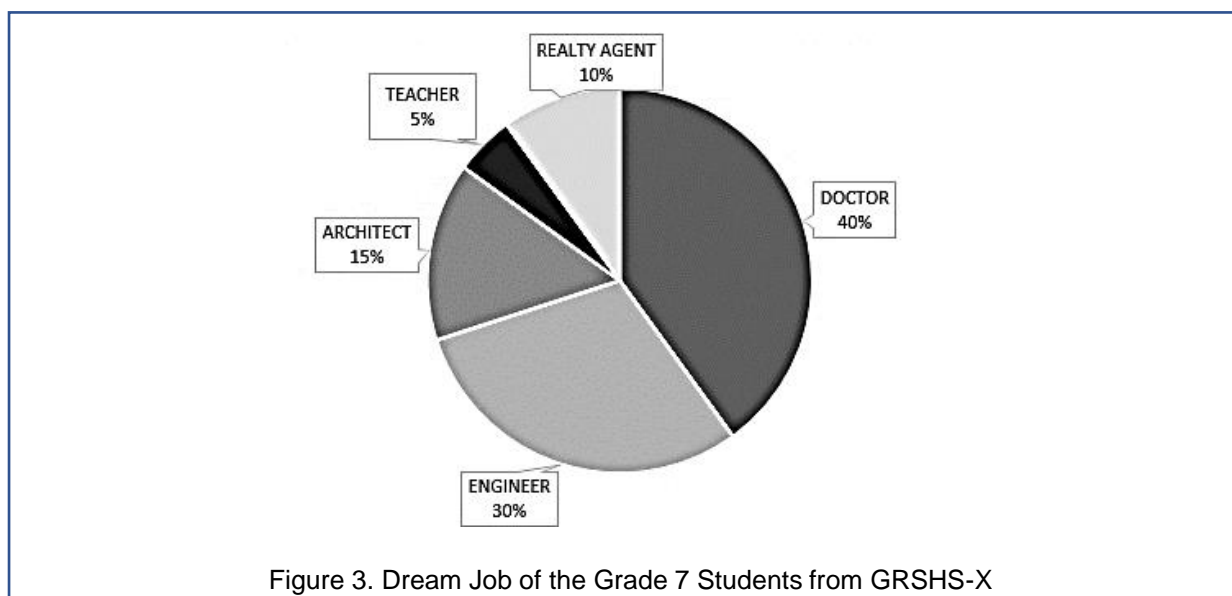
Cont.

Figure 1 shows the canteen lunch menu of GRSHS-X. The graph reveals that rice is highly patronized by the students and teachers with 150 cups sold daily. It can also be noted that pork and chicken menus have a good number of buyers (315 serve/pieces). Vegetable menus cannot be undervalued since several consumers (135 serve/pieces) also patronized the food. At the same time, seafood menus earn the last spot (50 serve/pieces sold). Generally, students and faculty of GRSHS-X preferred meat (pork and chicken) menus next to rice.

### Sample Interpretation of a Line Graph

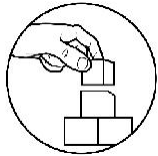


### Sample Interpretation of a Pie Graph



Cont.

Figure 3 showed the result of the survey conducted to Grade 7 students when asked about their dream job. From the graph, forty percent (40%) and thirty percent (30) of the participants wanted to become a doctor and an engineer, respectively with just thirty percent (30%) left for other professions. Only about five percent (5%) wanted to become a teacher. From the data, more than 70% of the Grade 7 students will likely pursue STEM strand courses when they graduate in high school.



## ***What's More***

### **Activity 1: Present Me!**

Directions: Present the following data using a specific non-prose material according to its purpose. Use a separate paper for your presentation.

According to the latest Facebook post of Department of Health-Philippines DOH COVID-19 CASE BULLETIN #106, dated June 28, 2020. Source: <https://bit.ly/3dMehug>; <https://bit.ly/31nmqv2>.

1. There are a total of 24, 137 Active Cases of COVID-19 in the Philippines (Data as of June 27, 2020) with the following breakdown:

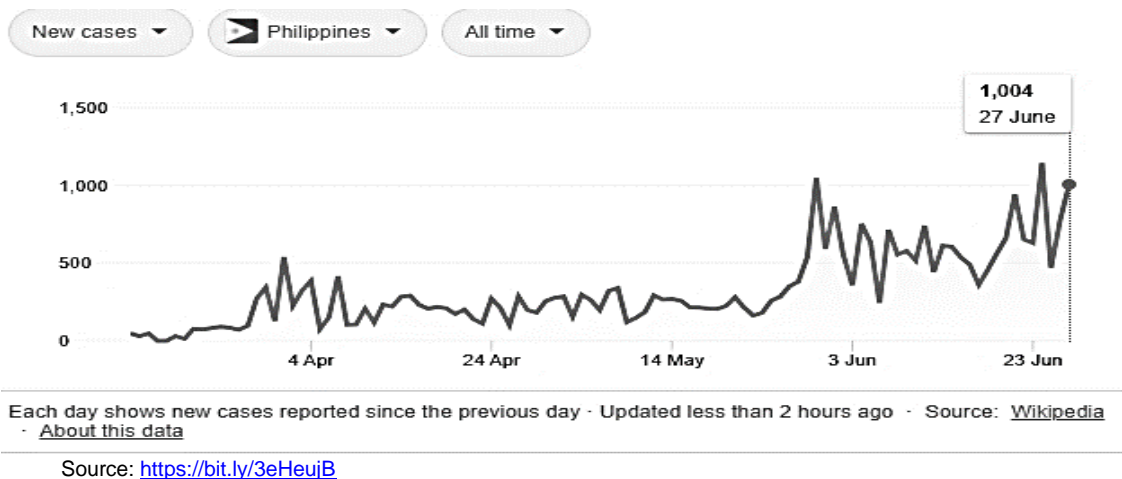
|              |   |                 |
|--------------|---|-----------------|
| Asymptomatic | - | 898 persons     |
| Mild         | - | 23, 090 persons |
| Severe       | - | 125 persons     |
| Critical     | - | 24 persons      |
  
2. These are the data on hospital beds and mechanical ventilators for COVID-19 patients with the following breakdown:

|                |   |                          |
|----------------|---|--------------------------|
| Ward beds      | - | 3, 179 (41.15% occupied) |
| Isolation Beds | - | 8,925 (37.93% occupied)  |
| ICU Beds       | - | 1, 313 (36.63% occupied) |
| Ventilators    | - | 1, 883 (22.89% in use)   |

### **Activity 2: Look and Explain Me!**

Directions: Interpret each figure given below. Follow the guidelines in interpreting the graph. Write a brief interpretation of the data on the space provided for each figure.

Graph 1. Line Graph of COVID-19 cases in the Philippines since March 15-June 27, 2020



Interpretation:

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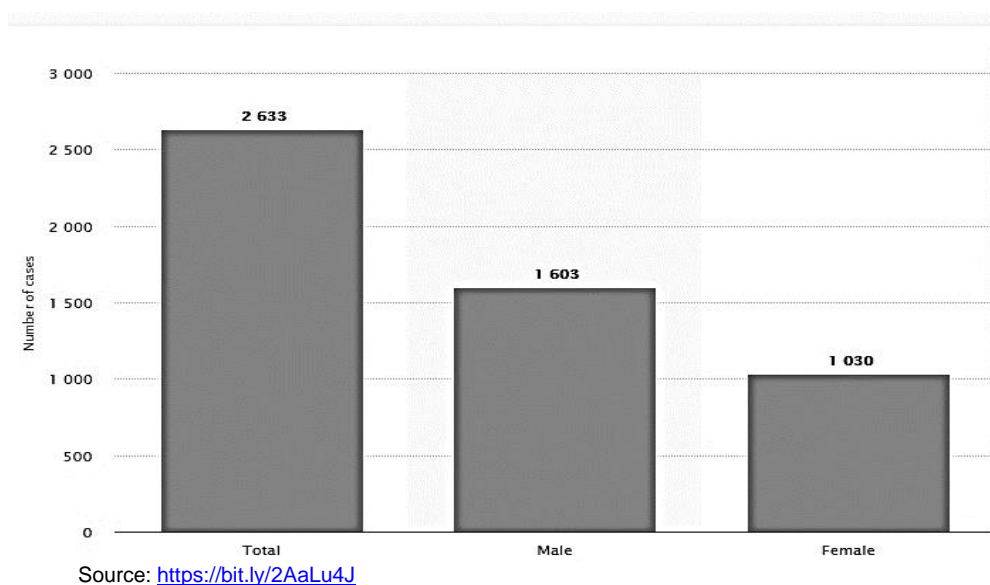
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Graph 2: Number of COVID-19 cases in the Philippines as of April 2, 2020, by gender



**Interpretation:**

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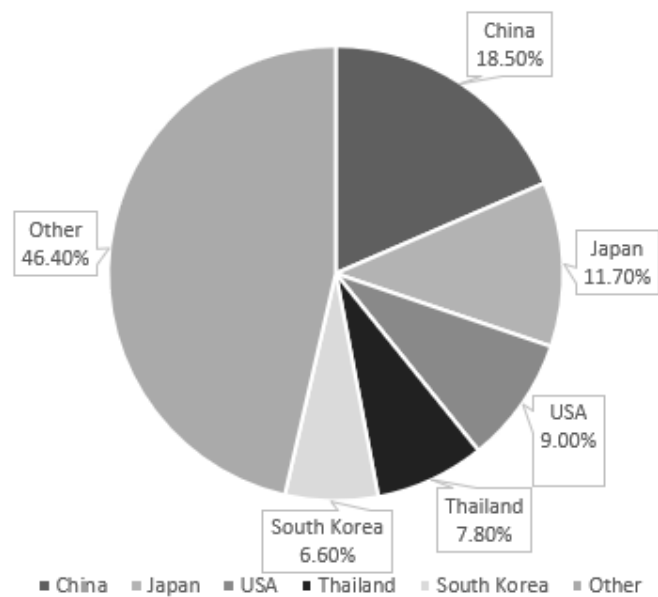
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Graph 3: Philippines Major Import Sources, 2016

Philippines Major Import Source (2016)



Source: <https://bit.ly/3i7Td4A>

**Interpretation:**

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### Activity 3: Use It!

Directions: Go to the link below and use it to run statistical analyses quickly and directly in your browser.

GraphPad Software <https://bit.ly/2X5JCTC>

### Activity 4: Interpret Me!

Directions: Interpret the table following the suggested guidelines. Write brief interpretation on the space provided.

**Table 2. Positive Discipline Practices of Teachers through the Use of Reinforcement**

| Constructs   | Mean        | SD         | Verbal Descriptions   |
|--|-------------|------------|-----------------------|
| 1. Coach positive social behaviors                             | 3.71        | .52        | Always observed       |
| 2. Reward targeted positive behaviors with incentives          | 2.89        | .84        | Often observed        |
| 3. Use problem solving strategy                                | 3.16        | .89        | Often observed        |
| 4. Prepare students for transitions with predictable routines  | 3.24        | .71        | Often observed        |
| 5. Give clear positive directions                              | 3.34        | .81        | Always observed       |
| 6. Warn consequences for misbehavior                           | 3.03        | .75        | Often observed        |
| 7. Use clear classroom discipline plane                        | 3.29        | .77        | Always observed       |
| 8. Use emotion coaching  | 3.18        | .69        | Often observed        |
| 9. Use imaginary play/drama, stories to teach problem solving. | 3.34        | .63        | Always observed       |
| 10. Set up problem scenarios to practice prosocial solutions.  | 3.37        | .67        | Always observed       |
| <b>Overall</b>   | <b>3.25</b> | <b>.44</b> | <b>Often observed</b> |

Legend: 1.00-1.75 = Never Observed, 1.76-2.50 = Sometimes Observed,  
2.51-3.25 = Often Observed, 3.26-4.00 = Always Observed

### Interpretation:

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### Activity 5: Let's go Online

Go to the link below and practice what you've learned from this lesson:

<https://bit.ly/3c8t01w>  
<https://bit.ly/2A7L6DE>  
<https://bit.ly/2TGK4Fr>  
<https://bit.ly/2BkEbl2>



## ***What I Have Learned***

Directions: Using the space below, write a reflective essay about your learning experience on the quantitative data presentation and interpretation. Let your essay reveal how much you learned about each concept behind each topic dealt with in this lesson. Express which concepts are the most understood, slightly understood, and the least understood ones.

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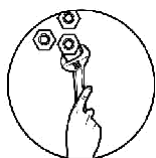
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## ***What I Can Do***

### **Task: Decision Making**

Directions: Perform the following task. You may write or encode your answer in short bond paper. Submit your output to your teacher for checking.

Since you are done gathering your data, it is now time to tally the obtained data on a separate sheet of paper. Decide on what type of data presentation you will use in your research study. Why will you use this specific graph? Once you have decided on what data presentation to use, it is time to create your interpretations. Follow the guidelines given.



## ***Additional Activity***

Directions: Now that your data presentation and interpretation have been checked and approved, it is now time to include your output in Chapter 4 of your research paper.

## Lesson 3

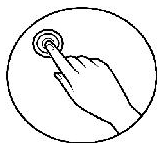
# Using Statistical Techniques to Analyze Data



### *What's In*

In the previous lesson, you were presented with options on how to present and analyze your data through tables and graphs. As mentioned previously, data analysis goes hand in hand with data presentation and is considered a time-consuming task because it involves a series of investigations, classifications, mathematical calculations, and graphical recording, among others.

You are fully aware that planning your research study is needed. Thus, it is assumed that when you begin your research study, you have already identified the scale of measurement to use in your research study. Comprehensive statistical analysis is important before making conclusions about your study.



### *What I Need to Know*

Statistical methods and techniques were already discussed in the previous modules. Sample Size Determination was also introduced in Module 4, Lesson 2. This lesson will discuss deeply the five most useful statistical techniques specifically in quantitative research: Percentage, Mean, Standard Deviation, Correlation, Regression, and Hypothesis Testing.

The computational procedure for hypothesis testing (Chapter 3) will also be shown in this lesson because this is where your decision-making skill will be tested. You will investigate and evaluate the claims about your study before writing your conclusions.



### *What's New*

#### **Activity 1: What's My Level?**

Directions: Look at the table below. Check your level of conceptual knowledge and computational skills of these statistical techniques.

| Statistical Techniques | Levels of Conceptual Knowledge |         |           | Levels of Conceptual Skills |         |           |
|------------------------|--------------------------------|---------|-----------|-----------------------------|---------|-----------|
|                        | Weak                           | Average | Excellent | Weak                        | Average | Excellent |
| Percentage             |                                |         |           |                             |         |           |
| Mean                   |                                |         |           |                             |         |           |
| Standard Deviation     |                                |         |           |                             |         |           |
| Correlation Analysis   |                                |         |           |                             |         |           |
| Regression Analysis    |                                |         |           |                             |         |           |
| Hypothesis Testing     |                                |         |           |                             |         |           |



## What Is It

### Statistical Techniques

**1. Percentage** is any proportion from the whole.

**Formula:**  $PERCENTAGE(\%) = \left( \frac{PART}{WHOLE} \right) \times 100$

**Example:**

Here's a data gathered by Purok A City High School administration regarding the number of Grade 7 parents who opted to receive digital copies of the learning modules.

Table 1: Percentage of Parents who Opted to Receive Digital Copies of Learning Modules

| Sections | Total Number of Parents | Number of Parents who opted to received digital copies of learning modules | Percentage (%)                       |
|----------|-------------------------|--|--------------------------------------|
| 7-A      | 30                      | 24   | $(24 \div 30) \times 100 = 80\%$     |
| 7-B      | 25                      | 25   | $(25 \div 25) \times 100 = 100\%$    |
| 7-C      | 32                      | 16   | $(16 \div 32) \times 100 = 50\%$     |
| 7-D      | 30                      | 11   | $(12 \div 30) \times 100 = 40\%$     |
| TOTAL    | 117                     | 76   | $(76 \div 117) \times 100 = 64.96\%$ |

**2. Mean or average** is the middlemost value of your list of values, and this can be obtained by adding all the values and divide the obtained sum to the number of values.

**Formula:**  $MEAN(\bar{X}) = \frac{SUM\ OF\ ALL\ VALUES}{NUMBER\ OF\ VALUES}$

**Example:**

1. Ungrouped Data

Refer to Table 1 above, to get the mean or average number of parents who opted to receive digital copies of learning modules, do the following:

$$MEAN(\bar{X}) = \frac{24+25+16+11}{4} = \frac{76}{4} = 19$$

2. Grouped Data

Here's the data gathered from the survey on Study Habits conducted by the Grade 12 students to the 150 Grade 7 students of Purok A City High School.

Table 2: Mean Distribution of the Study Habits of Students

| A Questionnaire to Review Your Study Habits      |                    |             |               |              |                       |   |                    |
|--|--------------------|-------------|---------------|--------------|-----------------------|---|--------------------|
|  | Strongly Agree (5) | Agree (4)   | Undecided (3) | Disagree (2) | Strongly Disagree (1) | Mean ( $\bar{X}$ )                            | Verbal Description |
| I study where there is good lighting.            | 120x5<br>=600      | 10x4<br>=40 | 0x3<br>=0     | 15x2<br>=30  | 5x1<br>=5             | $\frac{600 + 40 + 0 + 30 + 5}{150}$<br>=4.5   | Strongly Agree     |
| I study in a room where the temperature is cool. | 100x5<br>=500      | 20x4<br>=80 | 5x3<br>=15    | 10x2<br>=20  | 15x1<br>=15           | $\frac{500 + 80 + 15 + 20 + 15}{150}$<br>=4.2 | Agree              |

3. **Standard Deviation** shows the spread of data around the mean.

**Formula:** 
$$SD = \sqrt{\frac{\sum(x - \bar{x})^2}{n}}$$

**Example:**

Table 2: Mean and Standard Deviation Distribution of the Study Habits of Students

| <b>A Questionnaire to Review Your Study Habits</b> |                 |               |            |             |             |                    |   |                                |
|--|-----------------|---------------|------------|-------------|-------------|--------------------|---|--------------------------------|
|  | SA              | A             | U          | D           | SD          | Mean ( $\bar{X}$ ) | Mean ( $\bar{X}$ )                                | Standard Deviation ( $SD$ )    |
| I study where there is good lighting.              | 120x25<br>=3000 | 10x16<br>=160 | 0x9<br>=0  | 15x4<br>=60 | 5x1<br>=5   | 4.5                | $\frac{3000 + 160 + 0 + 60 + 5}{150}$<br>=21.50   | $=\sqrt{21.50 - 4.5}$<br>=4.12 |
| I study in a room where the temperature is cool.   | 100x25<br>=2500 | 20x16<br>=320 | 5x9<br>=45 | 10x4<br>=40 | 15x1<br>=15 | 4.2                | $\frac{2500 + 320 + 45 + 40 + 15}{150}$<br>=19.47 | $=\sqrt{19.47 - 4.2}$<br>=3.91 |

|                   | <b>Abbreviation</b> | <b>Numerical Values</b> |
|-------------------|---------------------|-------------------------|
| Strongly Agree    | (SA)                | - 5                     |
| Agree             | (A)                 | - 4                     |
| Undecided         | (U)                 | - 3                     |
| Disagree          | (D)                 | - 2                     |
| Strongly Disagree | (SD)                | - 1                     |

One need to get the range from which the mean of a five-point Likert can be interpreted. There are two methods to do this, if we treat the Likert scale as interval/ratio. First, the usual way is to calculate the interval by computing the range (e.g.,  $5 - 1 = 4$ ), then divided it by the maximum value (e.g.  $4 \div 5 = 0.80$ ). Ultimately, we get the following result:

- From 1 to 1.80 represents (strongly disagree).
- From 1.81 to 2.60 represents (do not agree).
- From 2.61 to 3.40 represents (true to some extent).
- From 3.41 to 4.20 represents (agree).
- From 4.21 to 5.00 represents (strongly agree).

The other way is to treat the selection as the range themselves, and so we get these results:

- From 0.01 to 1.00 is (strongly disagree);
- From 1.01 to 2.00 is (disagree);
- From 2.01 to 3.00 is (neutral);
- From 3.01 to 4.00 is (agree);
- From 4.01 to 5.00 is (strongly agree)

Here's how it will appear in your research paper.

| <b>Study Habit</b>                                  | <b>Mean (<math>\bar{X}</math>)</b> | <b>Standard Deviation (<math>SD</math>)</b> | <b>Verbal Interpretation</b> |
|---|------------------------------------|---|------------------------------|
| 1. I study where there is good lighting.            | 4.5                                | 4.12  | Strongly Agree               |
| 2. I study in a room where the temperature is cool. | 4.2                                | 3.91  | Agree                        |

**4. Correlation Analysis (Pearson's r)** is a statistical method used to estimate the strength of relationship between two quantitative variables.

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

**Example:**

Here's a data of five students with their corresponding grade in Math (Independent Variable) and grade in English (Dependent Variable). Is there a significant relationship between the grade in Math and the grade in English?

Table 3. Grade in Math and Grade in English of Five Students

| Student | Grade in Mathematics (x) | Grade in English (y) | $x^2$ | $y^2$ | xy    |
|---------|--------------------------|----------------------|-------|-------|-------|
| A       | 96                       | 97                   | 9216  | 9409  | 9312  |
| B       | 90                       | 92                   | 8100  | 8464  | 8280  |
| C       | 93                       | 96                   | 8649  | 9216  | 8928  |
| D       | 94                       | 95                   | 8836  | 9025  | 8930  |
| E       | 92                       | 90                   | 8464  | 8100  | 8280  |
| Sum     | 465                      | 470                  | 43265 | 44214 | 43730 |

Step 1. Compute the value of  $r$  using the Pearson's  $r$  formula.

$$r = \frac{5(43730) - (465)(470)}{\sqrt{[5(43265) - (465)^2][5(44214) - (470)^2]}} = 0.77$$

Step 2. From the table of values, there is a strong positive correlation between the grade in Math and the grade in English.

**5. Regression Analysis** can be used to explain the relationship between dependent and independent variables.

Three major uses:

- Causal analysis** -shows you the possible causation of changes in Y by changes X.
- Forecasting an Effect**- allows you estimate and predict the value of Y given the value of X.
- Linear Trend Forecasting**- helps you trace the line best fit to time series

**Formula:**  $Y = mX + b$

$$b = \frac{(\sum y)(\sum x^2) - (\sum x)(\sum xy)}{n(\sum x^2) - (\sum x)^2} \quad m = \frac{n(\sum xy) - (\sum x)(\sum y)}{n(\sum x^2) - (\sum x)^2}$$

**Example:**

Using the same data from Table 3, answer the following questions:

- What linear equation best predicts the grade in English given the grade in Math?

Step 1: Compute the  $b$  and  $m$ .

$$b = \frac{(\sum y)(\sum x^2) - (\sum x)(\sum xy)}{n(\sum x^2) - (\sum x)^2} \quad m = \frac{n(\sum xy) - (\sum x)(\sum y)}{n(\sum x^2) - (\sum x)^2}$$

$$b = \frac{(470)(43265) - (465)(43730)}{5(43265) - 216225} \quad m = \frac{5(43730) - (465)(470)}{5(43265) - (216225)}$$

$$b = 1 \quad m = 1$$

Step 2: Substitute the value of  $m$  and  $b$  to the regression formula.

The regression equation for predicting the grade in English given the grade in Math is  $Y = X + 1$ .

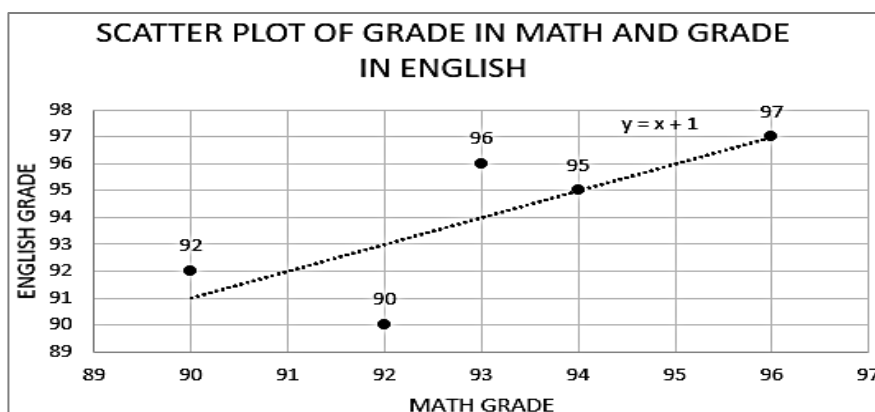
- b. If a student made a grade of 91 in Math, what grade would you expect the student to obtain in English?

Using the obtain equation  $Y = X + 1$ , substitute 91 in X.

$$Y = 91 + 1 = 92 \text{ (Grade in English)}$$

According to this model, for every 1 point increase in the Math grade, there is a corresponding average increase of 1 point in the English grade.

- c. How well does the regression equation fit the data?



Interpretation:

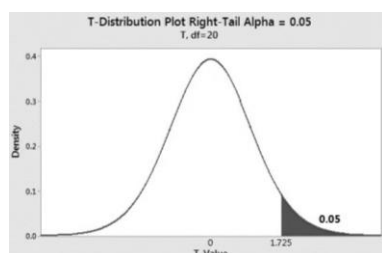
The Math grade is directly proportional to the English grade because the slope is positive.

**6. Hypothesis testing.** A hypothesis test helps you determine some quantity under a given assumption. The outcome of the test tells you whether the assumption holds or whether the assumption has been violated.

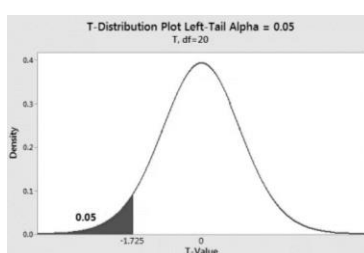
From Module 3, you were exposed to creating your **Null hypothesis ( $H_0$ )** which states that there is no difference between the two values or variables and the **Alternative hypothesis ( $H_1$ )** which states that there is a difference between two values or variables.

The **statistical test** uses the data obtained from a sample to decide about whether the null hypothesis should be rejected. In a **one-tailed test (left-tailed or right-tailed test)**, when the test value falls in the critical region on one side of the mean, the null hypothesis should be rejected.

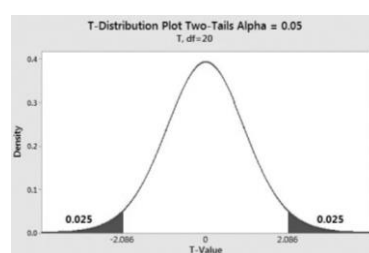
On the other hand, in a **two-tailed test**, the null hypothesis should be rejected when the test value falls in either of the two critical regions.



One-tailed, right-tailed test



One-tailed, left-tailed test



Two-tailed test

To perform hypothesis testing, you compute the mean from the sample and compare it with the mean from the population. Then, you decide whether to reject or not reject the

null hypothesis. If the difference is significant, the null hypothesis is rejected. If the difference is not significant, then the null hypothesis is not rejected. In the hypothesis-testing, there are four possible results.

|                     | $H_0$ true          | $H_0$ false         |
|---------------------|---------------------|---------------------|
| Reject $H_0$        | Error<br>Type I     | Correct<br>decision |
| Do not reject $H_0$ | Correct<br>decision | Error<br>Type II    |

The four possibilities are as follows:

1. It would be an incorrect decision and would result in a **Type I error** when you reject the null hypothesis when it is true.
2. It would be a correct decision when you reject the null hypothesis when it is false.
3. It would be a correct decision when you do not reject the null hypothesis when it is true.
4. It would be an incorrect decision and would result in a **Type II error** when you do not reject the null hypothesis when it is false.

The basic format for hypothesis testing:

1. State the hypotheses and identify them.
2. Find the critical value(s).
3. Compute the test value.
4. Make the decision.
5. Summarize the result.

Hypothesis testing can be done using the following t-value approach or critical value approach and p-value approach.

**1. The Critical Value Approach** is used to determine whether the observed test statistic is more extreme than a defined critical value. Hence, the observed test statistic (calculated on the basis of sample data) is compared to the critical value, from t-table. If the test statistic ( $t^*$ ) is more extreme than the critical value (t), the null hypothesis is rejected. If the test statistic is not as extreme as the critical value, the null hypothesis is not rejected.

**One-Sample t-test Formula:**

$$t^* = \frac{\bar{X} - \mu_0}{\frac{s}{\sqrt{n}}} \quad \sigma = \sqrt{\frac{\sum(X - \bar{X})^2}{n}}$$

**Example:**

A random sample of 10 Grade 7 students has grades in Math, where marks range from 90 (Good) to 98 (Excellent). The general average grade (Gen. Ave.) of all Grade 7 students as of the last 5 years is 93. Is the Gen. Ave. of the 10 Grade 7 students different from the population's Gen. Ave? Use 0.05 level of significance.

| Student    | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 |
|------------|----|----|----|----|----|----|----|----|----|----|
| Math Grade | 90 | 98 | 97 | 93 | 94 | 91 | 97 | 93 | 93 | 94 |

Given:  $n=10$

$\alpha=0.05$

$\mu_0=93$

$\bar{X}=94$

sd= 2.68

#### Computational Procedure:

1. Define the Null and Alternative Hypothesis

$H_0$ : There is no significant difference between the gen. ave. of 10 Grade 7 students from the population's gen. average of 93.

$$H_0: \mu = 93$$

$H_1$ : There is a significant difference between the gen. ave. of 10 Grade 7 students from the population's gen. average of 93.

$$H_1: \mu \neq 93$$

2. State the alpha and the degree of freedom.

$$\alpha = 0.05$$

$$Df = n - 1 = 10 - 1 = 9$$

3. State the decision rule.

One-tailed Test:  $|t| > z_{\alpha}$ ; Reject  $H_0$

Two-tailed Test:  $|t| > \frac{z_{\alpha}}{2}$ ; Reject  $H_0$

4. Calculate the Test Statistic.

$$t = \frac{\bar{X} - \mu_0}{\frac{s}{\sqrt{n}}} = \frac{94 - 93}{\frac{2.68}{\sqrt{10}}} = 1.18$$

5. State results (use t table to get the critical value, see procedure below).

$$\frac{t_{\alpha}}{2} = \frac{t_{0.05}}{10-1} = t_{0.0025} = 2.263$$

$$|1.18| < 2.262$$

6. Decision: Accept  $H_0$

7. Conclusion: Therefore, the average grade of 10 Grade 7 students is not different from the population's average grade in Math which is 93.

**2. P-value Approach** involves determining the probability (assuming the null hypothesis were true) of observing a more extreme test statistic in the direction of the alternative hypothesis than the one observed. If the  $P$ -value is less than (or equal to)  $\alpha$  then the null hypothesis is rejected in favor of the alternative hypothesis. And, if the  $P$ -value is greater than  $\alpha$ , then the null hypothesis is not rejected.

#### Example:

Use the same data from Example 1 of Critical value approach:

#### Computational Procedure:

1. Define the Null and Alternative Hypothesis

$H_0$ : There is no significant difference between the gen. ave. of 10 Grade 7 students from the population's gen. average of 93.

$$H_0: \mu = 93$$

$H_1$ : There is a significant difference between the gen. ave. of 10 Grade 7 students from the population's gen. average of 93.

$$H_1: \mu \neq 93$$

2. State the alpha and the degree of freedom.

$$\alpha = 0.05$$

$$Df = n - 1 = 10 - 1 = 9$$

3. State the decision rule.

One-tailed Test:  $|t| > z_{\alpha}$ ; Reject  $H_0$

Two-tailed Test:  $|t| > \frac{z_{\alpha}}{2}$ ; Reject  $H_0$

4. Calculate the Test Statistic.

$$t = \frac{\bar{X} - \mu_0}{\frac{s}{\sqrt{n}}} = \frac{94 - 93}{\frac{2.68}{\sqrt{10}}} = 1.18$$

5. Use statistical software or an online calculator (<https://www.statology.org/t-score-p-value-calculator/>) to find the corresponding p-value.

One-tailed P-value: 0.13412

Two-tailed P-value: 0.26825

6. State results.  
One-tailed  $|0.13412| > 0.05$   
Two-tailed  $|0.26825| > 0.05$
7. Decision: Accept  $H_0$   
Since this p-value is *not* less than our chosen alpha level of 0.05, we can't reject the null hypothesis.
8. Conclusion: Therefore, the average grade of 10 Grade 7 students is not different from the population's average grade in Math which is 93.

Here are the steps in finding the t-value or critical value at the t-table:

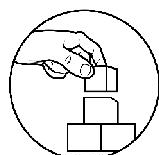
1. Locate your confidence level (alpha level) at the top row of the **t-table found below** (this tells you which column you need).
2. Intersect this column with the row for your *df* (degrees of freedom). The number you see is the **critical value** (or the **t-value**) for your confidence interval.

Table of T-Values

| <b>t Table</b> |           |           |           |           |           |           |            |           |            |            |             |
|----------------|-----------|-----------|-----------|-----------|-----------|-----------|------------|-----------|------------|------------|-------------|
| cum. prob      | $t_{.50}$ | $t_{.75}$ | $t_{.80}$ | $t_{.85}$ | $t_{.90}$ | $t_{.95}$ | $t_{.975}$ | $t_{.99}$ | $t_{.995}$ | $t_{.999}$ | $t_{.9995}$ |
| one-tail       | 0.50      | 0.25      | 0.20      | 0.15      | 0.10      | 0.05      | 0.025      | 0.01      | 0.005      | 0.001      | 0.0005      |
| two-tails      | 1.00      | 0.50      | 0.40      | 0.30      | 0.20      | 0.10      | 0.05       | 0.02      | 0.01       | 0.002      | 0.001       |
| df             |           |           |           |           |           |           |            |           |            |            |             |
| 1              | 0.000     | 1.000     | 1.376     | 1.963     | 3.078     | 6.314     | 12.71      | 31.82     | 63.66      | 318.31     | 636.62      |
| 2              | 0.000     | 0.816     | 1.061     | 1.386     | 1.886     | 2.920     | 4.303      | 6.965     | 9.925      | 22.327     | 31.599      |
| 3              | 0.000     | 0.765     | 0.978     | 1.250     | 1.638     | 2.353     | 3.182      | 4.541     | 5.841      | 10.215     | 12.924      |
| 4              | 0.000     | 0.741     | 0.941     | 1.190     | 1.533     | 2.132     | 2.776      | 3.747     | 4.604      | 7.173      | 8.610       |
| 5              | 0.000     | 0.727     | 0.920     | 1.156     | 1.476     | 2.015     | 2.571      | 3.365     | 4.032      | 5.893      | 6.869       |
| 6              | 0.000     | 0.718     | 0.906     | 1.134     | 1.440     | 1.943     | 2.447      | 3.143     | 3.707      | 5.208      | 5.959       |
| 7              | 0.000     | 0.711     | 0.896     | 1.119     | 1.415     | 1.895     | 2.365      | 2.998     | 3.499      | 4.785      | 5.408       |
| 8              | 0.000     | 0.706     | 0.889     | 1.108     | 1.397     | 1.860     | 2.306      | 2.896     | 3.355      | 4.501      | 5.041       |
| 9              | 0.000     | 0.703     | 0.883     | 1.100     | 1.383     | 1.833     | 2.262      | 2.821     | 3.250      | 4.297      | 4.781       |
| 10             | 0.000     | 0.700     | 0.879     | 1.093     | 1.372     | 1.812     | 2.228      | 2.764     | 3.169      | 4.144      | 4.587       |
| 11             | 0.000     | 0.697     | 0.876     | 1.088     | 1.363     | 1.796     | 2.201      | 2.718     | 3.106      | 4.025      | 4.437       |
| 12             | 0.000     | 0.695     | 0.873     | 1.083     | 1.356     | 1.782     | 2.179      | 2.681     | 3.055      | 3.930      | 4.318       |
| 13             | 0.000     | 0.694     | 0.870     | 1.079     | 1.350     | 1.771     | 2.160      | 2.650     | 3.012      | 3.852      | 4.221       |

Examples:

| Given  | t-value (critical value) |
|--|--------------------------|
| 1. $df=5$ , $\alpha=0.05$ , two-tailed test  | 2.571                    |
| 2. $df=12$ , $\alpha=0.05$ , one-tailed test | 1.782                    |



## What's More

### Activity 2: What's My Percentage?

Directions: Here's a data gathered by Purok A City High School administration regarding the number of Grade 7 parents who opted to receive printed copies of the learning modules. Fill out the boxes for total and percentage. Then write a brief interpretation of the table.

| Sections | Total Number of Parents | Number of Parents who opted to receive printed copies of learning modules | Percentage (%) |
|----------|-------------------------|---|----------------|
| 7-A      | 30                      | 6   |                |
| 7-B      | 25                      | 0   |                |
| 7-C      | 32                      | 16  |                |
| 7-D      | 30                      | 19  |                |
| Total    |                         |   |                |

**Interpretation:**

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### Activity 3: What's My Mean and Standard Deviation?

Directions: Here's the data gathered from the survey on Study Habits conducted by the Grade 12 students to the 150 Grade 7 students of Purok A City High School.

| A Review Your Study Habits                                |                    |           |               |              |                       |                    |                             |                       |
|---|--------------------|-----------|---------------|--------------|-----------------------|--------------------|-----------------------------|-----------------------|
|   | Strongly Agree (5) | Agree (4) | Undecided (3) | Disagree (2) | Strongly Disagree (1) | Mean ( $\bar{x}$ ) | Standard Deviation ( $SD$ ) | Verbal Interpretation |
| The desk where I study is always clear from distractions. | 90                 | 30        | 10            | 5            | 15                    |                    |                             |                       |
| I use earplugs to minimize distracting sounds.            | 10                 | 50        | 30            | 20           | 40                    |                    |                             |                       |
| I study facing a wall.                                    | 15                 | 35        | 30            | 20           | 50                    |                    |                             |                       |

### Activity 4: What's My Relationship?

Directions: Here's the data about the Math Pretest and Posttest scores of ten (10) Grade 12 students of Purok A City High School. Is there a significant relationship between the pretest and posttest scores in Math?

| Student | Pretest | Posttest |
|---------|---------|----------|
| 1       | 49      | 45       |
| 2       | 32      | 37       |
| 3       | 34      | 39       |
| 4       | 45      | 47       |
| 5       | 41      | 40       |
| 6       | 20      | 40       |
| 7       | 27      | 39       |
| 8       | 32      | 45       |
| 9       | 37      | 41       |
| 10      | 31      | 48       |

1. Compute the value Pearson's r: \_\_\_\_\_
2. Interpretation: \_\_\_\_\_  
\_\_\_\_\_
3. What linear equation best predicts the posttest given the pretest in Math? \_\_\_\_\_
4. If a student made a pretest score of 43 in Math, what grade would you expect the posttest score the student will obtain? \_\_\_\_\_
5. Show the line of best fit and its interpretation. \_\_\_\_\_

### Activity 5: Am I Rejected or Accepted?

Directions: A random sample of 10 Grade 7 students has grades in MAPEH, where marks range from 90 (Good) to 98 (Excellent). The general average grade (Gen. Ave.) of all Grade 7 students as of the last 5 years is 95. Is the Gen. Ave. of the 10 Grade 7 students different from the population's Gen. Ave? Use 0.05 level of significance.

| Student     | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 |
|-------------|----|----|----|----|----|----|----|----|----|----|
| MAPEH Grade | 92 | 95 | 95 | 96 | 97 | 98 | 95 | 94 | 98 | 92 |

Given:  $n=10$        $\alpha=0.05$        $\mu_0=95$        $\bar{X}=\underline{\hspace{1cm}}$        $sd=\underline{\hspace{1cm}}$

1. Perform hypothesis testing using the Critical Value Approach.
2. Perform hypothesis testing using the P-Value Approach.

### Activity 6: Let's go Online

Direction: Go to the link below and practice what you've learned from this lesson:

<https://bit.ly/3c6evv2>  
<https://bit.ly/36EfqBZ>  
<https://bit.ly/3gmMbYS>  
<https://bit.ly/2ZGYNEu>  
<https://bit.ly/2A7L6DE>  
<https://bit.ly/2TGK4Fr>



### ***What I Have Learned***

Using the space below, write a reflective essay about your learning experience on using statistical techniques in data analysis. Let your essay reveal how much you learned about each concept behind each topic dealt with in this lesson. Express which concepts are the most understood, slightly understood, and the least understood ones.

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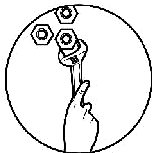


## ***What I Can Do***

### **TASK: Statistical Analysis**

Directions: Perform the following task. You may write or encode your answer in a long bond paper. Submit your output to your teacher for checking.

Based on your methodology, decide what statistical technique/s you will use to analyze deeply your data. Why will you use this tool? Use the statistical tool that you have decided upon to compute the significance of your study with relevance to the null and the alternative hypothesis. Conduct hypothesis testing. Indicate your data analysis.



## ***Additional Activity***

Directions: Now that your statistical computations and hypothesis testing have been checked and approved, it is now time to include your output in Chapter 4 of your research paper. Get ready for presentation of your written Results and Discussion. The rubrics below will served as a guide on how you will be rated by your teacher. The 4C (content, coherence, creativity, communication) technique will be used so that you can easily remember.

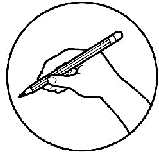
### Rubrics for Data Interpretation and Analysis

| Criteria  | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|
| <b>Content (35%)</b> <ul style="list-style-type: none"> <li>▪ The Research Instruments directly and clearly gathered the needed data.</li> <li>▪ Sufficient data are gathered that answers the research questions.</li> <li>▪ Appropriate statistical technique was used, and computation is accurate.</li> <li>▪ Presentations of data are clear and well labeled in a table or graph.</li> <li>▪ Interpretation and analysis highlight the significant results.</li> <li>▪ Discussion of the findings is well supported with relevant literature.</li> <li>▪ Implications of the results were presented.</li> </ul> |   |   |   |   |   |
| <b>Coherence (25%)</b> <ul style="list-style-type: none"> <li>▪ Cohesive of devices are effectively used.</li> <li>▪ Organization of ideas, presentation, and discussion is smoothly presented.</li> </ul>  |   |   |   |   |   |
| <b>Creativity (25%)</b> <ul style="list-style-type: none"> <li>▪ Writer's voice is showcased.</li> <li>▪ Paper uses variety of sentence structures.</li> <li>▪ Uses appropriate language.</li> </ul>  |   |   |   |   |   |
| <b>Communication (15%)</b> <ul style="list-style-type: none"> <li>▪ Sentences are well structured</li> <li>▪ Grammatical conventions are observed.</li> <li>▪ Correct spelling and proper research format are followed.</li> </ul>  |   |   |   |   |   |

*Legend:*  
 5 – to a very great extent,  
 4 – to a great extent,  
 3 – to some extent,  
 2 – to a little extent,  
 1 – not at all

## Summary

- **Data** are bits of information or facts known by everyone.
- **Quantitative data** are measurable, numerical, and related to a metrical system.
- **Data Collection** is an activity that allows the researcher to obtain relevant information regarding the specified research questions or objectives.
- **Quantitative research instruments** comprise questionnaires, interviews, tests, and observation.
- **Questionnaire** consists of a series of questions used for gathering information from respondents about a research topic.
- **Tests** are research instruments used for assessing various skills and types of behavior as well as for describing certain characteristics.
- **Quantitative interview** is a method of collecting data about an individual's behaviors, opinions, values, emotions, and demographic characteristics using numerical data.
- **Observation** is frequently used in qualitative research. It is also used in quantitative research when the characteristics being observed are quantitative, such as length, width, height, weight, volume, area, temperature, cost, level, age, time, and speed.
- **Google Forms** is a free online form that enables the researcher to construct, administer, and analyze surveys.
- **Informed Consent Form** is a document that provides the participants with the information they need in deciding whether they will participate or not in your study.
- **Editing** is a process wherein the collected data are checked for consistency, accuracy, organization, and clarity.
- **Coding** is a process wherein the collected data are categorized and organized. Labeling, using numbers, and symbols are also applied.
- **Tabulation** is a process of arranging data into a table which can be done manually or electronically using MS Excel.
- **Frequency distribution** is the organization of raw data in table form, using classes and frequencies.
- **Non-prose materials** are composed of graphs, bars, tables, charts, diagrams, illustrations, drawings, and maps.
- **Tables** are non-prose materials that help condense and classify information using columns and rows.
- **Positive Correlation**- when both values have the same directions (increase or decrease)
- **Negative Correlation**-when one value increases, the other one decreases and vice versa.
- **Pearson's  $r$  ( $r$ )** is a statistical method used for determining whether there is a linear relationship between variables.
- **Mean** refers to the average score of the given set of values.
- **Standard Deviation (SD)** is the square root of the variance.
- **Alpha level ( $\alpha$ )** is also known as the significance level. It refers to the probability value that must be reached before claiming that the findings obtained are statistically significant.
- **P-value ( $p$ )** is a calculated probability that is compared to the alpha level. If the p-value is lower than the set alpha level, there is a difference between the scores obtained for the two groups (statistically significant)
- **T-value ( $t$ )** is the statistic computed for the t-tests including the extent of the difference between the two groups being examined
- **Degree of Freedom ( $df$ )** refers to the number of values in the final computation of statistic that has the freedom to vary.
- A **Statistical hypothesis** is an assumption about a population parameter.

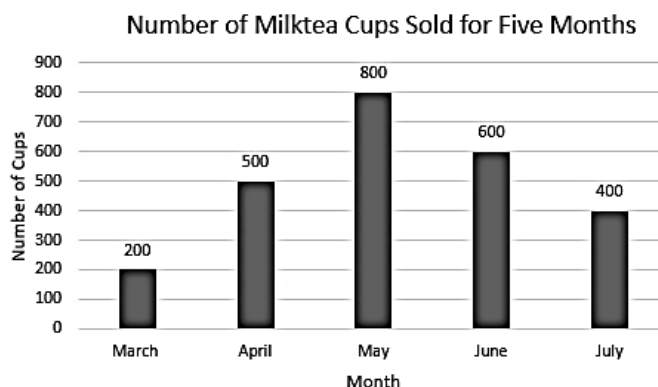


## Assessment

Multiple Choice. Answer the question that follows. Choose the best answer from among the given choices.

1. Which of the following is an unethical practice in research?
  - A. Informing participants that they are free to backout at any time
  - B. Requiring the participants to continue until the study is done
  - C. Assuring participants of confidentiality of gathered data
  - D. Securing informed consent
2. Which of the following is not considered part of descriptive statistic values?
  - A. Standard deviation
  - B. Variance
  - C. Pearson's r
  - D. Mean
3. What kind of correlation exists when two variables have no relationship with each other?
  - A. Strong Negative Correlation
  - B. Strong Positive Correlation
  - C. Negative Correlation
  - D. No Correlation
4. Which one of the following is an advantage of using questionnaire?
  - A. It can encourage the participants to be open to the researchers since their identity can be made anonymous.
  - B. Some participants will not be able to complete the required responses
  - C. Questionnaires may lack depth of answers from participants.
  - D. Some will not be able to return the questionnaire on time.
5. A study is conducted to determine the relationship between the time spent in studying and scores in a quarterly exam among 100 students of GRSHS-X. The result shows a correlational value of 0.98. What is the interpretation of this obtained result?
  - A. The amount of time spent on studying is strongly associated with the score in a quarterly exam.
  - B. The amount of time spent on studying is not associated with the score in a quarterly exam.
  - C. The score in a quarterly exam is moderately associated with the amount of time spent on studying.
  - D. The score in a quarterly exam is negatively associated with the amount of time spent on studying.
6. Which of these is not a method of data collection?
  - A. Questionnaires
  - B. Observations
  - C. Experiments
  - D. Interviews
7. A correlation coefficient enables you to:
  - A. quantify the strength of the relationship between variables.
  - B. evaluate whether two variables measure the same values.
  - C. measure the difference between two quantities
  - D. establish whether the data is exact.
8. What is the outcome when you reject the null hypothesis when it is false?
  - A. Incorrect decision
  - B. Correct decision
  - C. Type I Error
  - D. Type II Error

9. Which of the following is a graph that uses a line to represent data?
- A vertical graph
  - A pie chart
  - A line graph
  - A bar chart
10. Which of the following is not necessary when preparing your data analysis?
- Create a conclusion after gathering your data.
  - Encode and organize your data for analysis.
  - Prepare your research instruments.
  - Begin gathering your data.
11. To fight boredom, Cindy is trying her luck by selling milk tea during the COVID-19 pandemic lockdown. The table below shows the number of cups sold from March to July 2020. What is the best interpretation of the graph below?



- The graph shows that Cindy's milk tea sales is doing good every month.
  - The graph shows that the month of May is the best-selling month.
  - The graph shows that Cindy's milk tea sales is not good.
  - Cindy's milk tea business is going to shut down soon.
12. Which correlation is the weakest among the four?
- 1.0
  - +0.80
  - 0.6
  - +0.5
13. Which of the following statistical technique uses rankings instead of actual values in computing the correlational values between two sets of data?
- Analysis of Variance
  - Spearman's Rho
  - Pearson's r
  - t-test
14. What observational role is evident if an observer is known and recognized by the participants as part of their group or community but has limited interaction with them?
- Observer as participant
  - Participant as observer
  - Complete observer
  - Complete participant
15. What is a questionnaire?
- It is a tool for data interpretation.
  - It is a tool for data evaluation.
  - It is a tool for data collection.
  - It is a tool for data analysis.



## Key to Answers

**Pretest**

|      |       |       |
|------|-------|-------|
| 1. B | 6. A  | 11. A |
| 2. C | 7. B  | 12. D |
| 3. A | 8. A  | 13. A |
| 4. A | 9. D  | 14. C |
| 5. B | 10. B | 15. D |

**Lesson 1**

**What's New, Page 2**  
Answers may vary.

**What's More: Activity 1: Answer Me! Page 12**  
Answers may vary.

**What's More: Activity 2: Write Me Down! Page 12**  
Answers may vary.

**What's More: Activity 3: Quantitative or Not! Page 13**

|      |       |       |
|------|-------|-------|
| 1. ✓ | 6. x  | 11. x |
| 2. ✓ | 7. x  | 12. x |
| 3. ✓ | 8. x  | 13. x |
| 4. x | 9. x  | 14. x |
| 5. x | 10. x | 15. x |

**What's More: Activity 4: Observe Me! Page 13**

|      |       |
|------|-------|
| 1. B | 6. A  |
| 2. D | 7. C  |
| 3. A | 8. B  |
| 4. A | 9. C  |
| 5. B | 10. D |

**What's More: Activity 5: Try It! Page 14**  
Answers may vary.

**Lesson 2**

**What's More: Activity 1: Present Me! Page 22**

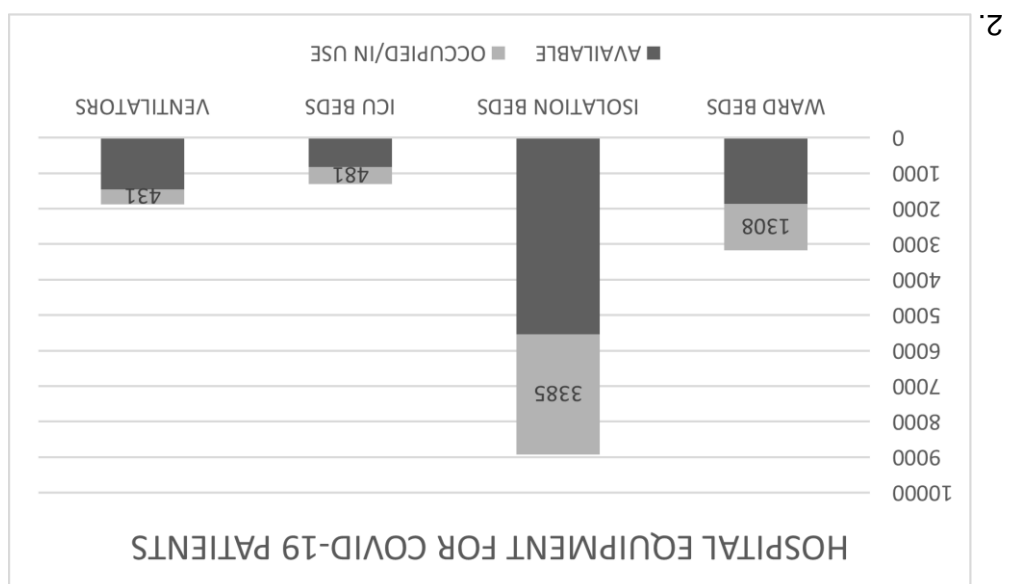
**ACTIVE CASES OF COVID-19 IN THE PHILIPPINES (as of June 27, 2020)**

| Category     | Count  |
|--------------|--------|
| Mild         | 23,090 |
| Asymptomatic |        |
| Severe       | 125    |
| Critical     | 24     |

**What's More: Activity 1: Present Me! Page 22**

## Lesson 2

### What's More: Activity 1: Present Me! Page 22



### What's More: Activity 2: Look and Explain Me! Page 22-23

1. Graph 1 showed the irregular growth of COVID-19 cases in the Philippines since March 15-June 27, 2020. From the graph, it is evident that the number of cases is increasing. Beginning June 2020, that the increase in the number of cases is quite noticeable. If public health protocols will not be imposed and strictly followed, there will be an alarming growing number of COVID-19 cases in the country.

2. Graph 2 showed the COVID-19 cases in the Philippines by gender as of April 2, 2020. From the graph, it is apparent that the number of cases among male is prevalent than that of the females. Both genders showed an alarming increase in number.

3. Graph 3 showed the Philippines major import sources as of 2016. From the graph, China is the number 1 country who imported their products to the Philippines. Additionally, this reality is supported by the fact that "Made in China" products swamped and intruded the Philippine markets. Other countries such as Japan, USA, Thailand, and South Korea, and other countries also imported their products to the country.

### Activity 4: Interpret Me! Page 25

Table 2 showed the positive discipline practices of teachers through the use of reinforcement. From the table, five constructs garnered a high mean score with a description of Always Observed. Consequently, five indicators garnered a description which is "Often Observed". Construct #1 Coach positive social behaviors earned a mean score of 3.71 which is the highest and Construct #2 Reward targeted positive behaviors with incentives earned a mean score of 2.89, regarded as the lowest. From the overall mean of 3.25 and a standard deviation of 0.44, the over-all interpretation for the positive discipline practices of teachers through the use of enforcement is "Often Observed".



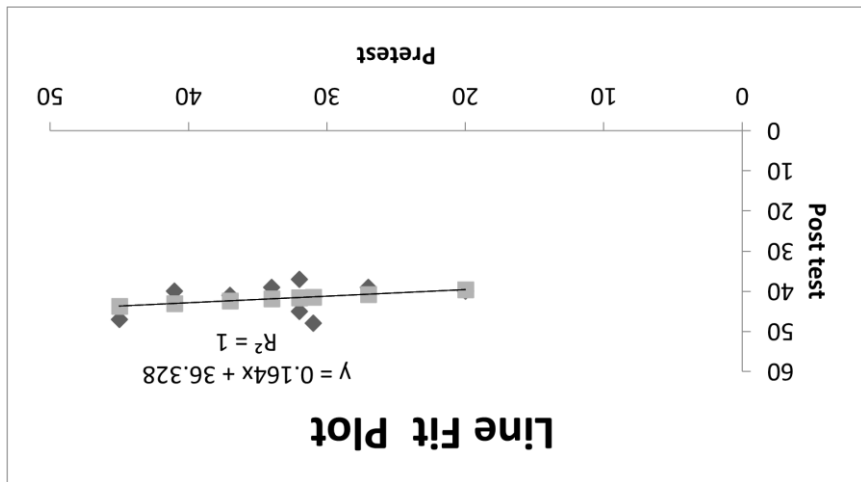
What's More: Activity 4: What's My Relationship? Page 35-36

| Student | Pretest (x) | Posttest (y) | $x^2$ | $y^2$ | xy    |
|---------|-------------|--------------|-------|-------|-------|
| 1       | 49          | 45           | 2401  | 2025  | 2205  |
| 2       | 32          | 37           | 1024  | 1369  | 1184  |
| 3       | 34          | 39           | 1156  | 1521  | 1326  |
| 4       | 45          | 47           | 2025  | 2209  | 2115  |
| 5       | 41          | 40           | 1681  | 1600  | 1640  |
| 6       | 20          | 40           | 400   | 1600  | 800   |
| 7       | 27          | 39           | 729   | 1521  | 1053  |
| 8       | 32          | 45           | 1024  | 2025  | 1440  |
| 9       | 37          | 41           | 1369  | 1681  | 1517  |
| 10      | 31          | 48           | 961   | 2304  | 1488  |
|         | 348         | 421          | 12770 | 17855 | 14768 |

$$r = \frac{10(14768) - (348)(421)}{\sqrt{[10(12770) - (348)^2][10(17855) - (421)^2]}} = 0.398$$

1.  $r = 0.398$
2. Interpretation:  
There is a weak positive correlation between the pretest and posttest scores in Math.
3. What linear equation best predicts the posttest given the pretest in Math?  
 $y = 0.164x + 36.328$
4. If a student made a pretest score of 43 in Math, what grade would you expect the posttest score the student will obtain?  
 $y = 0.164x + 36.328$   
 $y = 0.164(43) + 36.328$   
 $y = 43.328$  or 43

6. Show the line of best fit and its interpretation.



**Interpretation:**

According to this model, for every 1 point increase on the score of the pretest, there is a corresponding average increase of 0.164 point in the score of the post test in Math.

**What's More: Activity 5: Am I Rejected or Accepted? Page 36**

$$\bar{X}=95.2 \quad sd=2.04$$

1. Perform hypothesis testing using the Critical Value Approach.

1. Define the Null and Alternative Hypothesis

$H_0$ : There is no significant difference between the gen. ave. in MAPEH of 10 Grade 7 students from the population's gen. average of 95.

$$H_0: \mu = 95$$

$H_1$ : There is a significant difference between the gen. ave. in MAPEH of 10 Grade 7 students from the population's gen. average of 95.

$$H_1: \mu \neq 95$$

2. State the alpha and the degree of freedom.

$$\alpha = 0.05$$

$$Df = n - 1 = 10 - 1 = 9$$

3. State the decision rule.

One-tailed Test:  $|t| > z_\alpha$ ; Reject  $H_0$

Two-tailed Test:  $|t| > \frac{z_\alpha}{2}$ ; Reject  $H_0$

4. Calculate the Test Statistic.

$$t = \frac{\bar{X} - \mu_0}{\frac{s}{\sqrt{n}}} = \frac{95.2 - 95}{\frac{2.04}{\sqrt{10}}} = 0.31$$

5. State results .

$$\frac{t_\alpha}{2} = \frac{t_{0.025}^{n-1}}{2} = \frac{t_{0.025}^{10-1}}{2} = 2.263$$

$$|0.31| < 2.262$$

6. Decision: Accept  $H_0$

7. Conclusion: Therefore, the average grade in MAPEH of 10 Grade 7 students is not different from the population's average grade which is 95.

2. Perform hypothesis testing using the P-Value Approach.

Computational Procedure:

1. Define the Null and Alternative Hypothesis

$H_0$ : There is no significant difference between the gen. ave. in MAPEH of 10 Grade 7 students from the population's gen. average of 95.

$$H_0: \mu = 95$$

$H_1$ : There is a significant difference between the gen. ave. in MAPEH of 10 Grade 7 students from the population's gen. average of 95.

$$H_1: \mu \neq 95$$

2. State the alpha and the degree of freedom.

$$\alpha = 0.05$$

$$Df = n - 1 = 10 - 1 = 9$$

3. State the decision rule.

One-tailed Test:  $|t| > z_\alpha$ ; Reject  $H_0$

Two-tailed Test:  $|t| > \frac{z_\alpha}{2}$ ; Reject  $H_0$

4. Calculate the Test Statistic.

$$t = \frac{\bar{X} - \mu_0}{\frac{s}{\sqrt{n}}} = \frac{94 - 93}{\frac{2.68}{\sqrt{10}}} = 0.31$$

|       |       |                        |  |
|-------|-------|------------------------|--|
| 5. A  | 1. B  | Assessment, Page 40-41 |  |
| 4. A  | 2. C  |                        |  |
| 3. D  | 7. A  |                        |  |
| 6. C  | 8. B  |                        |  |
| 10. A | 9. C  |                        |  |
| 11. B | 12. D |                        |  |
| 13. B | 14. A |                        |  |
| 15. C | 15. C |                        |  |

- Find the corresponding p-value.  
One-tailed P-value: 0.38181  
Two-tailed P-value: 0.76362
- State results.  
One-tailed  $|0.38181| > 0.05$   
Two-tailed  $|0.76362| > 0.05$
- Decision: Accept  $H_0$   
Since this p-value is *not* less than our chosen alpha level of 0.05, we can't reject the null hypothesis.
- Conclusion: Therefore, the average grade in MAPEH of 10 Grade 7 students is not different from the population's average grade which is 95.

## **References**

Fraenkel, Jack R. and Wallen, Norman E. *How to Design and Evaluate Research in Education*. Asia: Mc-Graw Hill Companies, Inc., 2006.

Fraenkel, Jack R. and Wallen, Norman E. 2020. *How to Design and Evaluate Research in Education*. 6<sup>th</sup> ed., McGraw-Hill Global Education Holdings, LLC. Accessed June 3, 2020. <https://bit.ly/3eBIVrs>

GraphPad Software. 2018. <https://bit.ly/2X5JCTC>

QuestionPro. 2020. "What is a star rating question?". QuestionsPro Suvey Software. Accessed June 3, 2020. <https://bit.ly/2VD5EMg>

<https://www.surveygizmo.com/resources/blog/new-ways-to-ask-quantitative-research-questions-in-online-surveys/>

## Appendix

| <b>t Table</b> |                         |           |           |           |           |           |            |           |            |            |             |
|----------------|-------------------------|-----------|-----------|-----------|-----------|-----------|------------|-----------|------------|------------|-------------|
| cum. prob      | $t_{.50}$               | $t_{.75}$ | $t_{.80}$ | $t_{.85}$ | $t_{.90}$ | $t_{.95}$ | $t_{.975}$ | $t_{.99}$ | $t_{.995}$ | $t_{.999}$ | $t_{.9995}$ |
| one-tail       | 0.50                    | 0.25      | 0.20      | 0.15      | 0.10      | 0.05      | 0.025      | 0.01      | 0.005      | 0.001      | 0.0005      |
| two-tails      | 1.00                    | 0.50      | 0.40      | 0.30      | 0.20      | 0.10      | 0.05       | 0.02      | 0.01       | 0.002      | 0.001       |
| df             |                         |           |           |           |           |           |            |           |            |            |             |
| 1              | 0.000                   | 1.000     | 1.376     | 1.963     | 3.078     | 6.314     | 12.71      | 31.82     | 63.66      | 318.31     | 636.62      |
| 2              | 0.000                   | 0.816     | 1.061     | 1.386     | 1.886     | 2.920     | 4.303      | 6.965     | 9.925      | 22.327     | 31.599      |
| 3              | 0.000                   | 0.765     | 0.978     | 1.250     | 1.638     | 2.353     | 3.182      | 4.541     | 5.841      | 10.215     | 12.924      |
| 4              | 0.000                   | 0.741     | 0.941     | 1.190     | 1.533     | 2.132     | 2.776      | 3.747     | 4.604      | 7.173      | 8.610       |
| 5              | 0.000                   | 0.727     | 0.920     | 1.156     | 1.476     | 2.015     | 2.571      | 3.365     | 4.032      | 5.893      | 6.869       |
| 6              | 0.000                   | 0.718     | 0.906     | 1.134     | 1.440     | 1.943     | 2.447      | 3.143     | 3.707      | 5.208      | 5.959       |
| 7              | 0.000                   | 0.711     | 0.896     | 1.119     | 1.415     | 1.895     | 2.365      | 2.998     | 3.499      | 4.785      | 5.408       |
| 8              | 0.000                   | 0.706     | 0.889     | 1.108     | 1.397     | 1.860     | 2.306      | 2.896     | 3.355      | 4.501      | 5.041       |
| 9              | 0.000                   | 0.703     | 0.883     | 1.100     | 1.383     | 1.833     | 2.262      | 2.821     | 3.250      | 4.297      | 4.781       |
| 10             | 0.000                   | 0.700     | 0.879     | 1.093     | 1.372     | 1.812     | 2.228      | 2.764     | 3.169      | 4.144      | 4.587       |
| 11             | 0.000                   | 0.697     | 0.876     | 1.088     | 1.363     | 1.796     | 2.201      | 2.718     | 3.106      | 4.025      | 4.437       |
| 12             | 0.000                   | 0.695     | 0.873     | 1.083     | 1.356     | 1.782     | 2.179      | 2.681     | 3.055      | 3.930      | 4.318       |
| 13             | 0.000                   | 0.694     | 0.870     | 1.079     | 1.350     | 1.771     | 2.160      | 2.650     | 3.012      | 3.852      | 4.221       |
| 14             | 0.000                   | 0.692     | 0.868     | 1.076     | 1.345     | 1.761     | 2.145      | 2.624     | 2.977      | 3.787      | 4.140       |
| 15             | 0.000                   | 0.691     | 0.866     | 1.074     | 1.341     | 1.753     | 2.131      | 2.602     | 2.947      | 3.733      | 4.073       |
| 16             | 0.000                   | 0.690     | 0.865     | 1.071     | 1.337     | 1.746     | 2.120      | 2.583     | 2.921      | 3.686      | 4.015       |
| 17             | 0.000                   | 0.689     | 0.863     | 1.069     | 1.333     | 1.740     | 2.110      | 2.567     | 2.898      | 3.646      | 3.965       |
| 18             | 0.000                   | 0.688     | 0.862     | 1.067     | 1.330     | 1.734     | 2.101      | 2.552     | 2.878      | 3.610      | 3.922       |
| 19             | 0.000                   | 0.688     | 0.861     | 1.066     | 1.328     | 1.729     | 2.093      | 2.539     | 2.861      | 3.579      | 3.883       |
| 20             | 0.000                   | 0.687     | 0.860     | 1.064     | 1.325     | 1.725     | 2.086      | 2.528     | 2.845      | 3.552      | 3.850       |
| 21             | 0.000                   | 0.686     | 0.859     | 1.063     | 1.323     | 1.721     | 2.080      | 2.518     | 2.831      | 3.527      | 3.819       |
| 22             | 0.000                   | 0.686     | 0.858     | 1.061     | 1.321     | 1.717     | 2.074      | 2.508     | 2.819      | 3.505      | 3.792       |
| 23             | 0.000                   | 0.685     | 0.858     | 1.060     | 1.319     | 1.714     | 2.069      | 2.500     | 2.807      | 3.485      | 3.768       |
| 24             | 0.000                   | 0.685     | 0.857     | 1.059     | 1.318     | 1.711     | 2.064      | 2.492     | 2.797      | 3.467      | 3.745       |
| 25             | 0.000                   | 0.684     | 0.856     | 1.058     | 1.316     | 1.708     | 2.060      | 2.485     | 2.787      | 3.450      | 3.725       |
| 26             | 0.000                   | 0.684     | 0.856     | 1.058     | 1.315     | 1.706     | 2.056      | 2.479     | 2.779      | 3.435      | 3.707       |
| 27             | 0.000                   | 0.684     | 0.855     | 1.057     | 1.314     | 1.703     | 2.052      | 2.473     | 2.771      | 3.421      | 3.690       |
| 28             | 0.000                   | 0.683     | 0.855     | 1.056     | 1.313     | 1.701     | 2.048      | 2.467     | 2.763      | 3.408      | 3.674       |
| 29             | 0.000                   | 0.683     | 0.854     | 1.055     | 1.311     | 1.699     | 2.045      | 2.462     | 2.756      | 3.396      | 3.659       |
| 30             | 0.000                   | 0.683     | 0.854     | 1.055     | 1.310     | 1.697     | 2.042      | 2.457     | 2.750      | 3.385      | 3.646       |
| 40             | 0.000                   | 0.681     | 0.851     | 1.050     | 1.303     | 1.684     | 2.021      | 2.423     | 2.704      | 3.307      | 3.551       |
| 60             | 0.000                   | 0.679     | 0.848     | 1.045     | 1.296     | 1.671     | 2.000      | 2.390     | 2.660      | 3.232      | 3.460       |
| 80             | 0.000                   | 0.678     | 0.846     | 1.043     | 1.292     | 1.664     | 1.990      | 2.374     | 2.639      | 3.195      | 3.416       |
| 100            | 0.000                   | 0.677     | 0.845     | 1.042     | 1.290     | 1.660     | 1.984      | 2.364     | 2.626      | 3.174      | 3.390       |
| 1000           | 0.000                   | 0.675     | 0.842     | 1.037     | 1.282     | 1.646     | 1.962      | 2.330     | 2.581      | 3.098      | 3.300       |
| <b>Z</b>       | 0.000                   | 0.674     | 0.842     | 1.036     | 1.282     | 1.645     | 1.960      | 2.326     | 2.576      | 3.090      | 3.291       |
|                | 0%                      | 50%       | 60%       | 70%       | 80%       | 90%       | 95%        | 98%       | 99%        | 99.8%      | 99.9%       |
|                | <b>Confidence Level</b> |           |           |           |           |           |            |           |            |            |             |

**For inquiries or feedback, please write or call:**

Department of Education - Bureau of Learning Resources (DepEd-BLR)

Ground Floor, Bonifacio Bldg., DepEd Complex  
Meralco Avenue, Pasig City, Philippines 1600

Telefax: (632) 8634-1072; 8634-1054; 8631-4985

Email Address: [blr.lrqad@deped.gov.ph](mailto:blr.lrqad@deped.gov.ph) \* [blr.lrpdpd@deped.gov.ph](mailto:blr.lrpdpd@deped.gov.ph)