SECONDARY
JHS

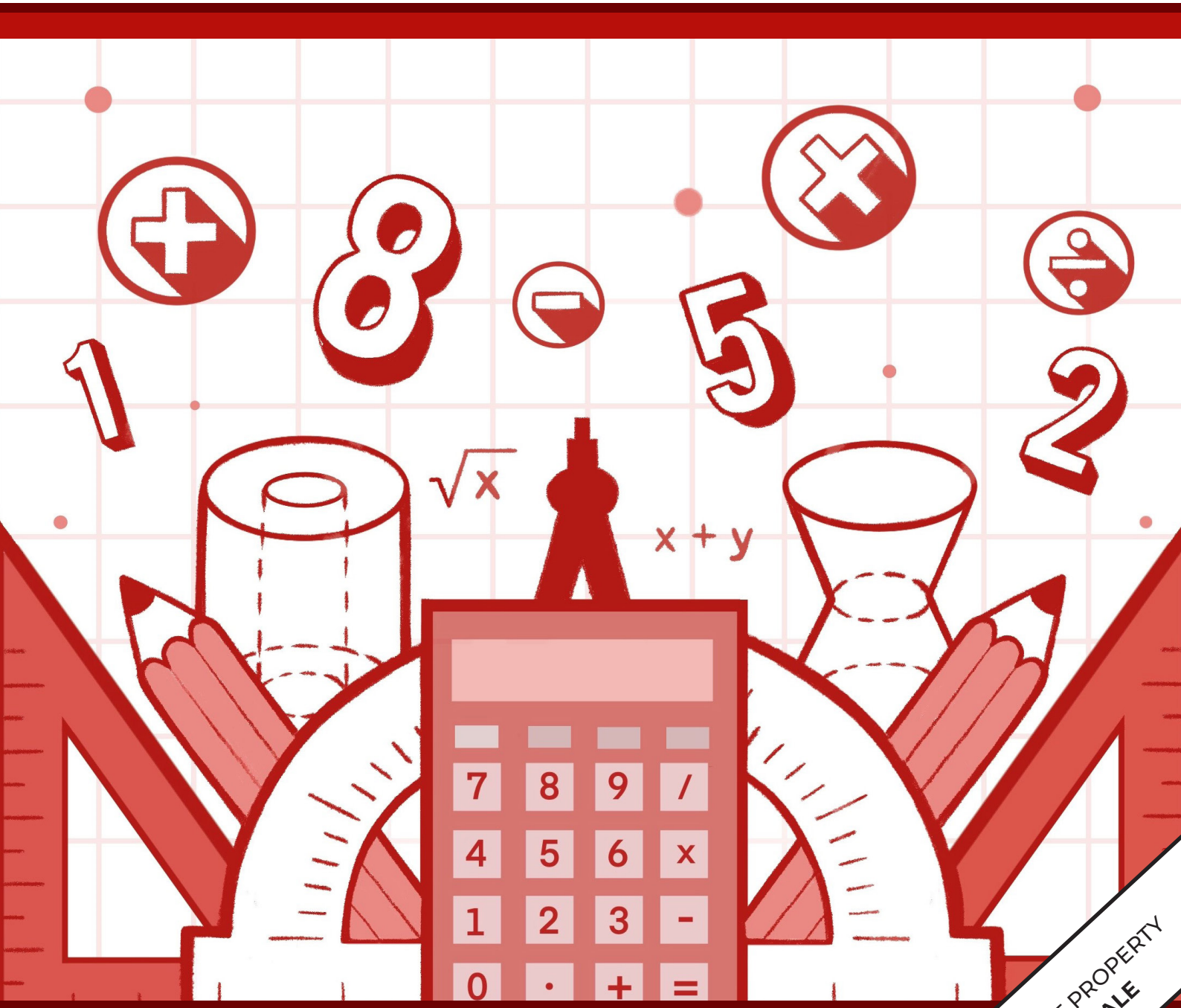
DepED DEPARTMENT OF EDUCATION

ALS Alternative Learning System LIFELONG LEARNING

LEARNING STRAND 3
MATHEMATICAL & PROBLEM-SOLVING SKILLS

MODULE 7: DESCRIBING THE WORLD THROUGH NUMBERS AND DATA

ALS Accreditation and Equivalency Program: Junior High School



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LEARNING STRAND 3

DESCRIBING THE WORLD THROUGH NUMBERS AND DATA

MATHEMATICAL AND PROBLEM-SOLVING SKILLS
MODULE 7

ALS Accreditation and Equivalency Program: Junior High School
Learning Strand 3: Mathematical and Problem-Solving Skills
Module 7: Describing the World Through Numbers and Data

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User's Guide

For the ALS Learner:

Welcome to this Module entitled Describing the World Through Numbers and Data under Learning Strand 3 Mathematical and Problem-Solving Skills of the ALS K to 12 Basic Education (BEC).

This module was designed to provide you with fun and meaningful opportunities for guided and independent learning at your own pace and time. You will be able to process the contents of the learning resource while being an active learner.

This module has the following parts and corresponding icons:

 *Let's Get to Know*	This will give you an idea of the skills or competencies you are expected to learn in the module.
 *Pre-assessment*	This part includes an activity that aims to check what you already know about the lesson. If you get all the answers correct (100%), you may decide to skip this module.
 *Setting the Path*	This section provides a brief discussion of the lesson. This aims to help you discover and understand new concepts and skills.
 *Trying This Out*	This comprises activities for independent practice to solidify your understanding and skills of the topic. You may check the answers to the exercises using the Answer Key at the end of the module.
 *Understanding What You Did*	This includes questions that process what you learned from the lesson.
 *Sharpening Your Skills*	This section provides an activity that will help you transfer your new knowledge or skill in real-life situations or concerns.
 *Treading the Road to Mastery*	This is a task which aims to evaluate your level of mastery in achieving the given learning competency.
 *Don't Forget*	This part serves as a summary of the lessons in the module.
 *Explore More*	In this portion, another activity will be given to you to enrich your knowledge or skill of the lesson learned. This also tends retention of learned concepts.
 *Reach the Top*	This part will assess your level of mastery in achieving the learning competencies in each lesson in the module.
Answer Key	This contains answers to all activities in the module.
Glossary	This portion gives information about the meanings of the specialized words used in the module.

At the end of this module you will also find:

References This is a list of all sources used in developing this module.

The following are some reminders in using this module:

1. Use the module with care. Do not put unnecessary mark/s on any part of the module. Use a separate sheet of paper in answering the exercises.
2. Don't forget to answer the Pre-assessment before moving on to the other activities included in the module.
3. Read the instruction carefully before doing each task.
4. Observe honesty and integrity in doing the tasks and checking your answers.
5. Finish the task at hand before proceeding to the next.
6. Return this module to your ALS Teacher/Instructional Manager/Learning Facilitator once you are through with it.

If you encounter any difficulty in answering the tasks in this module, do not hesitate to consult your ALS Teacher/Instructional Manager/Learning Facilitator. Always bear in mind that you are not alone.

We hope that through this material, you will experience meaningful learning and gain deep understanding of the relevant competencies. You can do it!

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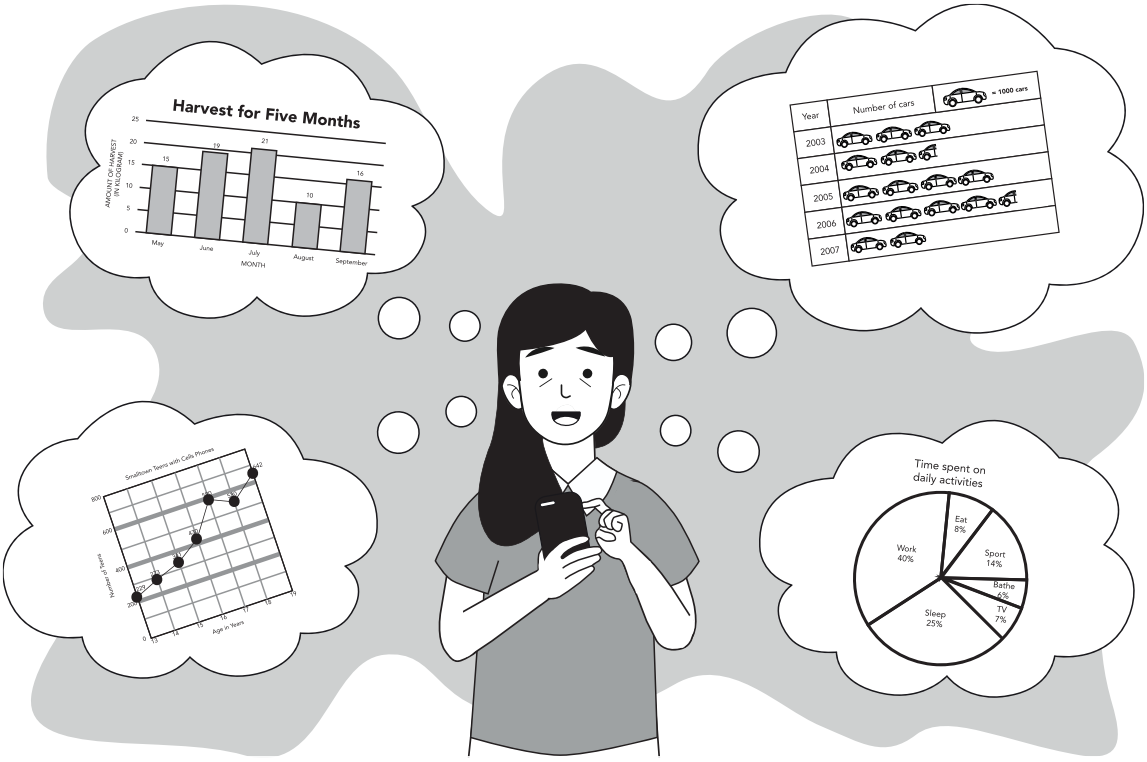
MODULE 7

LET'S GET TO KNOW



Betty uses the social media where she encounters various types of information. What appeals to her the most are those with pictures and graphs. Her curiosity led her to become interested in learning to make graphs of her own.

MODULE 7
PRE-ASSESSMENT

Choose the letter of the correct answer by writing it on a separate sheet of paper.

1. It refers to an individual who answers questions or survey.

   a. population **b.** sampling **c.** respondent **d.** survey

2. What type of graph can best illustrate "daily sales of a milk tea shop"?

   a. bar graph **b.** line graph **c.** pictograph **d.** pie graph

3. It is a set of printed or written questions with a choice of answers devised for the purpose of gathering information from the respondents.

   a. interview **b.** questionnaire **c.** population **d.** sample

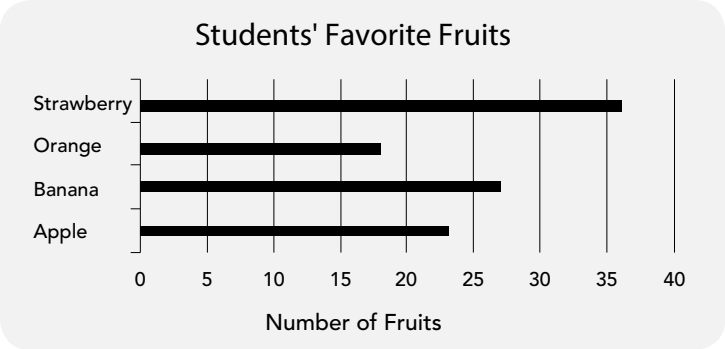
4. It is a method of collecting data by looking at habits and characteristics of people, events, and objects without any interaction between the researcher and the respondents.

   a. experiment **b.** questionnaire **c.** survey **d.** observation

5. Which type of survey only has two possible answers?

   a. demographic **b.** questionnaire **c.** survey **d.** multiple choice

For items 6-9, refer to the data on the next page.



6. What type of graph is being illustrated?

a. bar graph **b.** line graph **c.** pictograph **d.** pie graph

7. How many students liked banana?

a. 21 **b.** 23 **c.** 25 **d.** 27

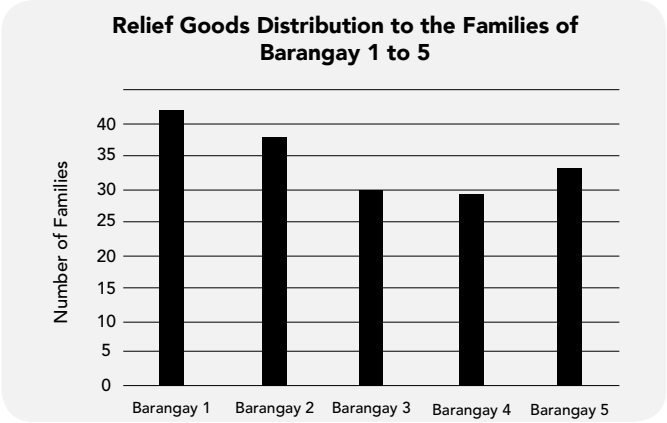
8. How many students liked strawberry and orange?

a. 52 **b.** 53 **c.** 54 **d.** 55

9. In total, how many students were surveyed?

a. 100 **b.** 104 **c.** 108 **d.** 110

For items 10-12, refer to the data below.



10. Which of the following barangay has the greatest number of relief goods received?

a. Barangay 1 **b.** Barangay 2 **c.** Barangay 3 **d.** Barangay 4

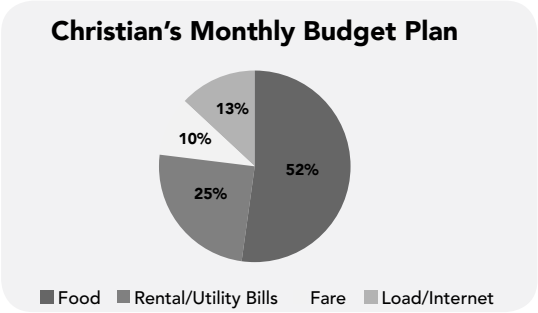
11. How many families in Barangay 4 and 5 received relief goods?

a. 58 **b.** 60 **c.** 62 **d.** 64

12. In total, how many families received the distributed relief goods?

a. 158 **b.** 172 **c.** 176 **d.** 180

For items 13-15, refer to the data below.
Christian has a monthly budget of ₱25,000.00 for his food, rental/ utility bills, fare, and load/internet.



13. How much of his monthly budget does Christian spend for food?

a. ₱ 13,000.00 **b.** ₱ 13,500.00 **c.** ₱ 14,000.00 **d.** ₱ 14,500.00

14. What is the total amount that Christian spends for fare and load/internet?

a. ₱ 5,000.00 **b.** ₱ 5,250.00 **c.** ₱ 5,500.00 **d.** ₱ 5,750.00

15. What is the amount that Christian spends for rental/utility bills?

a. ₱ 6,000.00 **b.** ₱ 6,250.00 **c.** ₱ 6,500.00 **d.** ₱ 6,750.00

LESSON 1

SETTING THE PATH

EXCUSE ME, MAY I ASK YOU A QUESTION?

At the end of this lesson, you will be able to:

- formulate simple statistical instruments (LS3MP-SP-PSF-JHS-22); and
- conduct a simple survey (LS3MP-SP-PSF-JHS-41).

LESSON 1

TRYING THIS OUT

Provide the information asked in the slam book. Compare your answers with other friends.

ABOUT ME

PHOTO

Name: _____
Email: _____ Blog/Website: _____

MY FIRST

First big achievement: _____
First risk I ever took: _____
_____
First time I felt completely happy: _____
_____

MY FAVES

Color/s: _____
Perfume: _____
Music: _____
Singer/s: _____
Song: _____
Food: _____
Weekend Activity: _____

HOBBIES

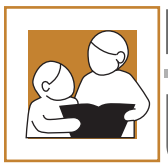
TV Show: _____
Movie: _____
Book: _____
Celebs: _____
Role Model: _____

AMBITION

_____
_____
_____

MOTTO

_____
_____
_____



LESSON 1
UNDERSTANDING WHAT YOU DID

The information you have provided in the slam book are examples of data.

Data are facts, such as numbers, words, measurements, observations or even just descriptions of things which are used for analysis and interpretation.

COLLECTION OF DATA

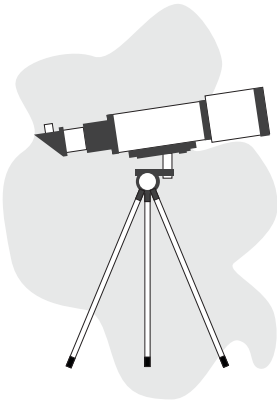
Collecting data is the process of gathering information which are important in providing an idea about the different characteristics of a group of subjects (people, animals, things, etc.) called **population**. Different fields use data in many ways such as to:

- **Describe different characteristics or trend within a group of people:**
  - age distribution, major religious affiliation
  - summary of the interests of customers to help design an effective marketing strategy
  - preference in candidates for an election, stand about issues
- **Know the needs of people such as:**
  - employees of a company to improve workplace conditions
  - people who need government services but have little access to resources

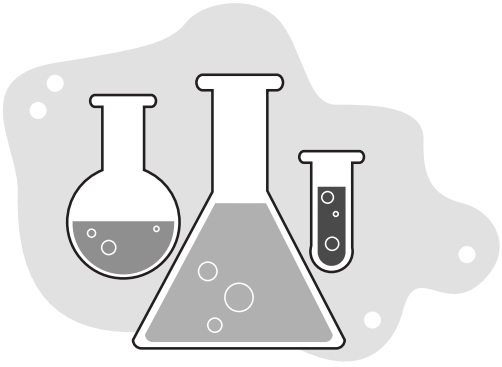
- **Rate to evaluate**
  - the effectivity of service
  - achievement of goals
- **Predict the trend in business and market**
  - identify if business is growing or losing money
  - performance of a company
  - identify good investment to help consumers make intelligent decisions

Different methods are used to collect data such as:

1. **Observation** – method of collecting data by looking at habits and traits of people or objects of interest without any interaction between the researcher and the subject.



2. **Experiment** – method of collecting data by doing scientific experiments to find answers or solutions to a scientific problem.



3. **Survey** - an investigation about the characteristics of a given population by means of collecting different information needed using a set of questions.

Survey is the most popular, most common and easiest data collection method in identifying characteristics of a population.

Sign up forms in social media and internet are forms of survey.

This module will focus on the collection of data using a survey on a group of people in a given area. Let us learn how to make a survey.

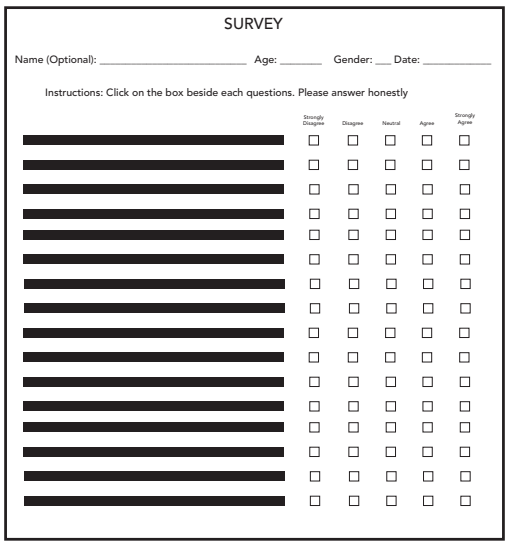
TYPES OF SURVEY

1. Interview

- a direct way of collecting data
- the interaction between a researcher (as the interviewer) and a respondent (as the interviewee)
- the researcher asks questions to one or more respondents about information needed in a research
- can be done through personal meetings, phone interviews, or even online exchange (such as emails, messenger, etc.)

2. Questionnaire

- a pen-and-paper document conducted among the respondents
- a document which can include closed-ended or open-ended questions
- can also be administered online for ease of distribution and collecting data


SURVEY

Name (Optional): _____ Age: _____ Gender: ___ Date: _____

Instructions: Click on the box beside each questions. Please answer honestly

The most important part of collecting data is to know the goal of your research or what you want to answer. You should be able to define a clear and attainable goal for your survey.

Example: Construct questions for a survey which goal is to improve the performance of a restaurant to survive a competitive environment.

TOPIC	SAMPLE QUESTIONS
Evaluating a performance of a restaurant	• Did you enjoy the food? • How would you rate the food? • How would you rate the service of the staff?

DIFFERENT TYPES OF SURVEY QUESTIONS

Different types of questions can be used to gather needed information and to make it easy for respondents to answer.

1. **Multiple-Choice Questions**

   Multiple choice questions are the most popular survey question type. They allow your respondents to select one or more options from a list of answers that you define.

2. Dichotomous Questions

Dichotomous questions give two options to the respondents – such as yes or no – to choose from. It is the easiest form of questionnaire for the respondent in terms of answering it.

Do you believe that the death penalty is ever justified?

_____ Yes

_____ No

3. Scaling Questions

Scaling questions measure the amount of agreement or feeling towards a given situation. This uses numbers to describe the appropriate description towards a given situation or choice.

In the course of last week...		Not at all	a little	rather	much	very strong
1	It was hard for me to concentrate	0	1	2	3	4
2	I felt helpless	0	1	2	3	4
3	I was absent minded and unable to remember what I was actually doing	0	1	2	3	4

4. Likert Scales

Likert scales are widely used to measure attitudes and opinions with a greater degree using "agree or disagree."

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I believe this product is made of high quality materials	○	○	✓	○	○

GUIDELINES IN MAKING A SURVEY

Here are some tips to follow in making your own survey.

- Keep your survey short. This is to keep your respondents' attention until the end of the survey.
- Prioritize the questions that answer the main problem or objective of your research.
- Focus on using closed-ended questions. Closed-ended questions already have a set of answers respondents can choose from. This allows your collected answers (data) to be uniform and relevant to the needed information.
- Treat your survey like a conversation. This is to make the survey questionnaires become less intimidating to the respondents.
- Do not force your respondents to provide their name and other information. Allow them to be anonymous.
- Keep the more personal questions (called *demographics* such as name, gender, age, etc.) to the end. Ask questions like name, gender, age, etc. at the end part of your survey so that the respondents can answer the priority questions relevant to the topic first.
- Do not ask leading questions. Avoid asking biased questions that shows favor towards one answer to avoid influencing the respondents' answer, such as: *Are you going to vote for candidate Ermil Gabuat even though the latest survey indicates that he will lose the election?*

- Keep your choices balanced by avoiding neutral responses in rating scales. Usually, respondents tend to choose the neutral answers in a rating scale.

- Absolutes can absolutely hurt the quality of your responses. Using absolute words such as “always” or “never” can confuse your respondents if they only do presented situations only sometimes or rarely.

- Preview your survey before you administer. Check and re-check the contents of your survey before giving it out to respondents.

LESSON 1

SHARPENING YOUR SKILLS

On a separate sheet of paper, create one survey question for each topic using the specified type of question.

1. **Dichotomous Question**
   - **a.** No homework policy in schools
   - **b.** Banning of old jeeps
   - **c.** Legalization of medical marijuana

2. **Likert Scale Multiple Questions**
   - **a.** Feeling towards Chinese workers
   - **b.** Enjoyment of a movie watched

3. **Multiple Questions**
   - **a.** Favorite hobby
   - **b.** Preferred basketball team in PBA
   - **c.** Best dish to pair with rice

4. **Rating Scale**
   - **a.** Enjoyment of a movie watched
   - **b.** Difficulty of an exam

LESSON 1

TREADING THE ROAD TO MASTERY

On a separate sheet of paper, design a short survey based on a topic of your choice. Use all appropriate types of questions to gather all the information you need. Include the **demographics** that you want to gather. Follow the tips in creating a survey.

LESSON 2

SETTING THE PATH

LET'S ORGANIZE THIS

At the end of this lesson, you will be able to:

- Describe the different kinds of graphs used to organize and present data in real life situations. (LS3MP-SP-PSF-BL/LE/AE/JHS-5)
- Identify the parts of a pictograph, bar graph, and line graph, i.e., title, legend, labels, and vertical and horizontal Axes. (LS3MP-SP-PSF-JHS-6)

LESSON 2
TRYING THIS OUT

Help Betty summarize the given list of answers she got from a simple survey she did around her community. Inside the tables are responses from her survey. Count the number of times that each response appears. Write your answers on a separate sheet of paper.

I. Favorite hobby:

Singing	Dancing	Singing	Reading a book	Singing
Reading a book	Singing	Listening to music	Singing	Dancing
Listening to music	Singing	Reading a book	Singing	Reading a book
Dancing	Reading a book	Listening to music	Watching TV	Reading a book
Singing	Reading a book	Dancing	Dancing	Singing
Watching TV	Listening to music	Singing	Singing	Dancing

1. Singing:	
2. Dancing:	
3. Reading a book:	
4. Listening to music:	
5. Watching TV:	

II. Favorite basketball team:

Barangay Ginebra	Alaska Aces	Magnolia Hotshots	Barangay Ginebra	Alaska Aces
Alaska Aces	Magnolia Hotshots	Alaska Aces	Magnolia Hotshots	Alaska Aces
TNT Katropa	Magnolia Hotshots	Barangay Ginebra	TNT Katropa	TNT Katropa
TNT Katropa	Barangay Ginebra	TNT Katropa	Alaska Aces	Alaska Aces
Magnolia Hotshots	Alaska Aces	Alaska Aces	Magnolia Hotshots	Magnolia Hotshots
Alaska Aces	Magnolia Hotshots	Barangay Ginebra	Barangay Ginebra	Magnolia Hotshots

1. Barangay Ginebra:	
2. Alaska Aces:	
3. Magnolia Hotshots :	
4. TNT Katropa :	

LESSON 2

UNDERSTANDING WHAT YOU DID

After conducting a survey, you will get a group of numbers or group of words as responses depending on the questions you asked such as those given in the activity.

FAVORITE HOBBY				
Singing	Dancing	Singing	Reading a book	Singing
Reading a book	Singing	Listening to music	Singing	Dancing
Listening to music	Singing	Reading a book	Singing	Reading a book
Dancing	Reading a book	Listening to music	Watching TV	Reading a book
Singing	Reading a book	Dancing	Dancing	Singing
Watching TV	Listening to music	Singing	Singing	Dancing

1. Singing:	11
2. Dancing:	6
3. Reading a book:	7
4. Listening to music:	4
5. Watching TV:	2

FAVORITE BASKETBALL TEAM				
Barangay Ginebra	Alaska Aces	Magnolia Hotshots	Barangay Ginebra	Alaska Aces
Alaska Aces	Magnolia Hotshots	Alaska Aces	Magnolia Hotshots	Alaska Aces
TNT Katropa	Magnolia Hotshots	Barangay Ginebra	TNT Katropa	TNT Katropa
TNT Katropa	Barangay Ginebra	TNT Katropa	Alaska Aces	Alaska Aces
Magnolia Hotshots	Alaska Aces	Alaska Aces	Magnolia Hotshots	Magnolia Hotshots
Alaska Aces	Magnolia Hotshots	Barangay Ginebra	Barangay Ginebra	Magnolia Hotshots

1. Barangay Ginebra:	6
2. Alaska Aces:	10
3. Magnolia Hotshots :	9
4. TNT Katropa :	5

However, the numbers will not mean anything unless we organize it in a manner that is easy to understand. We use a graph to organize these responses.

A **graph** is a picture that represents a data in an organized manner. It is a two-dimensional drawing that shows the relationship of two sets of data using lines, series of bars, or other symbols.

TYPES OF GRAPHS

1. Pictograph

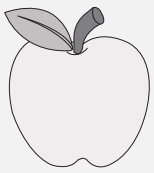
- A graph that shows numerical information by using picture or symbols to represent data sets. Each picture represents a specific value.
- Used to show the number of data elements for each category in the data set.
- Uses legend which is a brief explanation of symbols.

Example 1.

Joshua sold apples and listed his sales for four days. Use a pictograph to illustrate the data.

Day 1	10 apples
Day 2	40 apples
Day 3	25 apples
Day 4	20 apples

Choose a symbol to represent the objects in the data set and assign an equivalent amount for each symbol.



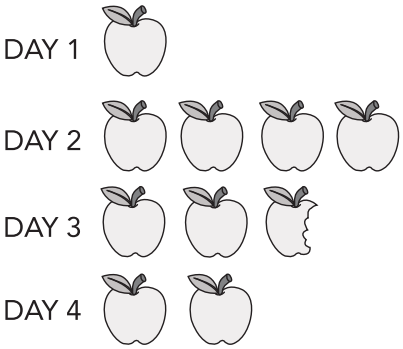
= 10 Apples

Since it is tedious to draw 25 or 40 apples, let us use one apple to represent 10 pieces sold, and half an apple to represent 5 pieces sold, as illustrated.

= 5 Apples

This is called the **legend** in a pictograph that allows other people to understand how much each picture represents.

Therefore, the pictograph will look like this:



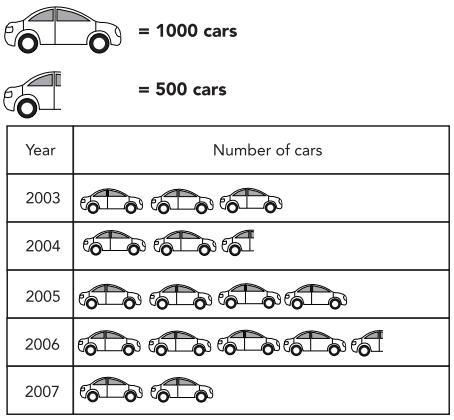
Example 2.

A car company sold 3,000 cars in 2003; 2,500 in 2004; 4,000 in 2005; 4,500 in 2006; and 2000 in 2007. Use a pictograph to illustrate the set of data.

To minimize the number of symbols to put in the graph, we use a legend.

Let 1 picture of a car represent 1000 cars.

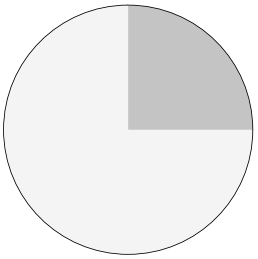
Divide each value per year by 1,000 to determine the number of symbols. However, in 2004, 2,500÷1,000 = 2.5 that is not a whole value. We can represent 0.5 using half a car which stands for 500 cars.



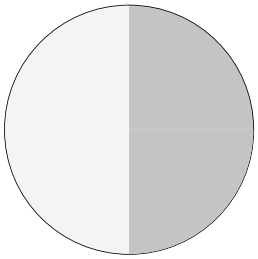
Therefore, the pictograph will look like this:

2. Pie Chart

- A circular graph divided into several parts representing distribution of each category in a data set using percentages.
- This is used to compare parts of the data set to the whole.



25% (quarter)



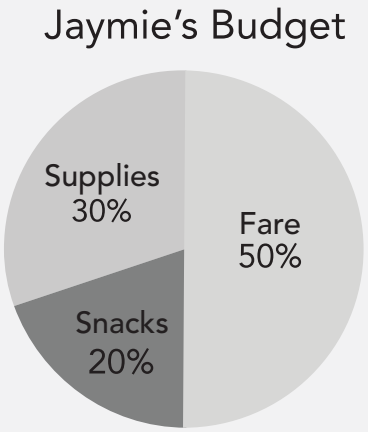
50% (half)

Example 1.

Jaymie budgets her money by spending her ₱200.00 allowance as follows: ₱100.00 on fare, ₱40.00 on snacks and ₱60.00 on supplies.

We need to get the percentage equivalent for each expense.

Make sure that the parts of the circle accurately depict the percentages.



Fare	$= \frac{100}{200}$	50%	Half
Snacks	$= \frac{40}{200}$	20%	Less than a quarter
Supplies	$= \frac{60}{200}$	30%	More than a quarter

Example 2.

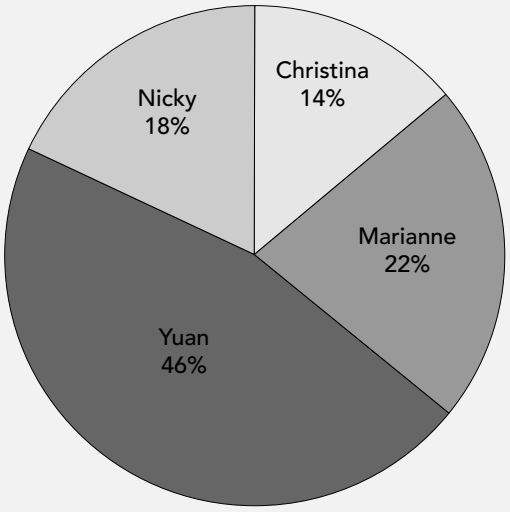
Christina, Marianne, Yuan, and Nicky divided the number of notes they need to copy. If Christina got 7, Marianne got 11, Yuan got 23, and Nicky got 9, present this distribution in a pie chart.

Solve the total number of notes first before we get each percentage. Notes to finish = 7 + 11 + 23 + 9 = 50

Make sure that the parts of the circle accurately depict the percentages.

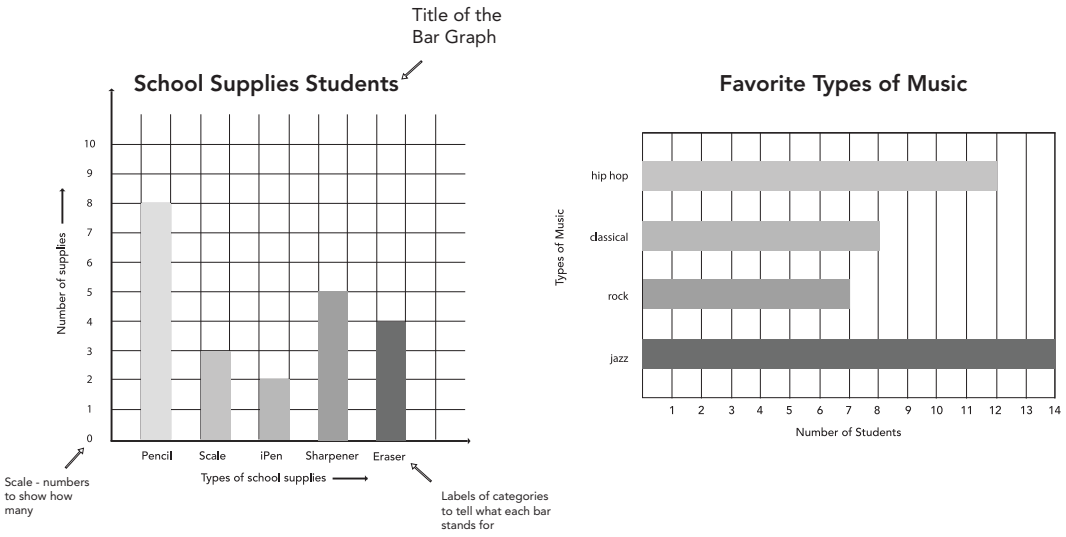
Christina	$= \frac{7}{50}$	14%	Less than a quarter
Marianne	$= \frac{11}{50}$	22%	Almost a quarter
Yuan	$= \frac{23}{50}$	46%	Almost half
Nicky	$= \frac{9}{50}$	18%	Less than a quarter

Notes to Copy



3. Bar Graph

- Uses vertical or horizontal bars with equal spacing to compare things between different groups or to track changes over time.
- Uses two axes, where one contains each category in the data set and the other is the corresponding number. Bar graphs of two or more data set can be made together.
- However, when trying to measure change over time, bar graphs are best when the changes are larger.

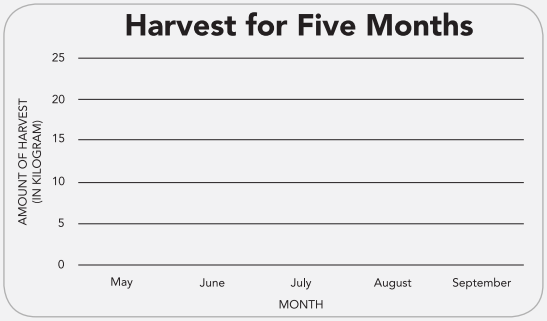


Two types of bar graphs may be used: **vertical bar graph** (*left figure*) and **horizontal bar graph** (*right figure*). Horizontal bar graphs are particularly used when the different categories have long titles and there is insufficient space to place below the horizontal bar.

Example 1.

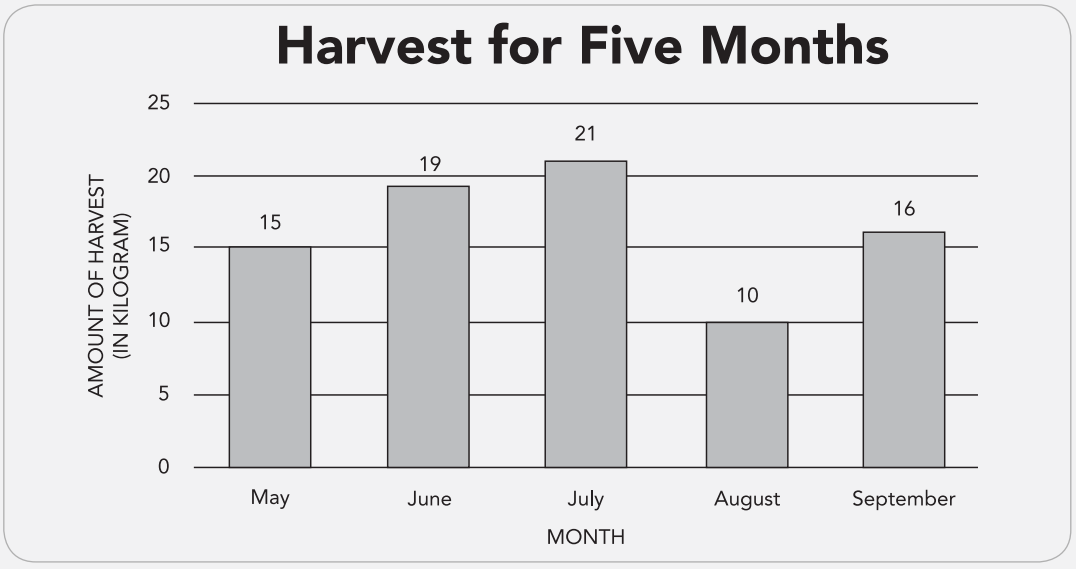
Allyah's farm wants to compare the amount of harvest for the last five months. Last May they harvested 15kg, then 19kg on June, 21kg on July, 10kg on August, and 16kg on September. Use a vertical (upright) bar graph to represent this data.

Since we must create a vertical bar graph, we put the categories (months) on the horizontal axis and the values (numbers) on the vertical axis.



We can use any interval (spacing between numbers) to minimize the space we use. Common intervals used are 2, 5, 10, 100, or 1000 depending on the size of the number.

Then, construct each vertical bar with the corresponding height equal to the amount of harvest for each month:

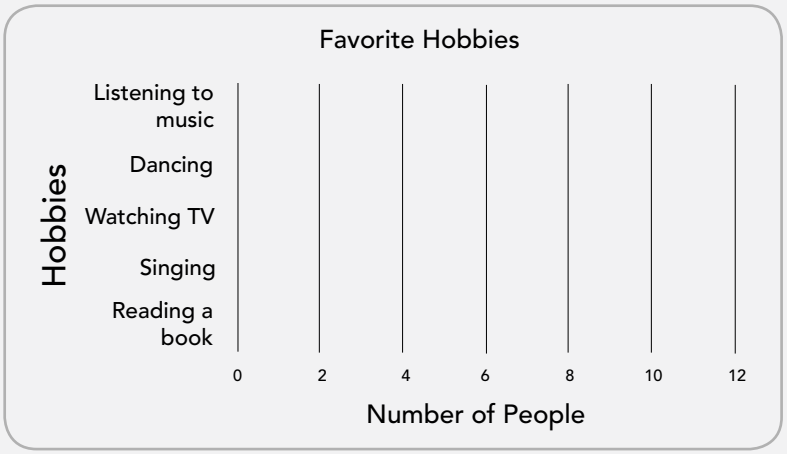


Example 2.

Create a horizontal bar graph for the number of people with favorite hobbies in Betty's list.

FAVORITE HOBBY				
Singing	Dancing	Singing	Reading a book	Singing
Reading a book	Singing	Listening to music	Singing	Dancing
Listening to music	Singing	Reading a book	Singing	Reading a book
Dancing	Reading a book	Listening to music	Watching TV	Reading a book
Singing	Reading a book	Dancing	Dancing	Singing
Watching TV	Listening to music	Singing	Singing	Dancing

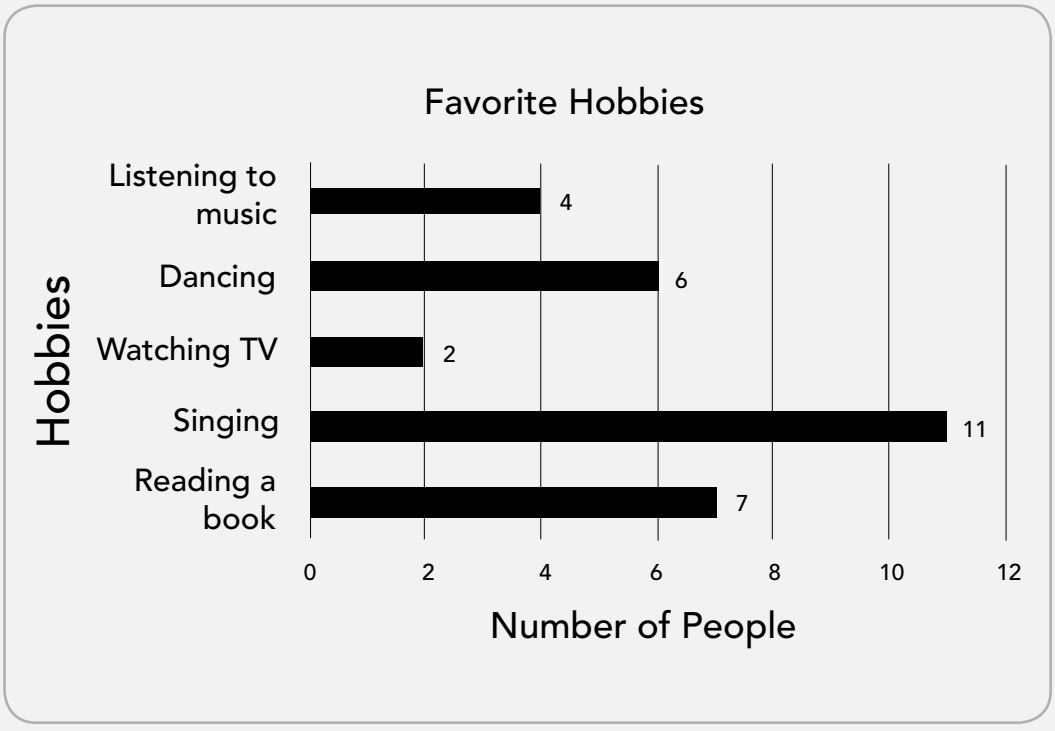
Since we are creating a horizontal bar graph, we put the categories (hobbies) on the vertical axis and the values (numbers) on the horizontal axis.



Then, construct the horizontal bars with length equal to the number of people who have the respective favorite hobby.

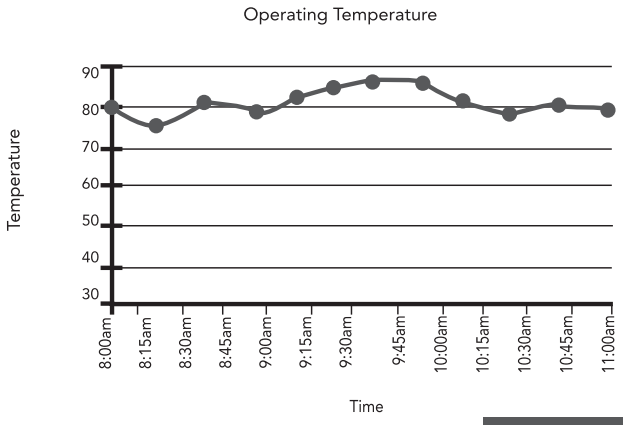
Reading a book	7
Singing	11
Watching TV	2
Dancing	6
Listening to music	4

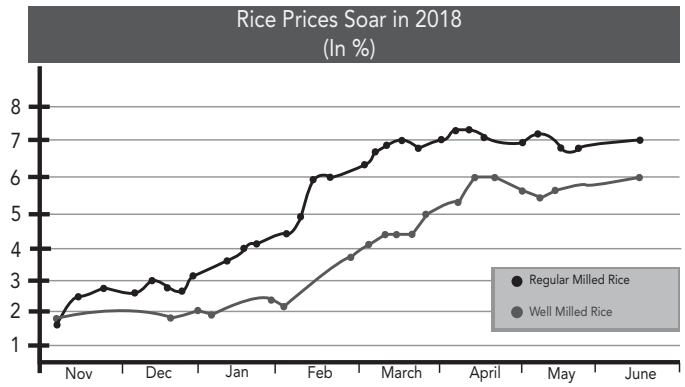
Therefore, we have the bar graph below:



4. Line Graph

- Uses lines connected by points representing the value of each category in a data set.
- Best used to track changes over short and long periods of time.
- Can also be used to compare changes over the same period of time for more than one group.





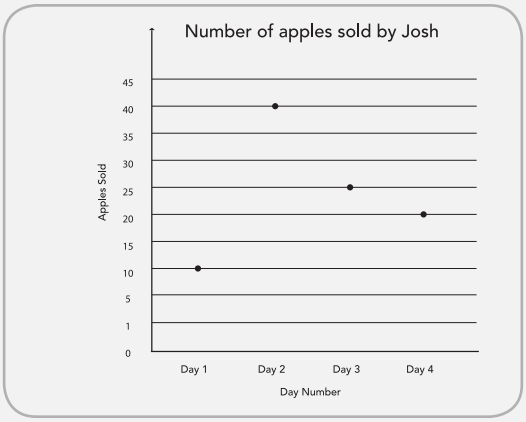
Notice that in both graphs, the horizontal (flat) axis contains the time intervals and the vertical (upright) axis contains the numbers or values.

Example 1.

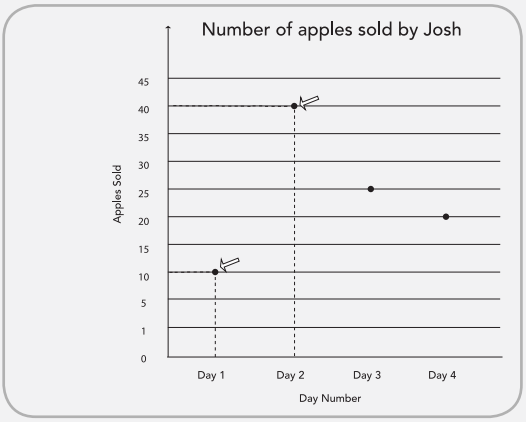
Let us construct a line graph for Joshua's sales of apples (example from pictograph) for four days.

Day 1	10 apples
Day 2	40 apples
Day 3	25 apples
Day 4	20 apples

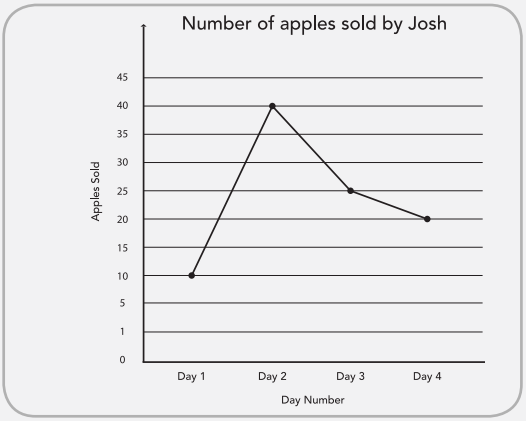
Put the time interval (days) on the horizontal axis and put the values (number of apples sold) on the vertical axis as shown below.



We can use any interval between numbers to minimize the space we use. Common intervals used are 2, 5, 10, 100, or 1000 depending on the size of the number. Mark (using a point or dot) the number of sold apples corresponding for each day:



Then, connect the points to form the line graph showing the changes (increase and decrease) in the number of sold apples for four days.



Example 2.

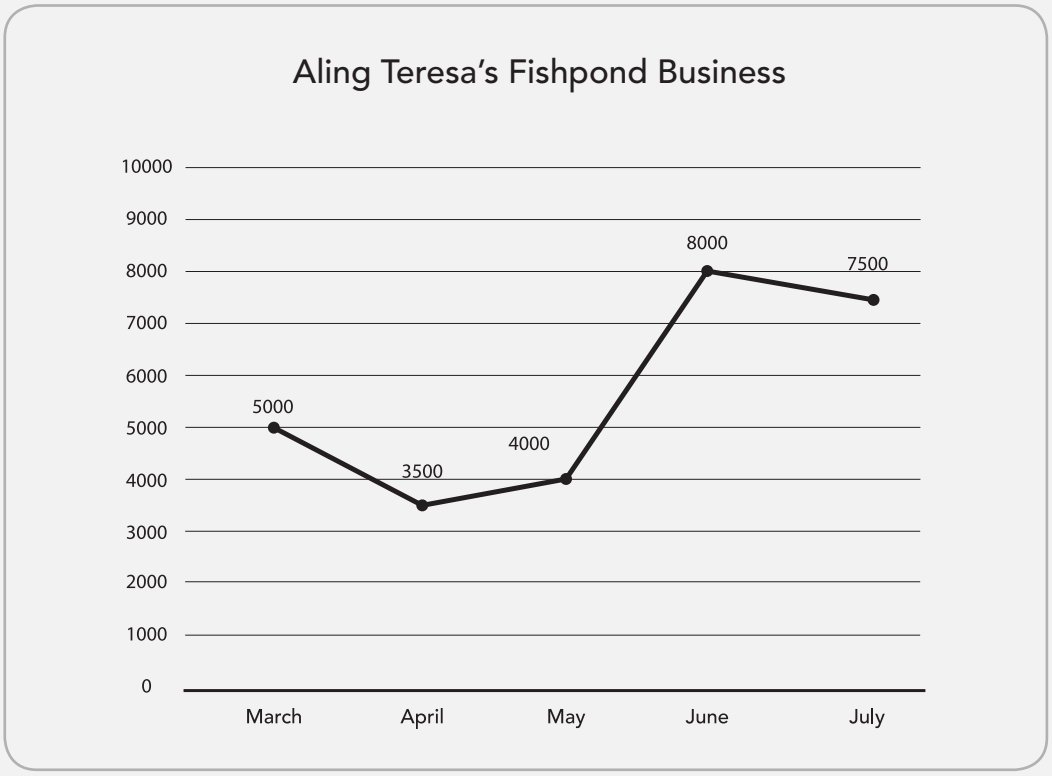
Make a line graph to show the profit from Aling Teresa's small fishpond business over 5 months.

March	5000
April	3500
May	4000
June	8000
July	7500

We can use an interval of 1000 between each number in the vertical axis since the values in the data set are very large.

Set the horizontal axis with the time interval (months) then plot the points.

Lastly, connect the points to complete the line graph.



LESSON 2

SHARPENING YOUR SKILLS

I. Identify the type of graph appropriate for each situation. Do this activity on a separate sheet of paper.

1. Favorite fruit of different age groups
2. Daily earnings of local sari-sari stores
3. Age distribution of people in your community (children, teen, adults, etc.)
4. Number of sacks of corn harvested in half a year
5. Favorite type of movie
6. Amount of clothes washed every week
7. Weekly budget monitoring per month
8. Daily weight monitoring of a child
9. Hourly salary of crew members from fast food stores
10. Garbage generated by a barangay (in kilograms) per month

II. Create the indicated graph for each data set. Use intervals when necessary. Do this activity on a separate sheet of paper.

1. Bar Graph

NUMBER OF RELIEF GOODS BOXES RECEIVED BY EACH BARANGAY	
Barangay	**Number of Relief Goods**
Magiliw	40
Mapayapa	35
Maaruga	50
Magalang	25
Malambing	60

2. Pie Chart

EXPENSES FOR COOKING ADOBO	
Ingredients	**Cost**
Pork	₱ 90.00
Soy Sauce	₱ 30.00
Vinegar	₱ 20.00
Condiments	₱ 10.00
Potatoes	₱ 50.00

3. Pictograph

NUMBER OF POINTS IN A BASKETBALL GAME	
Basketball Players	Points
Magiliw	40
Mapayapa	35
Maaruga	50
Magalang	25
Malambing	60

4. Line Graph

NUMBER OF POINTS IN A BASKETBALL GAME	
Month Year	Rate
April 2016	36
May 2016	46
June 2016	22
July 2016	5
August 2016	16
September 2016	18

LESSON 2

TREADING THE ROAD TO MASTERY

Create an appropriate graph for each given situation. Do this activity on a separate sheet of paper.

1. Budget of your family's income for a month

2. Daily earnings of sari-sari stores in your community (use at least 5)

3. Amount of profit earned by a vendor or driver in a week

LESSON 3

SETTING THE PATH

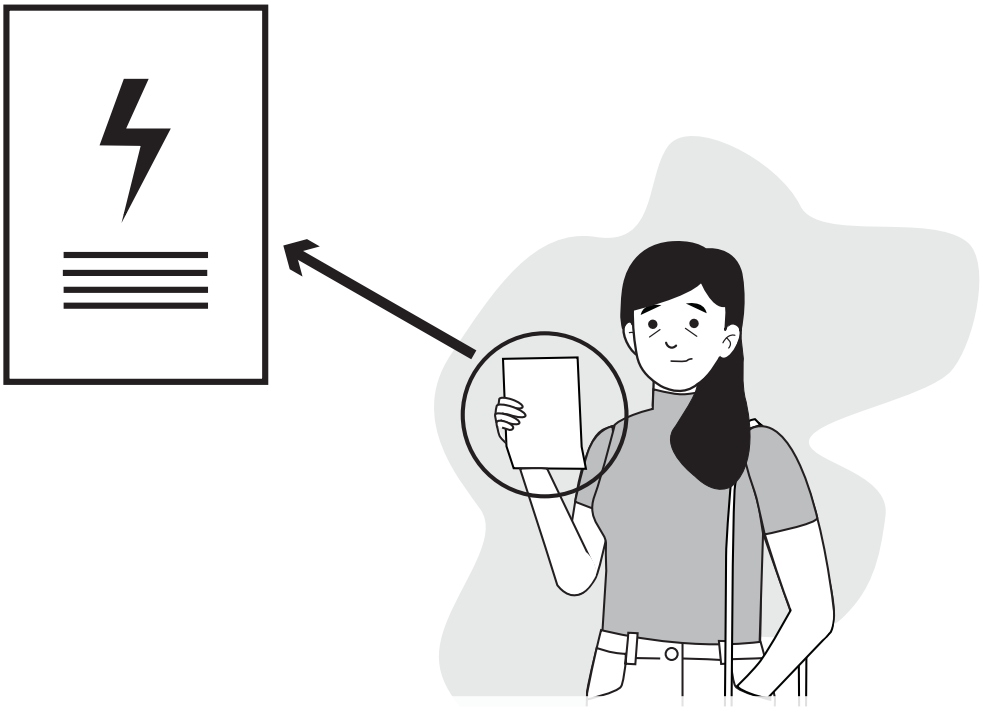
SO, WHAT DO YOU MEAN?

At the end of this lesson, you will be able to:

- read/interpret data presented in a graph (LS3MP-SP-PSF-JHS-8);
- make comparisons of data presented in a graph (LS3MP-SP-PSF-JHS-9); and
- draw inferences and conclusions based on analysis of data presented in graphs and tables (LS3MP-SP-PSF-JHS-10).

LESSON 3

TRYING THIS OUT



Betty received their electric bill for the previous month and noticed a graph containing some data. Let us help Betty identify the parts of the graph by answering the given questions.

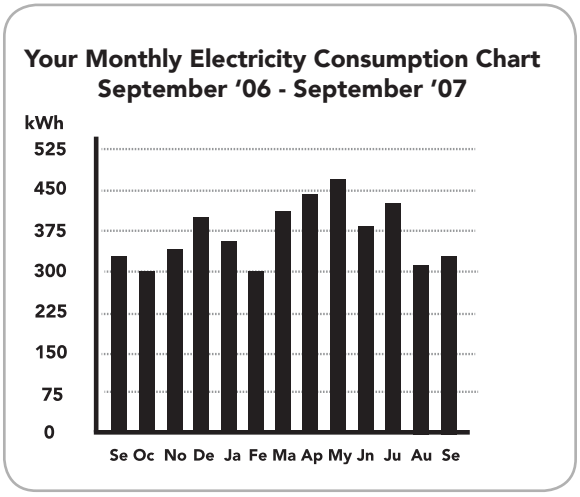
a. What type of graph is given? What is it about?

b. What is the value of the interval?

c. What do the vertical bars mean?

d. When did the highest value occur?

e. When did the lowest value occur?

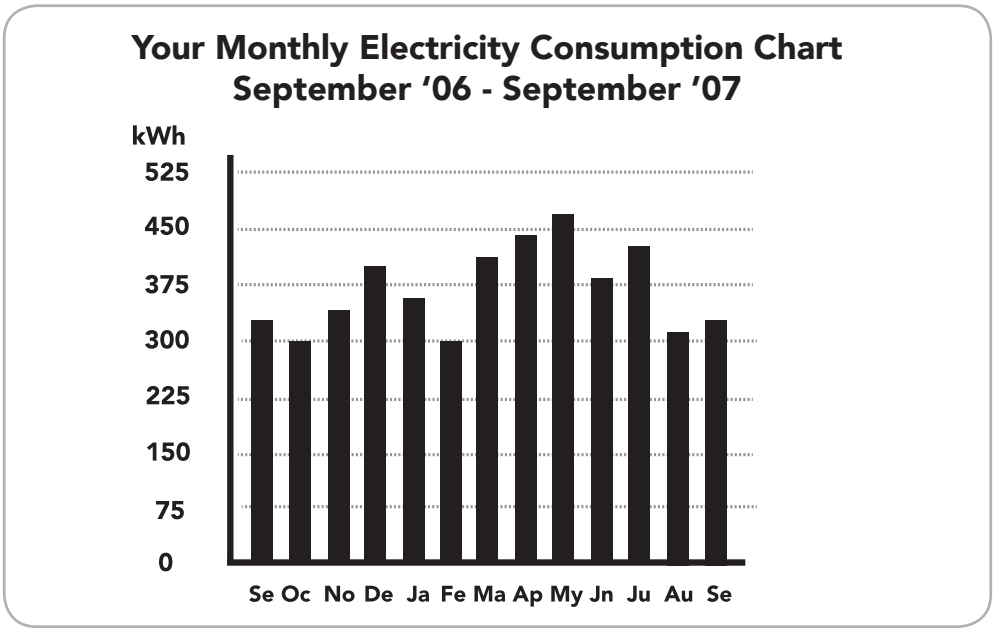


LESSON 3

UNDERSTANDING WHAT YOU DID

Graphs and charts can tell us a lot of information in a very simple manner. They can be understood by people who do not speak the same language. This makes numbers and symbols become powerful tools in giving out information.

- Pictographs show the value using pictures or symbols.
- Pie graph is used to show the distribution of different parts making a whole group.
- Bar graph is used to compare values of different criteria.
- Line graph is used to show the changes of values over time.



Let us consider the graph from Betty's electric bill consumption in the activity.

a. What type of graph is given? What is it about?

- All parts of a graph are important. The first one to check is the title, then the type of graph because it gives an idea as to what the graph is representing.
- The given is a bar graph with title "Your monthly electricity consumption chart". It shows the amount of electricity used in the household every month.

b. What is the value of the interval?

- Examine the axes for bar graphs and line graphs as it will tell you how to read the values accurately. In this example, the interval is 75 – between the numbers on the vertical axis.

c. What do the vertical bars mean?

- The vertical bars show the value of the consumption for each month by the household.

d. When did the highest value occur?

- The highest value of consumption occurred on May '07.

e. When did the lowest value occur?

- The lowest value of consumption occurred two times, October '06 and February '07.

Let us examine other graphs and answer questions about them.

Example 1.

Use the pictograph showing the number of customers in a beauty parlor to answer the following questions.

a. Which months have the highest and lowest number of customers?

b. Which months have the same number of customers?

c. If each girl on the pictograph pays ₱100.00, how much more did the beauty parlor earn in July than in January?

Monthly Customers in a Beauty Parlor

Legend:  = 1 customer

January	
February	
March	
April	
May	
June	
July	
August	
September	
October	
November	
December	

a. Count the number of symbols for each month.

- Highest number of customers: October (9)
- Lowest number of customers: June (2)

b. Compare the months and list those that have the same number of symbols.

- January & December (3)
- February, March & May (4)
- April & November (5)
- July & August (6)

c. Compute the earnings in January and July, then subtract.

Earnings:
- January: 3(100) = 300
- July: 6(100) = 600

Earnings in July-earnings in January = 600-300 = 300

Based on the pictograph, the beauty parlor earned ₱300.00 more in July than in January.

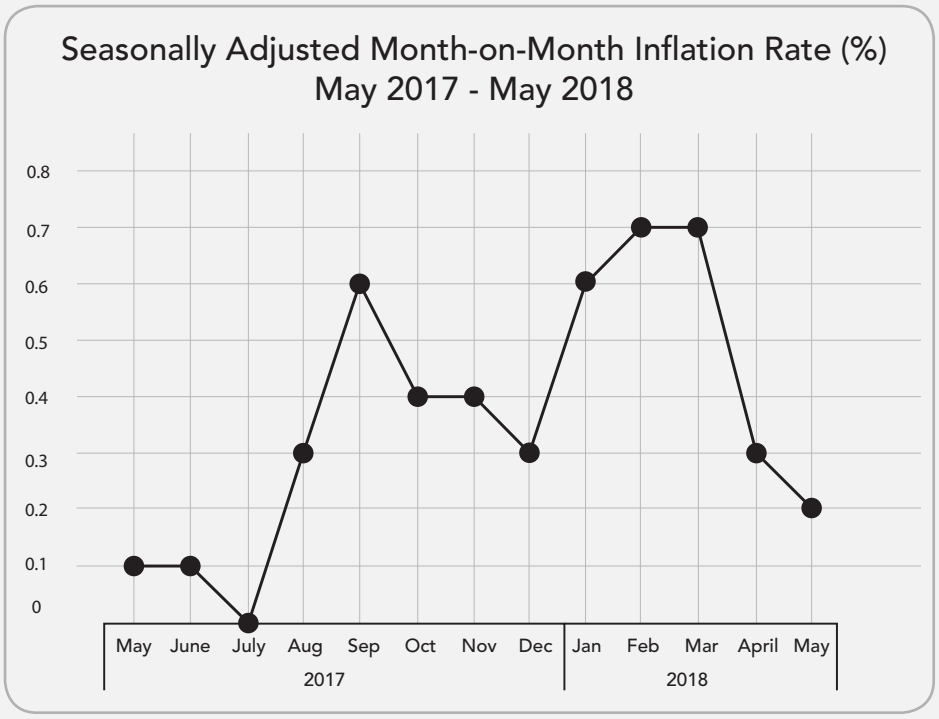
Example 2.

Refer to the line graph of inflation rate (changes in price of goods) to answer the following questions.

a. What months experienced a decrease in the inflation? Increase in the inflation? Remained the same?

b. In which months did the highest and lowest inflation rate occur?

c. Which month(s) experienced an inflation of 0.3?



a. Decrease in value is shown by diagonal lines that go down from left to right.

- June-July (2017), September-October (2017), November-December (2017) and March-May (2018).

Increase in value is shown by diagonal lines that go up from left to right.

- July-September (2017), December (2017) – February (2018).

Lines that are flat (or horizontal) show that the values remained the same (or constant).

- May-June (2017), October-November (2017), and February-March (2018).

b. The highest value of 0.7 inflation happened in February and March (2018), while the lowest value of 0 inflation happened in July (2017).

c. The months with plotted points across the value of 0.3 are August (2017), December (2017) and April (2018).

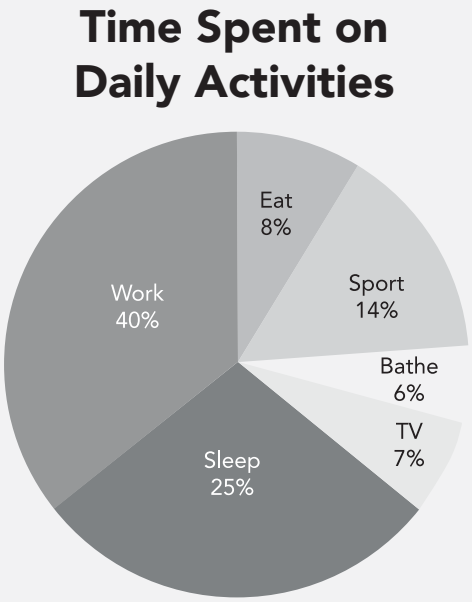
Example 3.

Use the pie chart showing the activities to answer the following questions.

a. How much time (in hours) is spent for sleeping?

b. How much time (in hours) is NOT spent for sleeping and work?

c. Which other activities must be added with sleeping and eating so that the amount spent with them is the same as that of work?



a. To find hours spent for sleeping, convert percentage (25%) to decimal, then multiply it by 24, since there are 24 hours during the day to distribute the activities.

$$\frac{25}{100} = 0.25$$

- $24 (0.25) = 6$
- Therefore, 6 hours is spent for sleeping.

b. Find the total number of hours spent on sleeping and working:

Sleeping = 25%
Working = 40%
Total = 25%+40% = 65%

- A pie chart shows 100% so to get the percentage NOT spent on sleeping and working, we subtract 65% from 100%.
- Time spent not for sleeping and working = 100%-65% = 35% or 0.35

- Lastly, multiply 35% by 24 hours,

  $24(0.35)= 8.4$

- Therefore, 8.4 hours is spent for activities other than sleeping and working.

c. We need to find another activity to be added to sleeping and eating to make their total percentage equal to the percentage of working which is 40%.

- Since 25% is allotted to sleeping and 8% to eating, their total percentage is

  $25\% + 8\% = 33\%.$

- Find the difference between working and the total of sleeping and eating.

  $40\% - 33\% = 7\%$

- The activity allotting 7% from the pie chart is watching TV.

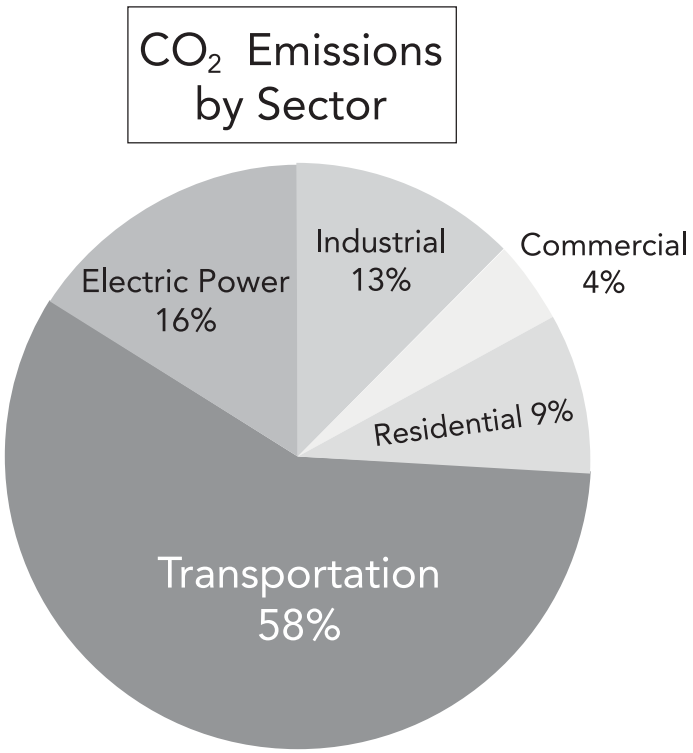
- Therefore, combining watching TV, sleeping and eating has the same amount of time spent for working.

LESSON 3

SHARPENING YOUR SKILLS

I. Answer the following questions using the given graphs. Do this activity on a separate sheet of paper.

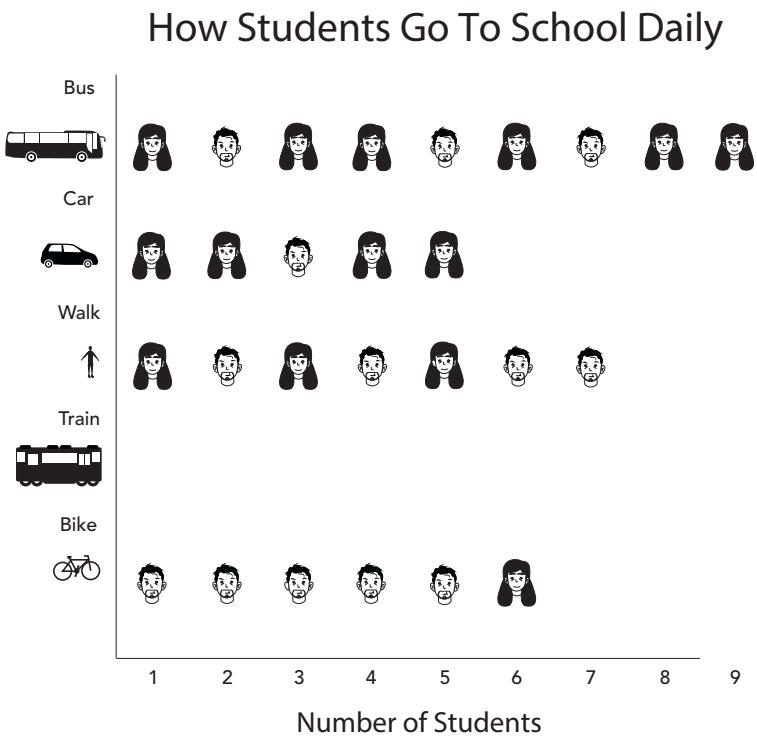
1



a. What sector is the least contributor to carbon dioxide emission?

b. What sector has the same carbon dioxide emission as commercial and residential combined?

c. If the carbon emission in a year is 250,000 tons, how much is contributed by each sector (in tons)?



2

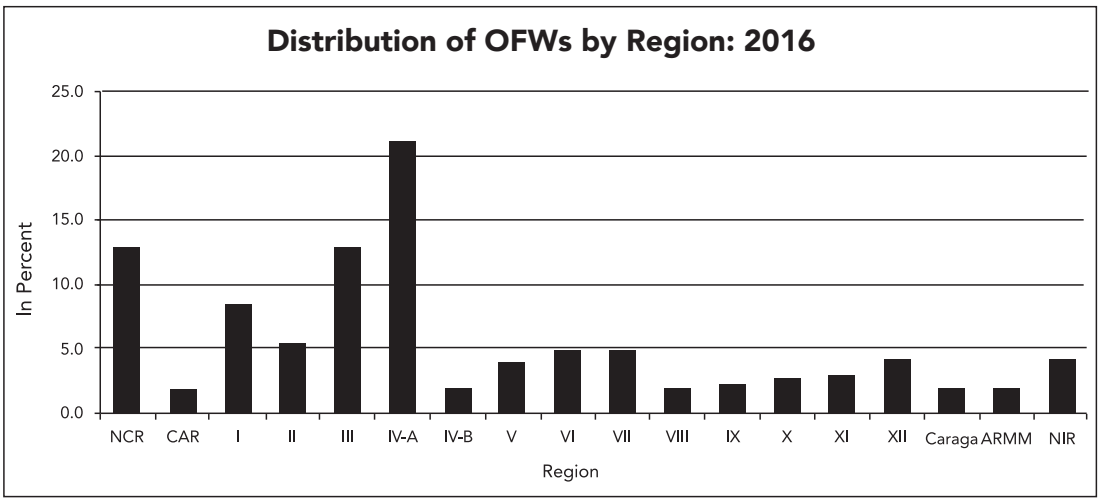
a. What is the most preferred mode of transportation? What is the least?

b. Except for the train, what mode of transportation is least preferred by boys?

c. If each symbol represents 5 students, how many students are present?

d. If each symbol represents 5 students, how much did the bus earn if each student is paying ₱15.00?

II. Identify the parts of the given graphs using the guide questions below. Do this activity on a separate sheet of paper.



Source: Philippine Statistics Authority, 2016 Survey on Overseas Filipinos
Note: Reference period is six months prior to survey

a. What is the graph about?

b. What is the interval used for the graph?

c. How many categories are being compared for each graph?

d. What category(ies) has the highest value in the graph?

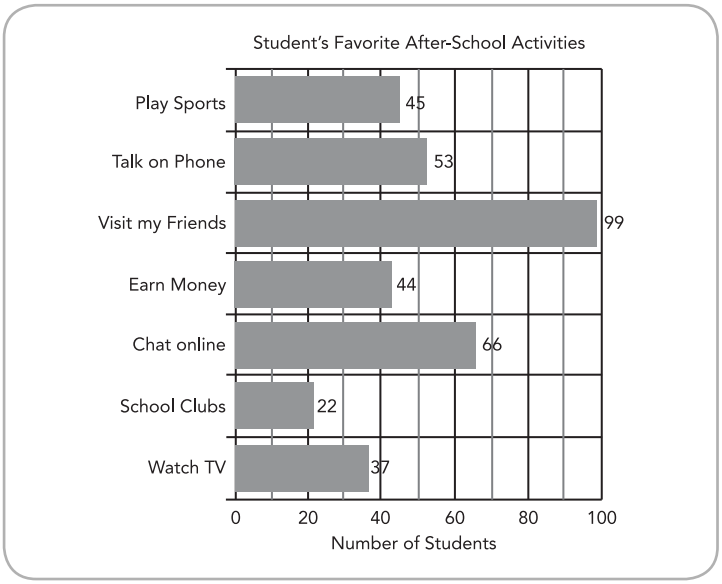
e. What category(ies) has the lowest value in the graph?

LESSON 3

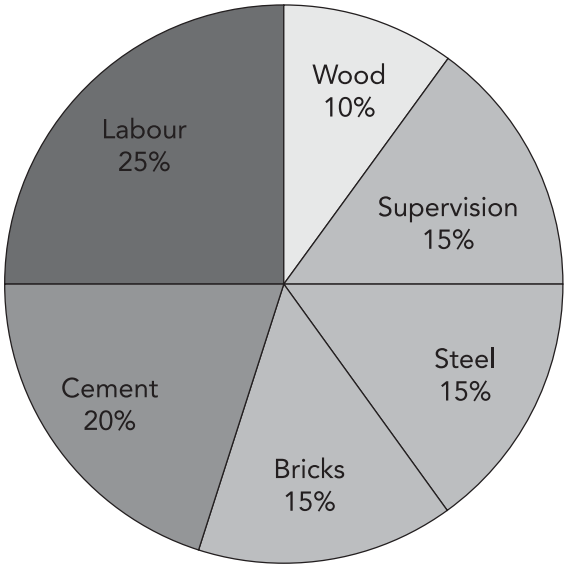
TREADING THE ROAD TO MASTERY

Write a paragraph with 4-5 sentences to interpret the meaning of each given graph. Discuss what the numbers represent, the categories included, and the trend or comparison of the categories in the data set.

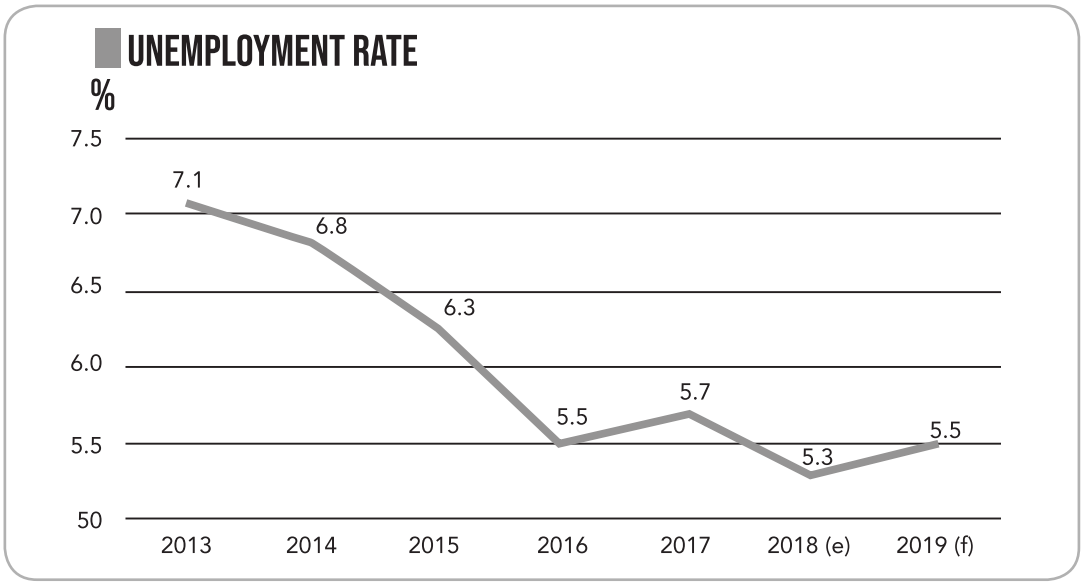
1. Students' Favorite After-School Activities



2. Cost of Home Construction



3. Unemployment Rate



MODULE 7

DON'T FORGET

- **Data** is a collection of facts, such as numbers, words, measurements, observations or even just descriptions of things.

- **Population** is the total number of group of people or objects in statistics that provide relevant data.

- **Types of Collecting Data**

  Observation – method of collecting data by looking at habits and traits of people or objects of interest without any interaction between the researcher and the subject.

  Experiment – method of collecting data by doing scientific experiments to find answers or solutions to a scientific problem.

  Survey – is an investigation about the characteristics of a given population by means of collecting different information needed using a set of questions.

- **Types of Survey**

  Interview – interaction involving the researcher asking questions to one or more respondents about information needed in a research.

  Questionnaire – a document with a series of questions for the purpose of gathering information from respondents.

- **Types of Questions Used in a Survey**

  Multiple choice questions are the most popular survey question type. They allow your respondents to select one or more options from a list of answers that you define.

  Dichotomous questions give two options to the respondents – yes or no – to choose from.

  Rating scale questions measure the amount of agreement or feeling towards a given situation using numbers.

  Likert scales are widely used to measure attitudes and opinions with a greater degree using "agree or disagree."

- **Types of Graphs**

  A **pictograph** is a graph that shows numerical information by using picture symbols to represent data sets. Each picture represents a specific value.

  Pie chart is a circular graph divided into several parts representing distribution of each category in a data set using percentages.

  Bar graph uses vertical or horizontal bars to represent the values of each category.

  Line Graph uses lines connected by points representing the value of each category in a data set.

COMPARISON OF WHEN TO USE EACH GRAPH	
Pictograph	This is used to show the number of data elements for each category in the data set.
Pie chart	This is used to compare parts of the data set to the whole.
Bar graph	Compare things between different groups or to track changes over time but only when the changes are very large.
Line graph	Line graphs are best used to track changes over short and long periods of time.

MODULE 7
EXPLORE MORE

For additional activities related to the topics of this module, these resources may be helpful:

"Survey Methods"
https://www.youtube.com/watch?v=7ZA2XG0ovWo

"7 Tips for Good Survey Questions"
https://www.youtube.com/watch?v=Iq_fhTuY1hw

"Types of Graphs and When to Use Them"
https://www.youtube.com/watch?v=yrTB5JSQPqY

"Understanding Statistical Graphs and when to use them"
https://www.youtube.com/watch?v=rllw15xkmUU

Making graphs using computer software tools:

- **Line Graph**
  https://www.youtube.com/watch?v=3PwVWX28dEE

- **Bar Graph**
  https://www.youtube.com/watch?v=X7O6WQl62Ks

- **Pie Chart**
  https://www.youtube.com/watch?v=azHNZbhu79A

MODULE 7
REACH THE TOP

Choose the letter of the correct answer by writing them on a separate sheet of paper.

1. It is a large collection of individuals or objects that is the main focus of the study.

   a. population
   b. respondent
   c. sampling
   d. survey

2. What type of graph can best illustrate "monthly budget plan"?

   a. bar graph
   b. line graph
   c. pictograph
   d. pie graph

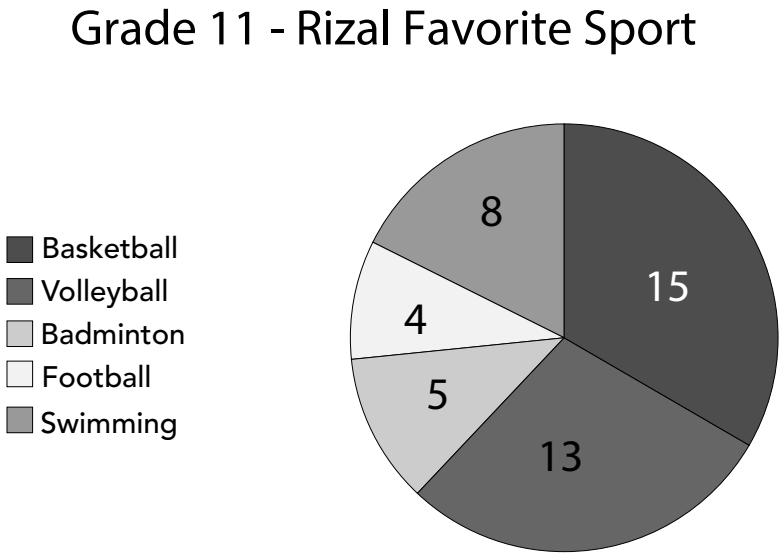
3. What type of graph shows a numerical data by using pictures or symbols to represent data sets?

   a. bar graph
   b. line graph
   c. pictograph
   d. pie graph

4. It is the process of gathering information which are important in providing an idea about the different belief, traits, or characteristics of a group of people or events.

   a. collecting data
   b. experiment
   c. interview
   d. observation

For items 5-8, refer to the data below.



5. Which sport is the most favorite of the students of Grade 11-Rizal?

a. badminton **b.** basketball **c.** football **d.** volleyball

6. Which sport is the least favorite of the students of Grade 11-Rizal?

a. badminton **b.** basketball **c.** football **d.** volleyball

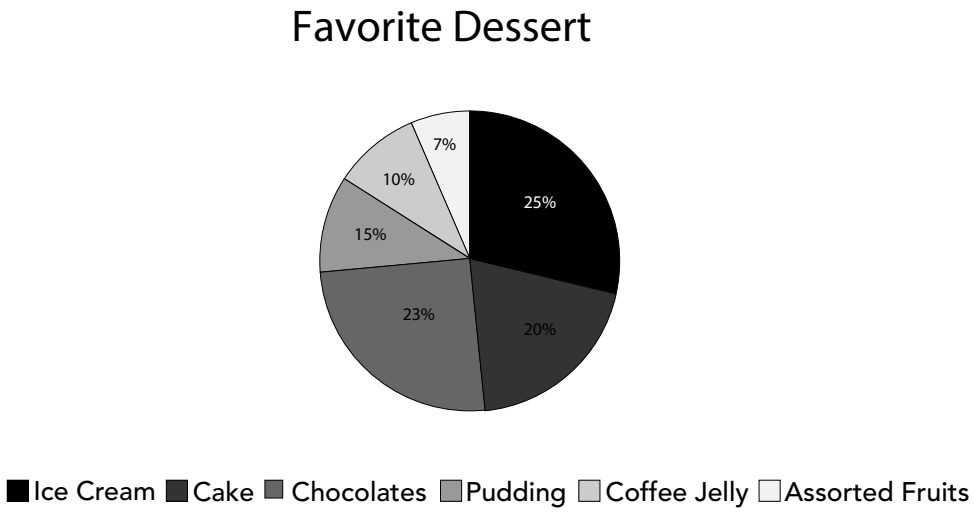
7. In total, how many students like basketball, volleyball, and football as their favorite sport?

a. 22 **b.** 25 **c.** 27 **d.** 32

8. What is the difference between the number of students who choose basketball than football as their favorite sport?

a. 2 **b.** 7 **c.** 10 **d.** 11

For items 9-11, refer to the data below.



9. How many students like to eat ice cream and chocolates as dessert?

a. 72 **b.** 75 **c.** 77 **d.** 79

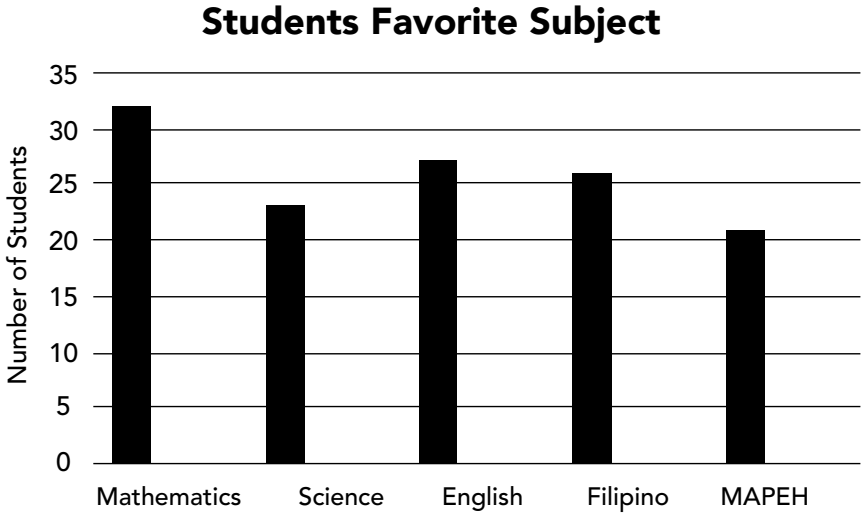
10. How many students like to eat coffee jelly as dessert?

a. 10 **b.** 15 **c.** 20 **d.** 25

11. Which dessert is the favorite of 30 students from the survey?

a. cake **b.** chocolates **c.** ice cream **d.** pudding

For items 12-15, refer to the data below.



12. How many students choose Mathematics as their favorite subject?

a. 30 **b.** 32 **c.** 34 **d.** 36

13. What subject is liked by the fewest number of students?

a. English **b.** Filipino **c.** MAPEH **d.** Mathematics

14. In total, how many students choose English, Filipino, and Science as their favorite subject?

a. 68 **b.** 72 **c.** 76 **d.** 80

15. What is the difference between the number of students who choose Mathematics than MAPEH as their favorite subject?

a. 11 **b.** 14 **c.** 17 **d.** 20

ANSWER KEY

PRE-ASSESSMENT

PAGE 2

1. c
2. b
3. b
4. c
5. b
6. a
7. d
8. c
9. b
10. a
11. c
12. b
13. a
14. d
15. b

LESSON I: EXCUSE ME, MAY I ASK YOU A QUESTION?

SHARPENING YOUR SKILLS

PAGE 15

ACTIVITY I

1. Sample questions answerable by Yes or No.
   a. Are you in favor of the no homework policy in schools?
   b. Do you agree with the suggestion of banning old jeeps for public transport?
   c. Are you in favor of legalizing marijuana for medical purposes?

2. Sample questions measuring level of feeling about a topic.
   a. I feel okay about the growing presence of Chinese workers in the Philippines.

STRONGLY AGREE	AGREE	DISAGREE	STRONGLY DISAGREE

   b. The movie I watched was well made

STRONGLY AGREE	AGREE	DISAGREE	STRONGLY DISAGREE

ANSWER KEY

3. Sample questions should have multiple choices.
   a. Which of the following is your favorite hobby?
      - Singing
      - Dancing
      - Reading a book

   b. What is your most preferred basketball team in the PBA?
      - Barangay Ginebra
      - Alaska Aces
      - Magnolia Hotshots

   c. What dish is best paired with rice?
      - Adobo
      - Sinigang
      - Nilaga

4. Sample questions must be answered using a rating scale
   a. On a scale of 1 – 5, with 5 being the highest, how much did you enjoy the movie you watched?

5	4	3	2	1

   b. On a scale of 1 – 5 , with 1 being the lowest, how difficult can you say the exam was?

5	4	3	2	1

ANSWER KEY

TREADING THE ROAD TO MASTERY

PAGE 16

Guidelines for Types of Questions

- **Dichotomous**: Question should be answerable using only two options.
- **Multiple Choice**: Question should have multiple choices presented to the respondent.
- **Rating Scale**: Question should use a rating scale (choice of numbers) to answer a question.
- **Likert Scale**: Question should measure level of agreement on a certain topic.

RUBRICS IN MAKING A SIMPLE SURVEY			
	3	2	1
Are all questions relevant to the topic chosen	All the questions included are important to answering the chosen topic problem.	There are some questions that are not related and needed in answering the topic problem.	All questions are not relevant or needed in answering the topic problem.
Are all types of questions used correctly? (Refer to the guide above)	All types of questions were used correctly to accurately gather needed information to answer the topic problem.	Some types of questions are incorrectly used and do not help in answering the topic problem.	All questions are incorrectly used and do not answer the topic problem completely
Are demographics correctly placed?		Demographics are included in the survey.	Demographics are not included in the survey.
Presentation: Was the survey explained clearly?		All items in the survey were explained clearly.	Some items in the survey were not explained clearly.
TOTAL: 10 POINTS			

ANSWER KEY

LESSON 2: LET'S ORGANIZE THIS

SHARPENING YOUR SKILLS

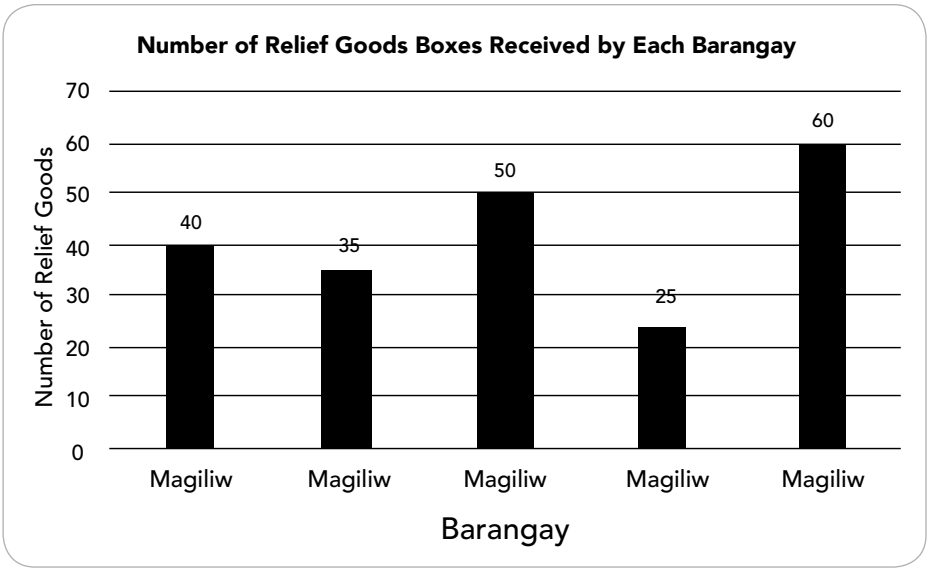
PAGE 33

ACTIVITY I

1. bar graph or pictograph
2. line graph
3. pie chart
4. line graph
5. bar graph or pictograph
6. line graph
7. pie chart
8. line graph
9. bar graph or pictograph
10. bar graph or pictograph

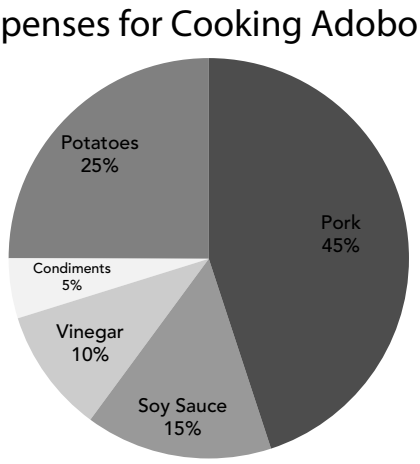
ACTIVITY II

1.



ANSWER KEY

2.



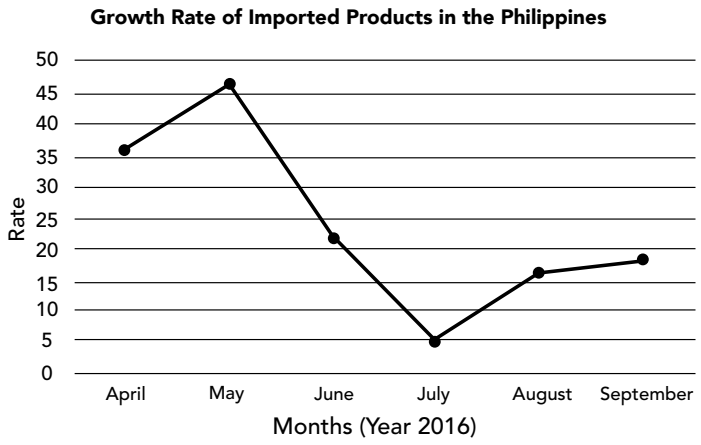
3.

Number of Points in a Basketball Game

Basketball Player	Points
Alvin Patrimonio	
Beau Belga	
James Yap	
June Mar Fajardo	
Kiefer Ravena	
Paul Simon	

Legend: = 10 points

4.



ANSWER KEY

TREADING THE ROAD TO MASTERY

PAGE 36

1. Use pie chart
   - Each part of the pie should represent an item where the budget is used for.
   - Indicate the name and the percentage occupied by each part of the pie.
   - Indicate the title of the pie chart above or below.

2. Use bar graph
   - For vertical bar graph:
     The horizontal axis should have the names of the sari-sari stores, vertical axis should have the amount of earnings using the appropriate interval.

   - For horizontal bar graph:
     The vertical axis should have the names of the sari-sari stores, horizontal axis should have the amount of earnings using the appropriate interval.

   - Indicate the name of the axes used. Write the title of the bar graph above or below the image.

   - Make sure that the bars are correctly aligned to the values they represent. Write the value at the top of (vertical) or beside (horizontal) each bar.

3. Use line graph

- The horizontal axis should contain each day of the week. The vertical axis should contain the amount of profit using appropriate intervals.
- Make sure each point representing each day is aligned with the correct value of profit.
-
- Label each point with the correct values. Connect the points in the line graph.
-
- Indicate the name of the line graph above or below the line graph.

ANSWER KEY

LESSON 3: SO, WHAT DO YOU MEAN?

SHARPENING YOUR SKILLS

PAGE 47

ACTIVITY I

1. **a.** Commercial
   b. Industrial
   c. Transportation = 145,000
   Electric Power = 40,000
   Industrial = 32,500
   Commercial = 10,000
   Residential = 22,500

2. **a.** most preferred is bus
   least preferred is train
   b. car
   c. 135
   d. ₱675

ACTIVITY II

a. Distribution of OFWs in each region
b. Interval of 5 was used
c. There are eighteen (18) regions being compared
d. Region IVA
e. Caraga, ARMM, & CAR

ANSWER KEY

TREADING THE ROAD TO MASTERY

PAGE 50

1. The student should mention the following:
   - The bar graph shows the preference of students for after-school activities.
   - The horizontal axis shows the number of students, the vertical axis shows the type of activities
   - There are eight (8) activities being compared
   - Intervals of 20 were used
   - Most favorite activity is Visit with Friends (99)
   - Least Favorite activity is School Clubs (22)

2. The student should mention the following:
   - The pie chart shows the cost of home construction
   - There are six (6) categories being compared
   - Labor takes the highest percentage in constructing a home (25%)
   - Wood takes the lowest percentage in constructing a home (10%)

3. The student should mention the following:
   - The line chart shows the changes in the unemployment rate over the years
   - There are seven (7) years being compared
   - Unemployment rate is decreasing from 2013 to 2016, increasing from 2016 o 2017, decreasing from 2017 to 2018, and increasing from 2018 to 2019
   - The highest unemployment rate happened in 2013 (7.1)
   - The lowest unemployment rate happened in 2018 (5.3)

ANSWER KEY

REACH THE TOP

PAGE 56

1. a
2. d
3. c
4. a
5. b
6. c
7. d
8. c
9. a
10. b
11. a
12. b
13. c
14. c
15. a

GLOSSARY

Bar graph	a graph that uses vertical or horizontal bars to represent values from categories
Data	collection of facts (numbers, words, measurements, observation, descriptions of things) used for analysis and interpretation
Data collection	process of gathering important data in providing information about the different characteristics of a population
Dichotomous questions	type of survey questions that provide two options to choose from
Experiment	method of collecting data by doing scientific procedure to find answers or solutions to a scientific problem
Graph	a picture that represents a data in an organized manner
Interview	interaction involving the researcher asking questions to one or more respondents about information needed in a research
Likert scales	type of survey questions used to measure attitudes and opinions with a greater degree using "agree" or "disagree"

GLOSSARY

Line Graph	a graph that uses lines connected by points representing the value of each category in a data set
Multiple choice questions	type of survey questions that allow respondents to select one or more options
Observation	method of collecting data by looking at habits and traits of people or objects of interest without interaction between the researcher and the subject
Pictograph	a graph that shows numerical information by using picture symbols to represent data sets
Pie chart	a circular graph divided into several parts representing distribution of each category in a data set using percentages
Population	total number of group of people or objects in statistics that provide relevant data
Questionnaire	a pen-and-paper survey with a series of questions for the purpose of gathering information from respondents
Rating scale questions	type of survey question that measures the amount of agreement or feeling towards a given situation using numbers
Survey	an investigation about the characteristics of a given population by means of collecting different information needed using a set of questions

REFERENCES

Bluman, Allan G. Elementary Statistics: A Step by Step Approach. New York: McGraw-Hill, 2009.

Illowsky, Barbara, and Susan Dean. Introductory Statistics. Houston: 12th Media Services, 2017.

Math Goodies, Line Graphs (2017), accessed August 28, 2019, https://www.mathgoodies.com/lessons/graphs/line.

Pierce, Rod, Pie Chart (2017), accessed August 28, November 9, 2019, https://www.mathsisfun.com/citation.php.

SmartDraw, LLC. Bar Graph (2019), accessed August 28, 2019, https://www.smartdraw.com/bar-graph/

Sincero, Sarah Mae, Types of Survey, accessed April 4, 2020, https://explorable.com/types-of-survey

Survey Monkey. Writing Good Survey Questions (2019), accessed August 28, 2019, https://www.surveymonkey.com/mp/writing-survey-questions/.

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