

Reading Graphs and Tables

ESSENTIAL QUESTIONS

- What is the importance of reading graphs and tables?
- How do we effectively read a graph and tables?

MODULE OBJECTIVES

After successful completion of the module, the student should be able to

1. Explain the importance of reading graphs and tables
2. Identify the main information conveyed by graphs and tables

CONCEPTS

READING GRAPHS AND TABLES

Data is often presented in the form of graphs and tables in order to summarize and communicate a wide range of information. An effective graph or table is able to convey the most important features of selected data completely, accurately, fairly, and with relative ease. Because graphs and tables are so useful and ubiquitous in today's world, it is important to know how to read them.

FORMS OF DATA PRESENTATION

(A) TEXTUAL

Data presented in the textual form is merely data enumerated through a written account. It is a combination of texts and figures written in paragraph form.

Example:

"According to the data gathered from the World Bank in data.worldbank.org, the entire Philippine population during the year 1965 was 30.9 million people. In 1971, it was 36.9 million people. In 1975, it was 41.3 million people. In 1985, it was 54.3 million people."

(B) TABULAR

Data presented in the tabular form is data arranged within tables: through rows and columns.

PHILIPPINE POPULATION FROM 1965 TO 1985

Year	1965	1971	1975	1985
Population (in millions)	30.9	36.9	41.3	54.3

Source: World Bank (data.worldbank.org)

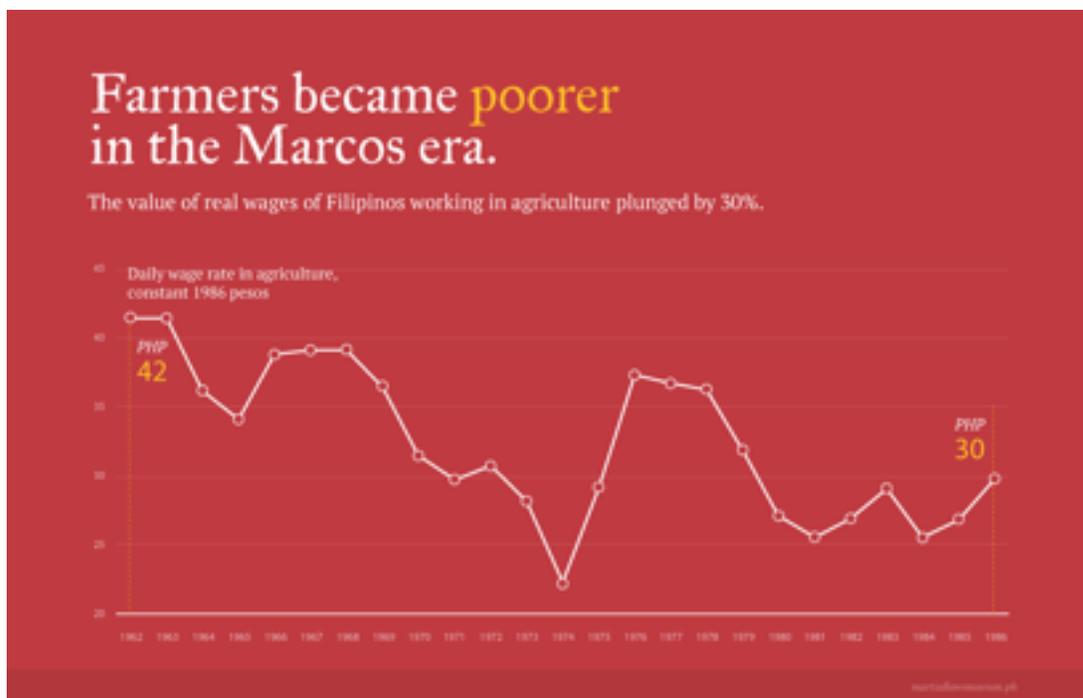
(C) GRAPHICAL

The graphical form serves as visual representation of data for easier interpretation between its proportions and relationships. This only highlights essential information from data, without having to present all of the elements.

Below are the different types of graphical presentations of data:

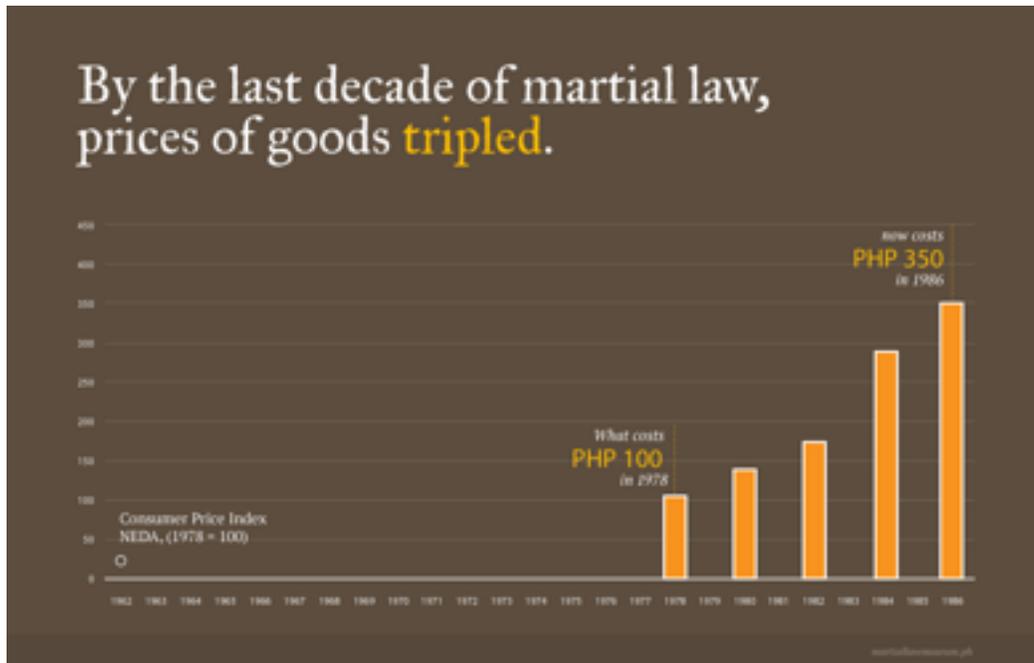
① LINE GRAPH

In line graphs, data are represented by coordinate points joined by line segments over a coordinate plane. The horizontal axis is usually the time axis, while the vertical axis is another quantity. Line graphs usually show the change in one quantity over the change in another.



2 BAR GRAPH AND HISTOGRAM

In bar graphs, data are represented by rectangular bars of different heights to represent the magnitude of each datum. This graph is usually used to emphasize comparisons between data. It may be vertical or horizontal. Histograms are similar to bar graphs but with numbers grouped into ranges. In graphing histograms, it is not necessary to put spaces in between bar graphs.

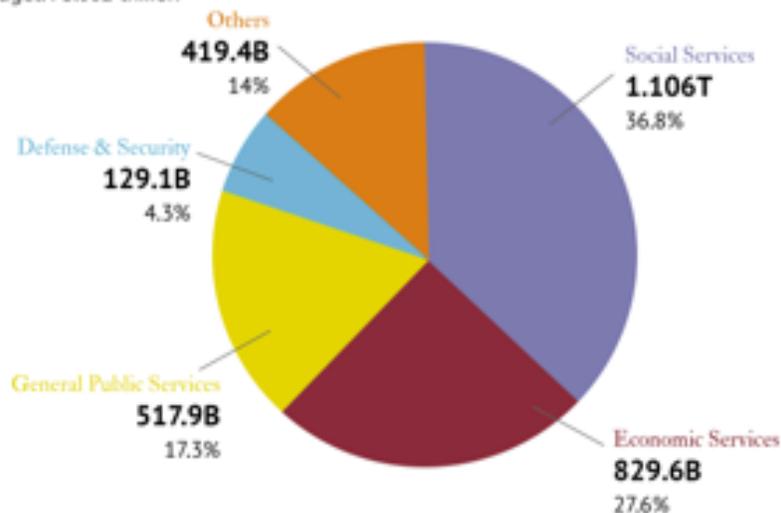


3 PIE GRAPH

Pie graphs represent data in the form in a pie-shaped graph with each “pie slice” as the percent distribution of each datum. The pie is divided into sections proportional to the magnitudes of data these represent. Pie graphs visually represent data to show sizes of each datum relative to other data in the set.

National Budget 2016

Total Budget: P3,002-trillion



4 PICTOGRAPH

Similar to a bar graph, pictographs present data through pictures that represent specific quantities, usually plotted with horizontal and vertical axes.

Example:

For Linggo ng Wika, one class from each of four batches was tasked to look for as many Philippine flags as they can. Below are the results of the inter-batch competition:

Linggo ng Wika Competition Results

GRADE AND SECTION	# of Philippine Flags collected
Grade 1 Truth	
Grade 2 Freedom	
Grade 3 Justice	
Grade 4 Faith	

Each  represents 4 Philippine flags.

PARTS OF A GRAPH AND ITS FUNCTIONS

Some parts of graphs useful to know are:

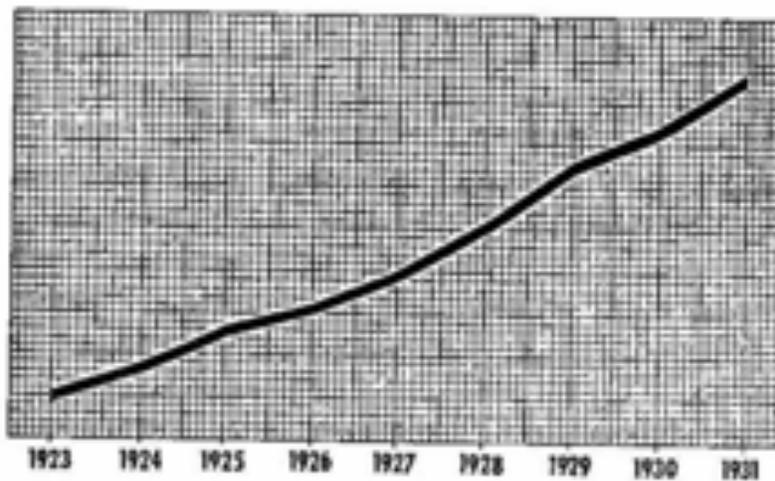
1. **Range:** this is the difference between the maximum and minimum data plotted
2. **Mode:** this is the most frequent datum (or data) plotted

AN ERRONEOUS GRAPH AND ITS POTENTIAL TO MISLEAD

Because graphing more often than not utilizes only a portion of the data collected, some graphs, when not properly constructed, may mislead or give a false impression. Here are some ways graph can be erroneous and potentially mislead:

1. When parts of the graph are omitted or not included

- a. Because the graph below does not have a label for its vertical axis, it becomes impossible to read.

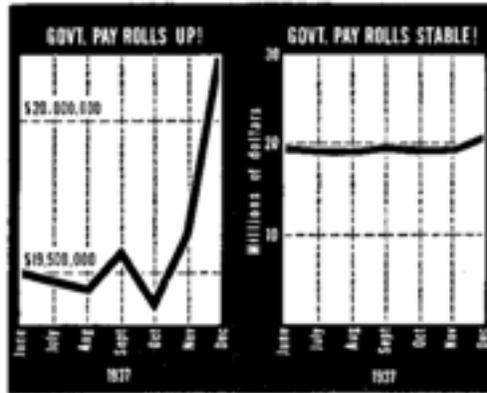


Source: *How to Lie with Statistics*

2. Choosing what to exclude from the graph and how this changes the impression it gives.

Example:

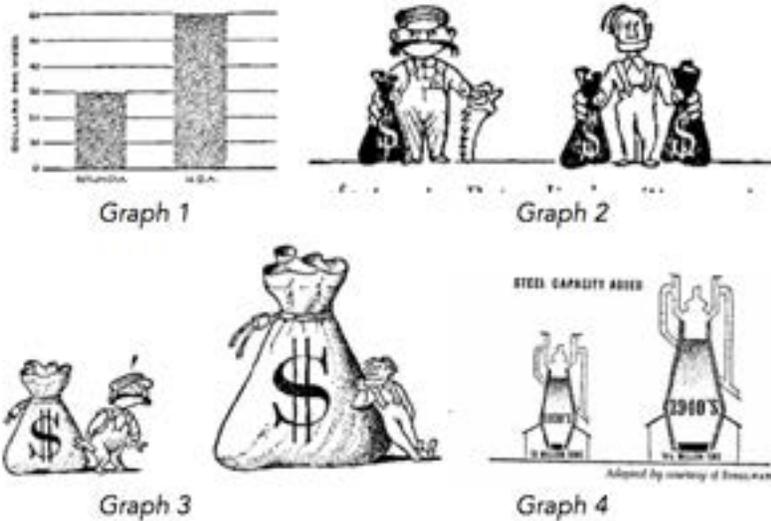
“According to the data gathered from the World Bank in data.worldbank.org, the entire Philippine population during the year 1965 was 30.9 million people. In 1971, it was 36.9 million people. In 1975, it was 41.3 million people. In 1985, it was 54.3 million people.”



Source: *How to Lie with Statistics*

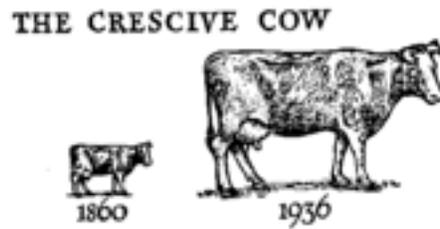
3. Misleading pictographs

a. Actual Ratio vs. Visual Impression: Pictographs that utilize three-dimensional symbols can sometimes give the impression that the proportion is greater than it actually is. Proportion is usually expressed in pictographs through differences in length (like the Graph 1) or with the same symbols but with differences in quantity (like Graph 2). However, pictures cannot simply be “enlarged” like Graph 3 and Graph 4 below. This is because increasing a three-dimensional object’s height also increases its width, and depth — effectively multiplying the visual impression it leaves more than supposed.



Source: *How to Lie with Statistics*

- b. Inappropriate picture choice: Some visual representations of data may be taken too literally by those unfamiliar with pictographs. The examples below may cause people to think that cows have become larger in 1936 than in 1860.



Source: *How to Lie with Statistics*

READING GRAPHS AND TABLES WORKSHEET

EXERCISES

A. Reading Data

POVERTY DURING THE MARCOS REGIME

Poverty rate, % of families	1965	1971	1975	1985
Philippines	41	43.8	51.5	58.9
Manila and Suburbs	10.6	16	40.6	43.9
<u>Ilocos</u>	57.3	56.3	51.7	51.6
Cagayan Valley	67.6	65.5	56.5	55.7
Central Luzon	32.3	30.7	37.8	43.5
Southern Tagalog	34	39.8	50.9	55.2
Bicol	38.5	49.8	55.9	73.5
Western <u>Visayas</u>	37.7	36.9	53.5	73.4
Eastern <u>Visayas</u>	52.3	61.5	54.9	70.2
Central <u>Visayas</u>	52.3	61.5	54.9	69.9
Northern Mindanao	47.8	51.5	65.6	63
Central Mindanao	47.8	51.5	65.6	60.2
Western Mindanao	51.2	47	55.2	65.6
Southern Mindanao	51.2	47	55.2	63.6

Source: *The Philippines: The Political Economy of Growth and Impoverishment in the Marcos Era*, Table 2.13, Estimates in Poverty Incidence by Region, 1965-1985 (percent of families living below poverty line)¹

1. From the table, how many times were the poverty rates collected within the entire Marcos Regime?
2. Which region had the lowest poverty rate in the beginning of the regime? Which had the lowest in the end?
3. What was the highest poverty rate reached? At what year and where?
4. When and where did the highest increase in poverty rate happen?
5. From the beginning until the end of the regime, which region had the lowest increase in poverty rate?

¹(Author's notes to data) James K. Boyce: Calculated from regional data presented in original source using 1980 population as weights

PHILIPPINE POPULATION PHILIPPINE POPULATION FROM 1965 TO 1985

Year	1965	1971	1975	1985
Population (in millions)	30.9	36.9	41.3	54.3

Source: World Bank (data.worldbank.org)

- From the two tables, how many Filipinos were poor at the beginning of the regime?
- How many Filipinos were poor at the end of the regime?



Source: *The Philippines: The Political Economy of Growth and Impoverishment in the Marcos Era*, Table 2.13, *Estimates in Poverty Incidence by Region, 1965-1985 (percent of families living below poverty line)*

- What type of graph is this?
- Which region had the highest increase in poverty rate?
- How many regions increased in poverty rate by more than 15%?
- How many regions increased in poverty rate by less than 15%?
- Why are the bars of Ilocos Region and Cagayan Valley upside down (below the x-axis)?

B. Errors in Graphs

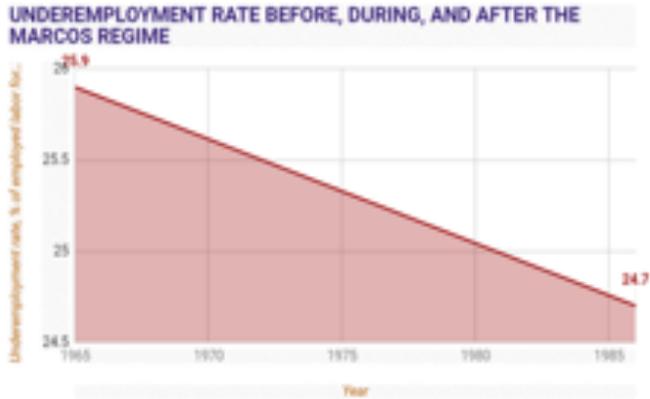
- Given this table of data, which graph properly represents the data collected? (The Marcos Regime was from 1965 - 1986)

UNDEREMPLOYMENT BEFORE, DURING, AND AFTER THE MARCOS REGIME

Year	Underemployment rate, % of employed labor force	Year	Underemployment rate, % of employed labor force
1956	21.4	1981	21.7
1957	18.7	1982	27.5
1958	21.3	1983	30.9
1959	18.9	1984	32.9
1960	21.4	1985	21.8
1961	23	1986	24.7
1962	24.1	1987	26.5
1963	29.9	1988	23.5
1964	27.7	1989	23.2
1965	25.9	1990	22.4
1966	23.8	1991	22.5
1967	26.6	1992	20
1968	26.7	1993	21.7
1969	20.3	1994	21.4
1970	17.75	1995	20
1971	15.2	1996	21
1972	12.7	1997	21.9
1973	12.4	1998	21.6
1974	10.2	1999	22.1
1975	11.7	2000	21.7
1976	25.5	2001	17.2
1977	20	2002	17
1978	16.1	2003	17
1979	20.05	2004	17.6
1980	24	2005	21

Source: Philippine Statistics Authority²

²(Author's notes to data) 1970 and 1979 interpolated by JC Punongbayan: 1956: past week, 10 yo and over; 1976: past quarter, 15 yo and over; 1987: past week, 15 yo and over



Graph 1



Graph 2



Graph 3

ANSWER:

2. What are the errors of graphing data in Graph 3, if any?
3. What are the errors of graphing data in Graph 2, if any?
4. What are the errors of graphing data in Graph 1, if any?
5. If Graph 1 were to be used represent the data, what impression would it leave on its audience?
6. Is Graph 1 truthful? Consider how it uses truthful data. (Underemployment rates during 1965 and 1986)
7. Last February 7, 1986, the famous Snap Election was held in the Philippines. The COMELEC declared Ferdinand Marcos the winner with a final tally of 10,807,197 votes while Corazon Aquino came in second place with a finally tally of 9,291,716 votes. In a parallel tally by the NAMFREL however, Ferdinand Marcos's final tally was only 6,532,362 votes while Corazon Aquino's was 7,158,679 votes. (Atwood et al., 1986) Below is a visual representation of Ferdinand Marcos' supposed win over Corazon Aquino, citing the COMELEC.
8. What is wrong with the picture?



(Source: *A Path to Democratic Renewal* by Atwood et al.)

READING GRAPHS AND TABLES ANSWER KEY

EXERCISES

A. Reading Graphs

1. Four
2. Manila and Suburbs in the beginning; Central Luzon in the end
3. 73.5%, 1985 in Bicol
4. 1971 -1975 in Manila
5. Central Luzon
6. 12.7 million Filipinos
7. 32 million Filipinos
8. Bar Graph
9. Western Visayas
10. Eight
11. Four (Ilocos and Cagayan Valley did not increase in poverty rate)
12. The bars are upside down because the poverty rate of Ilocos and Cagayan Valley decreased, while every other region with upright bars had an increase in poverty rate

B. Errors in Graphs

1. Answer: Graph 3
 - a. Does not omit the "before" and "after" parts of the data
 - b. Includes and plots all of the data collected
2. None
3. Omitted significant data "before" and "after" the regime
4. Omitted significant data "before" and "after" the regime, Omitted significant data "during" the regime (only plotted rates for two years: 1965 and 1986)
5. That underemployment decreased in a linear fashion during the Marcos Regime.
6. No. It is deceptive and manipulative. Even if the data plotted in Graph 1 are true, it is not the whole truth. Purposely omitting parts of the data to produce different impressions is not truthful.
7. Unrealistically exaggerates the difference in votes (1,515,481) as more than it actually is; can be misinterpreted as Ferdinand Marcos being a bigger human being than Corazon Aquino; does not visually translate the data in any way

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