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Quarter 4 – Module 6: Analyzing and Interpreting Research Data

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Quarter 4 – Module 6: Analyzing and Interpreting Research Data
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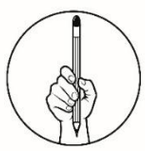
What I Need to Know

This module was designed and written with you in mind. It is here to help you master Analyzing and Interpreting Research Data. The scope of this module permits it to be used in many different learning situations. The language used recognizes the diverse vocabulary level of students. The lessons are arranged to follow the standard sequence of the course. But the order in which you read them can be changed to correspond with the textbook you are now using.

The module has only one lesson:

- Lesson 1 – Analyzing and Interpreting Research Data

After going through this module, you are expected to analyze and interpret a research data.



What I Know

Choose the letter of the best answer. Write the chosen letter on a separate sheet of paper.

1. What is the most stable measure of central tendency?
   A. Mean
   B. Mode
   C. Median
   D. Range

2. Which of the following give us a way to see where a certain data point or value falls in a sample or distribution?
   A. Measures of Central Tendency
   B. Measures of Positions
   C. Measures of Variability
   D. Measures of Dispersion

For numbers 3–5, use the Frequency Distribution Table below.

The number of members in the families of Sitio Pinagkaisahan

Class Interval	f	x	fx	<cf	LB	UB
4 - 6	39	5	195	39	3.5	6.5
7 - 9	35	8	280	74	6.5	9.5
10 – 12	26	11	286	100	9.5	12.5
	N = 100		$\sum fx = 761$			

3. What is the average number of members in the families of Sitio Pinagkaisahan?
   A. 6
   B. 7
   C. 8
   D. 9

4. The percentile rank of 8 in the class interval is 56.5. What does it mean?
   A. 56.5% of the whole distribution has exactly 8 members in their family.
   B. 56.5% of the whole distribution has exactly or less than 8 members in their family.
   C. 43.5% of the whole distribution has less than 8 members in their family.
   D. 43.5% of the whole distribution has exactly 8 members in their family.

5. What is the score in the 87^{th} percentile?
   A. 9
   B. 10
   C. 11
   D. 12

Lesson 1

Analyzing and Interpreting Research Data

In the previous lessons, you have learned how to formulate a mini-statistical research using the measures of central tendency and measures of positions. In this lesson, we shall analyze and interpret those data we gathered in mini research. Data analysis is the most crucial part of any research. Data analysis summarizes collected data. It involves the interpretation of data gathered using analytical and logical reasoning to determine patterns, relationships, or trends.

What's In

The following formulas must be used to find the measures of central tendency and measures of position in ungrouped and grouped data.

	Ungrouped Data	**Grouped Data**
	Measures of Central Tendency	
Mean	$\bar{x} = \frac{\sum x}{N}$	$\bar{x} = \frac{\sum fx}{N}$
Median	$\tilde{x} = the\ middle\ score\ if\ n\ is\ odd$ $\tilde{x} = the\ mean\ of\ two\ middle\ scores\ if\ n\ is\ even$	$\tilde{x} = LB + \left(\frac{\frac{N}{2} - < cf}{f}\right) i$
Mode	$\hat{x} = most\ frequent\ scores$	$\hat{x} = LB + \left(\frac{f_m - f_b}{2f_m - f_a - f_b}\right) i$
	Measures of Position	
Quartile	$Q_k = \frac{k(n+1)}{4}$	$Q_k = LB + \left(\frac{\frac{kN}{4} - < cf}{f}\right) i$
Decile	$D_k = \frac{k(n+1)}{10}$	$D_k = LB + \left(\frac{\frac{kN}{10} - < cf}{f}\right) i$
Percentile	$P_k = \frac{k(n+1)}{100}$	$P_k = LB + \left(\frac{\frac{kN}{100} - < cf}{f}\right) i$

Legend:

$\bar{x}$ = mean	n (or N) = number of scores
$\tilde{x}$ = median	LB = lower boundary
$\hat{x}$ = mode	<cf = less than cumulative frequency
Q_k = quartile	f = frequency
D_k = decile	I = class size
Q_k = percentile	f_b= frequency of preceding class
f_a= frequency of succeeding class	

What's New

Data interpretation refers to the implementation of processes through which data is reviewed for the purpose of arriving at an informed conclusion. The interpretation of data assigns a meaning to the information analyzed and determines its signification and implications.

The importance of data interpretation is evident, and therefore it needs to be done properly. Data is very likely to arrive from multiple sources and tends to enter the analysis process with haphazard ordering. Data analysis tends to be extremely subjective. That is to say, the nature and goal of interpretation will vary from business to business, likely correlating to the type of data being analyzed. While there are several different types of processes that are implemented based on individual data nature, the two broadest and most common categories are "quantitative analysis" and "qualitative analysis".

The interpretation of data is designed to help people make sense of numerical data that has been collected, analyzed, and presented. Having a baseline method (or methods) for interpreting data will provide your analyst teams a structure and consistent foundation. Indeed, if several departments have different approaches to interpret the same data, while sharing the same goals, some mismatched objectives can result. Disparate methods will lead to duplicated efforts, inconsistent solutions, wasted energy and inevitably – time and money. In this part, we will look at the two main methods of interpretation of data: with a qualitative and a quantitative analysis.

The purpose of collection and interpretation is to acquire useful and usable information and to make the most informed decisions possible. From businesses, to newlyweds researching their first home, data collection and interpretation provide limitless benefits for a wide range of institutions and individuals.

What is It

Quantitative analysis refers to a set of processes by which numerical data is analyzed. Often, it involves the use of statistical modeling such as standard deviation, mean, and median. Let us quickly review the most common statistical terms:

- **Mean -** A mean represents a numerical average for a set of responses. When dealing with a data set (or multiple data sets), a mean will represent a central value of a specific set of numbers. It is the sum of the values divided by the number of values within the data set. Other terms that can be used to describe the concept are arithmetic mean, average, and mathematical expectation.
- **Standard deviation -** This is another statistical term commonly appearing in quantitative analysis. Standard deviation reveals the distribution of the responses around the mean. It describes the degree of consistency within the responses; together with the mean, it provides insight into data sets.
- **Frequency distribution -** This is a measurement gauging the rate of a response appearance within a data set. When using a survey, for example, frequency distribution has the capability of determining the number of times a specific ordinal scale response appears (i.e., agree, strongly agree, disagree, etc.). Frequency distribution is extremely keen in determining the degree of consensus among data points.

Let us have an example.

Analyze and interpret the Frequency Distribution Table using the measures of central tendency and measures of position.

Scores of 40 students in a Science Class consist of 60 items.

Class	f	x	fx	<cf
10 – 14	5	12	60	5
15 – 19	2	17	34	7
20 – 24	3	22	66	10
25 – 29	5	27	135	15
30 – 34	2	32	64	17
35 – 39	9	37	333	26
40 – 44	6	42	252	32
45 – 49	3	47	141	35
50 – 54	5	52	260	40
	N = 40		$\sum fx = 1345$	

Solution:

$$\bar{x} = \frac{\sum fx}{N} \qquad \bar{x} = \frac{1345}{40} \qquad \bar{x} = 33.63$$

Analysis: The mean performance of 40 students in science quiz is 33.63. Those students got scores below 33.63 did not perform well in the said examination while those students got scores above 33.63 performed well.

$$Q_3 = LB + \left(\frac{\frac{3N}{4} - <cf}{f}\right)i \qquad Q_3 = 34.5 + \left(\frac{\frac{3(40)}{4} - 17}{9}\right)10 \qquad Q_3 = 48.94$$

Analysis: The upper quartile of the given distribution is 48.94. It means that 75% of the 40 students (which are 30 students) got a score less than or equal to 48.94. Therefore, the remaining 25% (10 students) got a score higher than 48.94.

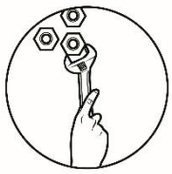
What's More

Find the values of the median, 7th Decile, and 43rd Percentile of the distribution given in the part "What Is It" above and come up with analysis.

What I Have Learned

Considerations in research data analysis

- Researchers must have the necessary skills to analyze the data, getting trained to demonstrate a high standard of research practice. Ideally, researchers must possess more than a basic understanding of the rationale of selecting one statistical method over the other to obtain better data insights.
- Usually, research and data analytics methods differ by scientific discipline; therefore, getting statistical advice at the beginning of analysis helps design a survey questionnaire, select data collection methods, and choose samples.
- The primary aim of data research and analysis is to derive ultimate insights that are unbiased. Any mistake in or keeping a biased mind to collect data, selecting an analysis method, or choosing audience sample il to draw a biased inference.
- Irrelevant to the sophistication used in research data and analysis is enough to rectify the poorly defined objective outcome measurements. It does not matter if the design is at fault or intentions are not clear, but lack of clarity might mislead readers, so avoid the practice.
- The motive behind data analysis in research is to present accurate and reliable data. As far as possible, avoid statistical errors, and find a way to deal with everyday challenges like outliers, missing data, data altering, data mining, or developing graphical representation.



What I Can Do

The test consists of 60 multiple-choice type questions ranging over a wide variety of topics. The scores for 27 applicants to fill in a senior position were:

26	42	28	33	6	19	30	39	18
28	34	40	49	10	29	37	43	52
39	18	53	44	24	13	39	42	32

1. Arrange the scores as an array.
2. What is the mean score of the raw data?
3. Find the median of the raw data.
4. Find the mode of the raw data.
5. Find the lower and upper quartiles of the raw data.
6. Construct a grouped frequency distribution using i = 5.
7. Calculate and interpret the following using the table in number 6.

a. mean	d. Q_1	g. D_5	j. P_{10}	m. P_{54}
b, median	e. Q_2	h. D_6	k. P_{20}	n. P_{72}
c. mode	f. Q_3	i. D_8	l. P_{30}	o. P_{89}

Assessment

Choose the letter of the best answer. Write the chosen letter on a separate sheet of paper.

1. It refers to the implementation of processes through which data is reviewed for the purpose of arriving at an informed conclusion.
   A. Data Gathering
   B. Data Interpretation
   C. Quantitative Analysis
   D. Qualitative Analysis

2. It refers to a set of processes by which numerical data is analyzed. Often, it involves the use of statistical modeling such as standard deviation, mean and median.
   A. Data Gathering
   B. Data Interpretation
   C. Quantitative Analysis
   D. Qualitative Analysis

3. Which of the following can be a challenge in doing data analysis?
   A. Outliers
   B. Data Altering
   C. Data Mining
   D. All of the above

4. This is another statistical term commonly appearing in quantitative analysis. It reveals the distribution of the responses around the mean. It describes the degree of consistency within the responses; together with the mean, it provides insight into data sets.
   A. Mean
   B. Variance
   C. Percentile Rank
   D. Standard Deviation

5. What is a measurement gauging the rate of a response appearance within a data set?
   A. Maps
   B. Bar Graphs
   C. Histogram
   D. Frequency Table