Australian Aid

DepED
DEPARTMENT OF EDUCATION

ACTION RESEARCH

SESSION 5.2

QUANTITATIVE ANALYSIS

PART I: DESCRIPTIVE STATISTICS

BEST Basic Education Sector Transformation

Objectives

At the end of the session, teachers should be able to:

1. compute measures of location and measures of variability for different types of variables using computer software;
2. calculate a measure of relationship between variables (e.g., the Pearson product-moment correlation coefficient); and
3. interpret descriptive statistics as applied to existing data.

Key Understandings

1. Graphical representations such as bar graph, frequency polygon, pie chart, pictograph, and scatterplot help in visualizing and understanding the distribution of quantitative data.
2. The mode, median, and mean are measures of location (central tendency or average) indicating the point around which the data gather or congregate.
3. The range, variance, and standard deviation are measures of variability (dispersion or spread) indicating the extent to which data are alike or different from each other. If the data are more alike, they are described as "homogeneous"; if they are far apart, they are "heterogeneous".
4. The normal curve is a useful way of interpreting data.
5. The Pearson product-moment correlation coefficient describes the relationship between variables in terms of intensity and direction.

Materials

- LCD projector
- Laptop
- Calculators
- Scratch papers
- Pencils
- Copies of data sheets for task under Application
- Copies of data set for task under Application
- Copies of guide in activating MS Excel's Analysis ToolPak

TIME ALLOTMENT

120 minutes/2 hours

References

Campbell, Michael J., David Machin, and Stephen J. Walters. (1990) 2007. Medical Statistics: A Commonsense Approach. Chichester, England: Wiley-Blackwell.

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Levin, Jack A., James Alan Fox, and David R. Forde. (2003) 2013. Elementary Statistics in Social Research. New York: Pearson.

Australian Bureau of Statistics. n.d. "Measures of Shape." Australian Bureau of Statistics (website). Accessed May 12, 2018. http://www.abs.gov.au/websitedbs/a3121120.nsf/home/statistical+language+-+measures+of+shape.

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Paul Gingrich. n.d. "Association Between Variables." Introductory Statistics for the Social Sciences. University of Regina Department of Sociology and Social Studies (website). Accessed May 12, 2018. http://uregina.ca/~gingrich/ch11a.pdf.

Introduction

Begin the learning session by saying: "Good day, everyone. Welcome to today's LAC session. I am _____, your facilitator. We will be discussing the first part of quantitative analysis, specifically, descriptive statistics. I am hoping that we will all be able to smoothly sail together through this topic so that we can successfully meet and reach the session objectives.

Take note that we will be focusing on understanding the two kinds of descriptive statistics, namely, measures of location or central tendency and measures of variability or dispersion. We will also discuss measures of relationship, particularly the Pearson product-moment correlation coefficient. At the end of this session, we will be generating values for location and variability for data that you will encode using Microsoft Excel (MS Excel). We will also try to compute for the Pearson product-moment correlation coefficient. I hope everyone remembered to bring their own laptops."

Activity (5 minutes)

Lead the participants in doing the pre-discussion activity by observing the following instructions.

1. Call for 14 volunteers among the participants. Wait for the participants to raise their hands.
2. Be ready with 7 metacards that contain statistical terms and 7 more with their corresponding definitions. Distribute these metacards to the 14 volunteers.
3. Ask the volunteers to find their pair (statistical term to definition or definition to statistical term). As soon as they have found their pair, have them come up to the front and stand together.
4. When all pairs have completed the task, ask each of them to read first the term and then the definition. Their answers should match the contents of the following table.

Statistical Term	Definition
Correlation coefficient	describes relationship between variables
Mean	sum of scores divided by the number of cases
Median	middlemost score
Mode	most frequently appearing score
Range	difference between highest and lowest scores
Standard deviation	square root of variance
Variance	mean squared deviation

Analysis (5 minutes)

Process the result of the activity by asking the participants the following guide questions.

1. Which statistical term/s was/were familiar to you? (mode, mean, and range)
2. How do you compute for these statistics? (For mode, simply find the score with the highest frequency. Mean is computed by summing up all the scores and then dividing by the number of cases. As for range, it is simply the difference between the highest and the lowest values.)
3. Which statistical term/s was/were quite unfamiliar to you? (Median, variance, standard deviation, and Pearson product-moment correlation coefficient)

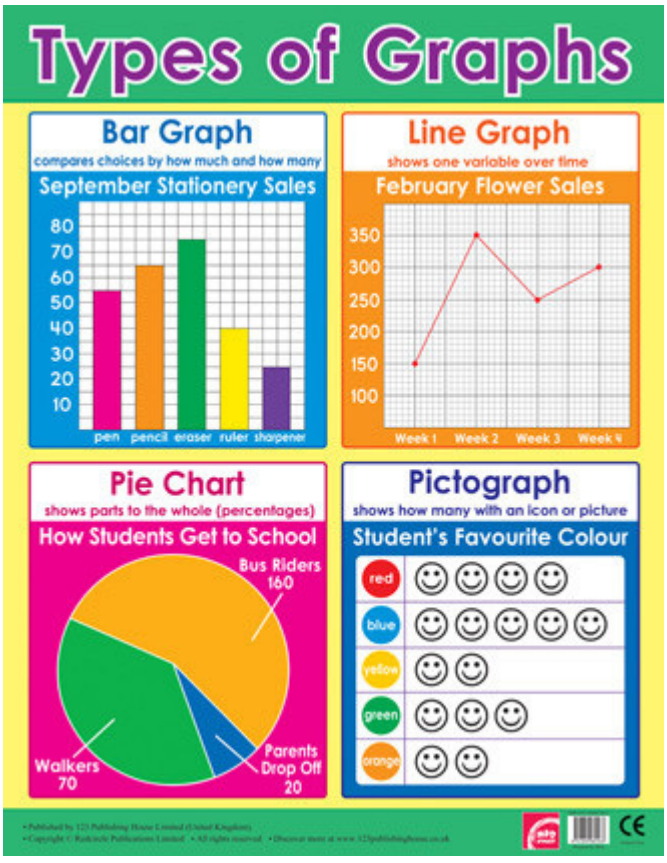
Abstraction (30 minutes)

Proceed to the discussion part of the session by saying: "It is alright if you are not familiar with some of the statistical terms or if you do not know how to compute them. In today's session, we will only be defining or describing these statistics. I will also walk you through the computation of some of the statistics you are not familiar with to give you an idea. In the end, however, we will be computing these statistics using MS Excel."

DESCRIBING DISTRIBUTIONS GRAPHICALLY

The first thing that researchers can do with data collected from groups is to get their big picture. Graphs are pictures of data that give us ideas on how individuals differ within groups and how groups differ from each other. Below are examples of graphs that can be used.

1. **Frequency polygon** is a line graph that shows the frequency of occurrence of each score. All frequency polygons must have the following: title, X-axis (which specifies the score values), Y-axis (which indicates the frequency for each score value), and data points with a line connecting them.
2. **Histogram** is a graphical presentation of data using bars, whose heights indicate the frequency of the occurrence of a score value or a range of scores.
3. **Bar graph** is similar to a line graph and histogram, except that it is used more for categorical data. It can be displayed vertically or horizontally.
4. **Pie chart** (or pie graph or circle chart) is a circular graph divided into slices to display numerical proportions. The arc length, central angle, and area of each slice are proportional to the quantity it represents.
5. **Pictograph** uses picture symbols to express relative frequency or proportion of different levels of categorical variable. For example, the number of students in each class may be displayed in terms of faces with each face representing 10 students.



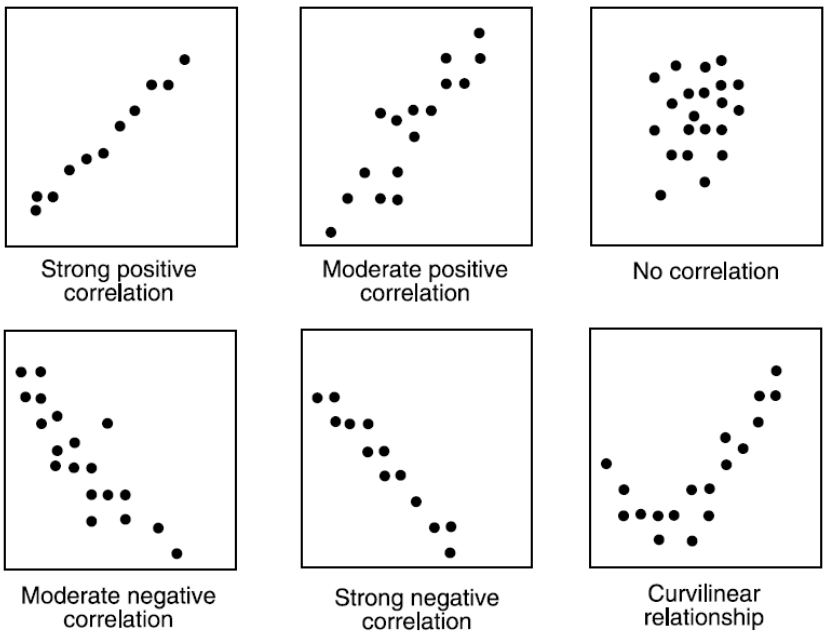
Types of Graphs

Source: Classroom Capers;https://www.classroomcapers.co.uk/media/catalog/product/cache/1/image/363x/040ec09b1e35df139433887a97daa66f/r/2/r23-graphs.jpg

SCATTER PLOT

(or scatter gram or scatter graph) is a graph depicting the relationship between two variables. On the X-axis are the values of one variable (X) and on the Y-axis are the values of the other variable (Y). Each point represents the cross-point between the two variables. As cross-points are plotted, the graph gives a picture of the nature of the relationship between the variables.

Below are examples of scatterplots.

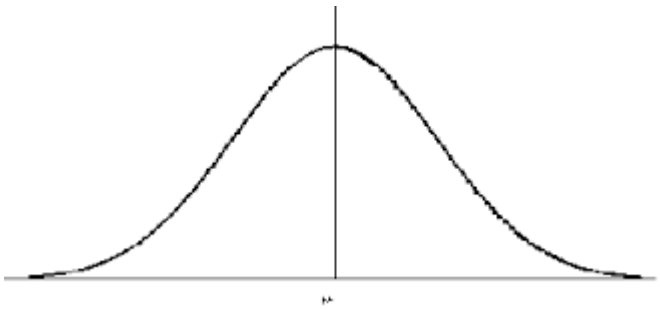


Examples of Scatterplots

Source: Quizizz.com; https://quizizz.com/_media/quizzes/L2FwcGhvc3RpbmdfcHJvZC9ibG9icy9BRW5CMlVyYnphMlFtSDVwSkNWR3hfRVo5OXVuckxIOHV2UXJIaXd3RTgwX2gyajFZblhfLUJaM2VKZGZWYkJidlpHMkM0NmY2bXlrdFdqQzVldnNOVmFsR3QxaDNfcmRaVElFSTFRRVkzbkMzb1hOVUtEeUR4MC5vcHlhZjd0X2Q0QTB2Smlm_200_200

SYMMETRIC/SYMMETRICAL AND ASYMMETRIC/ASYMMETRICAL DISTRIBUTIONS

1 Symmetric/Symmetrical Distribution. In graph form, this refers to the type of distribution wherein the left side is a mirror of the right side. When the graph is divided in the middle, the left and right sides of are roughly equally balanced around the mean. Thus, the mean is approximately equal to the median.

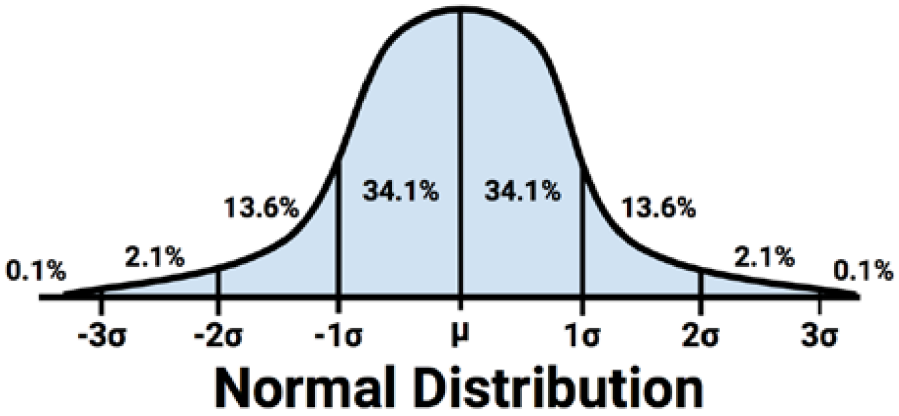


Symmetrical Distribution

Source: AIWizz.com; https://aiwizz.com/wp-content/uploads/2017/05/Normal_Distribution_NIST.gif

Normal distribution or normal curve is an example of a symmetric or symmetrical distribution. It is also known as bell curve because of its bell shape and Gaussian distribution after mathematician Karl Friedrich Gauss who discovered it. Its characteristics are as follows:

a symmetrical—When divided in the middle, its left and right sides are mirror images of each other.
b unimodal—It has only one mode.
c mesokurtic—It is moderately peaked.
d asymptotic—Its tails approach infinity as sample size n grows indefinitely, therefore the tails do not touch the number line.
e equal—The three measures of central tendency (e.g., mode, median, and mean) are equal or have the same value.

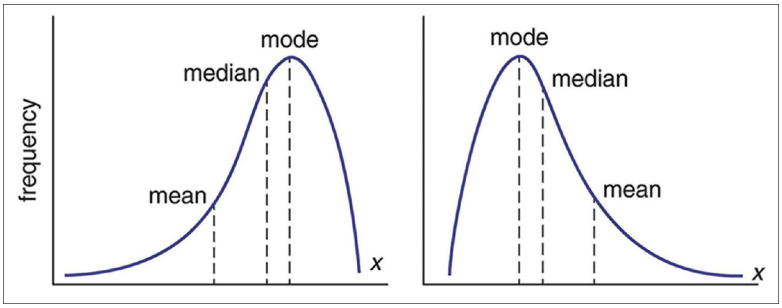


Graph of Normal Distribution

Source: https://www.google.com/search?tbm=isch&sa=1&ei=5ptUW6T-Mdr1rQHMp43wDQ&q=normal+curve+showing+mode+median+and+mean&oq=normal+curv&gs_l=img.1.1.35i39k1l2j0i67k1j0l7.6890.6890.0.9862.1.1.0.0.0.0.208.208.21.1.0....0...1c.1.64.img..0.1.204....0.84u_qFBrl9Q#imgrc=JgB08Cn48VeLXM:

2 Asymmetric/Asymmetrical (or Skewed) Distribution. This refers to distribution in which the values of variables occur at irregular frequencies and the mode, median, and mean occur at different points. It exhibits skewness (e.g., lack of symmetry); hence, this distribution is also described as skewed.

Skewness can either be positive or negative. Negative skewness, negatively skewed, or left-skewed (see left figure in the sample graph of asymmetrical distribution) indicates that the mode has the highest value, the mean has the lowest value, and the median is somewhere in between the mode and the mean. Positive skewness, positively skewed, or right-skewed (see right figure in the sample graph) indicates that the mean has the highest value, the mode has the lowest value, and the median is somewhere in between the mode and the mean.



Asymmetrical Distribution

Source: schoolbag.info; https://schoolbag.info/physics/physics_math/physics_math.files/image790.jpg

DESCRIBING GROUPS STATISTICALLY

There are two major ways of characterizing data—through measures of location and through measures of variability. Let us look at these statistics one at time.

1 Measures of Location. These measures allow us to describe data with several different single values according to the point on the number line around which groups tend to converge. These include mode, median, and mean.

a Mode is the most frequently occurring value in a data set. It is determined simply by counting how many times each value appears and then finding the value with the highest frequency.

Given the frequency table below, the highest frequency is 3 and the score (value) that corresponds to that is 10. Therefore, the mode is 10.

TABLE ---. Frequency Table

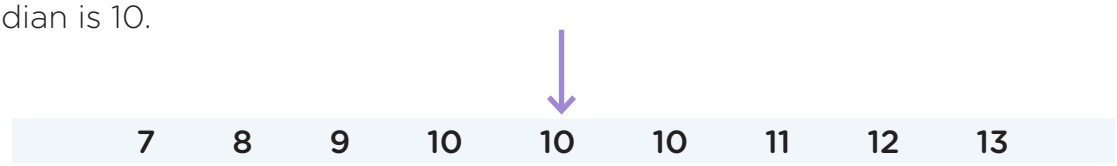
Score	Frequency
7	1
8	1
9	1
10	3
11	1
12	1
13	1

b Median is the number that divides the data set into two equal parts. It is also known as the middlemost point or the 50th percentile. It shows that 50% of data lie below it and 50% above it. It is determined by arranging data consecutively from highest to lowest or lowest to highest and finding the middlemost number.

The scores on the table earlier are arranged from lowest to highest. The sample size or n is 9. The position is determined by the equation below.

Position of the median = (n + 1) ÷ 2

The position of the median for our data is 5.0. Counting from the lowest, the median is 10.



c Mean (μ for population or M for sample) is the arithmetic average. It is computed by summing up all the data and then dividing it by the number of data or cases.

For our array of score earlier, the sum is 90. This sum is then divided by the number of scores or cases or simply the sample size n, which is 9. Therefore, the mean is 10.

Among the three measures of location, the most stable is the mean because it takes in all scores. The most unstable is the mode because it simply relies on frequency of occurrence of a single value.

The mean is the most sensitive to outliers. These are extreme values, either extremely high or extremely low. It is a practice to remove outliers from the analysis since these may lead to faulty analyses and interpretations.

Take note that not all measures of location are suitable for all types of data. Specific measures are meaningful only for a particular level or scale of measurement. The appropriate measures of location for each level or scale of measurement are shown in the matrix below.

TABLE --. Measures of Location and Level of Measurement

STATISTIC	LEVEL OF MEASUREMENT			
	Nominal	Ordinal	Interval	Ratio
Mode	✔		✔	✔
Median		✔	✔	✔
Mean			✔	✔

2 Measures of Variability. These measures allow us to describe data with several different single values according to the extent to which they are alike or are different. These include range, variance, and standard deviation.

a Range (R), the simplest of the three measures of variability, is computed by finding the difference between the highest value and the lowest value. This measure of dispersion is not reliable because it is affected by outliers or extreme scores. It also relies on only two values, the highest and the lowest.

In the array of scores earlier, the highest value is 13 and the lowest is 7. The difference between these scores is 6. This is the range.

b Variance (σ^2 for population or s^2 for sample) is the average squared deviation. This means that we have to first get the deviations (X-M) for each score and then square these $(X-M)^2$. We may then get the average of these squared deviations. As in computing any average, we just need to get the sum of the squared deviations $(X-M)^2$ and divide this by sample size n. However, instead of using the sample size n=9 as the denominator, we use the degrees of freedom (n–1). Dividing the sum, 28, by 8 gives us 3.50. This is the variance for the set of data.

TABLE.--. Table of Variance

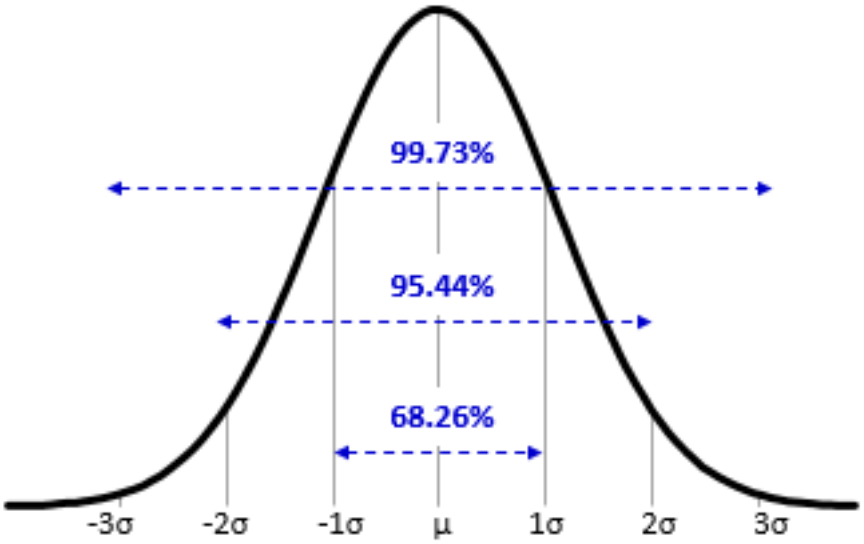
X	X-M	$(X-M)^2$
7	-3	9
8	-2	4
9	-1	1
10	0	0
10	0	0
10	0	0
11	1	1
12	2	4
13	3	9
Total		28
Variance		28/8 = 3.50

c Standard Deviation (σ for population or s for sample) is simply the square root of variance. In squaring the deviations, the unit of the value, say points, is also squared. Hence, 28 is really 28 points squared. However, we do not use points squared. Hence, to get to the original unit, we need to extract the square root of variance. The standard deviation for the data earlier is the square root of 3.50, which is 1.87.

The standard deviation is considered the most stable and the most suitable measure of variability since it takes into consideration all score values (unlike the range, which is computed only based on two values), and is expressed in the original unit of measurement of the variable (unlike the variance, which is in squared units).

The relative values of the standard deviations are a gauge of how varied the data points or scores in different groups are. If data points or scores are widely spread or quite varied, the group is described as being heterogeneous. If data points or scores are quite alike or close to each other, the group is characterized as being homogeneous. When comparing groups in terms of variability on the same variable, lower standard deviations mean more homogeneity, while higher standard deviations mean more heterogeneity.

The standard deviation is used to calibrate the normal distribution. It is a unit of measurement that can help us figure out where students are likely to fall. For example, when scores in a test are normally distributed, 68% of the students fall within one standard deviation on either side of the mean. This means that most of the students (68%) will fall between -1 and +1 standard deviations from the mean. The percentage increases to 95% if you go out to two standard deviations. Almost all (99.7%) of the students will fall within three standard deviations.

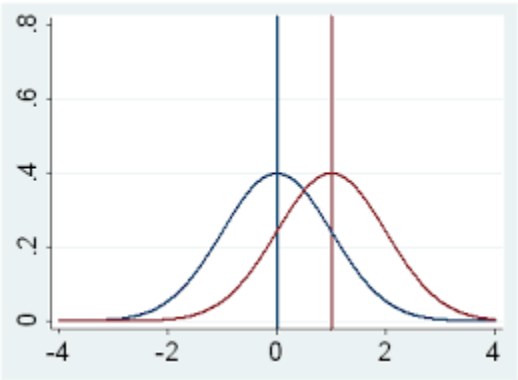


Example Illustration of Standard Deviation

Source: https://www.google.com/search?hl=en-PH&biw=1024&bih=610&tbm=isch&sa=1&ei=gBFUW9OmJ9Kw9QPRlJs4&q=normal+curve+with+standard+deviaitons+&oq=normal+curve+with+standard+deviaitons+&gs_l=img.3...2305150.2314645.0.2315660.40.20.0.0.0.0.555.4322.0j3j6j2j1j2.14.0....0...1c.1.64.img..34.3.1014...0j0i8i30k1.0.nCd7GIVmaGs#imgrc=jBlvRFOzNRyE8M

DESCRIBING DISTRIBUTIONS USING MEASURES OF LOCATION AND VARIABILITY

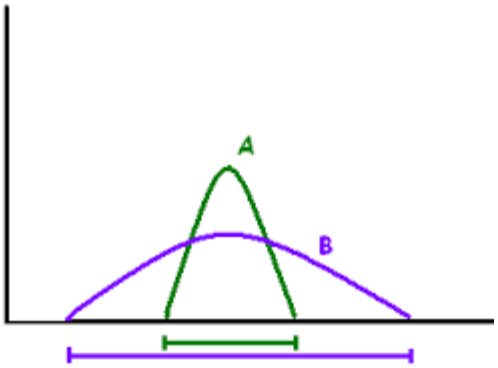
Measures of location and variability are utilized to describe distributions. For example, the following figure shows two distributions that have the same variability but have different locations. The group on the right has a higher mean than the group on the left.



Example Graph of Distributions

Source: UCLA Institute for Digital Research and Education; https://stats.idre.ucla.edu/wp-content/uploads/2016/02/ttest1.gif

In the following figure, the means of Groups A and B are the same. However, group A is more homogeneous and group B is more heterogeneous. The standard deviation of group A would be lower than that of group B.



Example Illustration of Standard Deviation

Source: https://www.google.com/search?tbm=isch&sa=1&ei=-VFYW528FZjcrQGh05bYCQ&q=groups+with+same+mean+different+variability&oq=groups+with+same+mean+different+variability&gs_l=img.3...256656.259379.0.260503.11.10.1.0.0.0.235.1160.0j5j2.7.0....0...1c.1.64.img..4.3.458...35i39k1.0.pefwfjqpypk#imgrc=C26TNh4LkcUWlM:)

DESCRIBING DATA USING CORRELATION COEFFICIENT

Correlation coefficient is a descriptive statistic that is applied when we want to depict the nature of the relationship between variables. There are two information that can be derived from a correlation coefficient. First, the numerical value tells us the strength or intensity of the relationship between the variables. Second, the sign (positive or negative) indicates the direction of the relationship.

The values of the correlation coefficient can range from 0.0 (no relationship) to 1.0 (perfect relationship). Values in between depict weak relationship (0.1 to 0.3), moderate relationship (0.4 to 0.6), and strong relationship (0.7 to 0.9).

As for direction or sign, the correlation coefficient can either be positive or negative. Positive correlation coefficient indicates a direct relationship; as one variable increases, the other likewise increases, and vice versa. Negative correlation coefficient indicates inverse relationship; as one variable increases, the other one decreases.

There are many formulas for computing the correlation coefficient between variables. If the two variables are continuous, that is, the values range from low to high (as in the case of the data below), the appropriate formula is the Pearson product-moment correlation coefficient. If the variables are in the form of ranks, the suitable formula is the Spearman's rank-order correlation or Spearman's rho.

Let us look at the following set of data.

TABLE --. Sample Table of Data

ID No.	Quiz	Assignment	Days Absent
1	7	13	2
2	8	14	0
3	9	12	1

4	10	15	2
5	10	15	0
6	10	17	1
7	11	15	2
8	12	16	1
9	13	18	0

On the one hand, the correlation coefficient for quiz and assignment scores is r = +0.78. We can describe the relationship between the two variables as strong and direct. The higher the quiz score, the higher the assignment score. On the other hand, the correlation coefficient for quiz score and days absent is r = -0.23. We can describe the relationship between these two variables as weak and inverse.

Application (120 minutes)

Lead the participants in putting into practice what they have learned about descriptive statistics. Say: "At this point, we shall now be applying what we have discussed using basic MS Excel operations and MS Excel Add-ins. I hope everyone brought a laptop with them. Let us continue to work in pairs. Please sit together so that you can assist each other during our activity. Now, I will be giving you a data set for which you will have to prepare a coding guide. Do you still remember how to prepare one?" Pause to listen to the participants' responses. Then, distribute copies of the following data set.

TABLE --. Data Set for Descriptive Statistics

IQ Score	Achievement Test Score	Computer Game (hours per week)
98	76	7
101	80	1
105	84	2
95	79	5
88	75	4
100	80	4
107	87	3
98	81	4
102	82	5
103	85	1
109	91	2
90	82	4
97	83	4
93	82	3

Ask the participants to run the MS Excel program by clicking the icon for it in their laptops. They should be able to see a blank worksheet similar to the one depicted in the following figure. To guide them, display the sample page on the screen (using LCD projector) from your own computer.

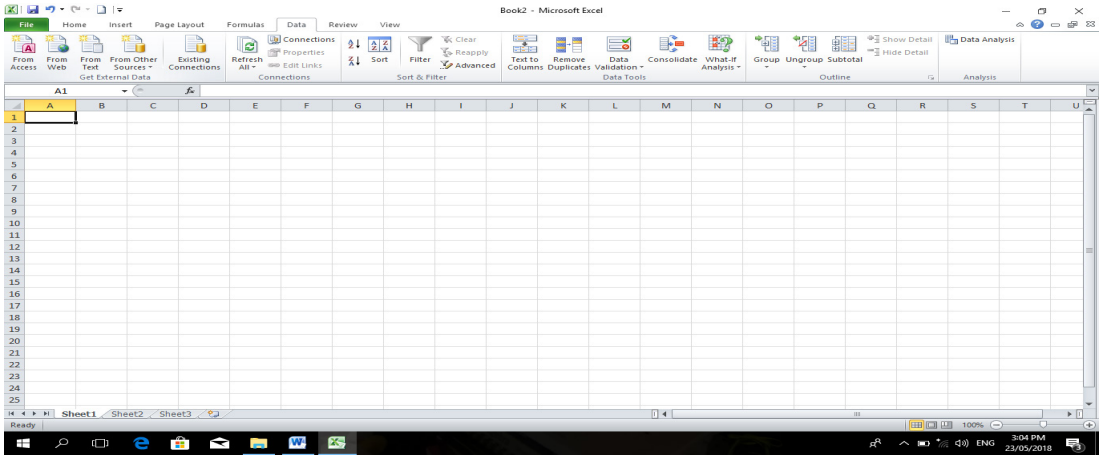


FIGURE --. MS Excel blank worksheet.

Once they have a worksheet ready, ask the participants to prepare the coding guide for the data set given. Give them 5–10 minutes to do this. Go around the room to check on each pair's work. Be sure that those who are just beginning to use MS Excel will be seated with someone who knows how to navigate it. Below is a sample coding guide for the given data set for your reference.

TABLE --. Coding Guide for Data Set for Descriptive Statistics

Column Number	Variable*	Variable Label*	Value	Value Label	Level of Measurement
1	ID	ID number	as is		nominal
2	IQ	IQ score	as is		interval
3	AchTest		as is		ratio
4		computer game time	as is		ratio

*Note: The variables will differ, but the variable labels must be accurate.

After making sure that the coding guides are correct, instruct the participants to encode the data. Assist the beginners in the group. Give them 20 minutes for this task. When everyone or most of the participants have completed encoding the data, continue to the next task.

Say: "Most of you probably know how to use MS Excel worksheets and how to compute basic descriptive statistics such as mode, median, mean, range, variance, and standard deviation. I will walk you through this to make sure that everyone knows how to use basic MS Excel operations for descriptive statistics. I will also show you how to activate the Analysis Toolpak in MS Excel, which is a faster way of computing these statistics. This will also be used for inferential statistics in our next LAC session.

You may follow as I perform the analyses for the modes and medians of the three variables: IQ score, achievement test score, and computer game time. Then, you will be doing the analysis for the means of the three variables."

Demonstrate how to compute the modes and medians for all three variables. Show them how to round off the values to two decimal points. Then, allow the participants to compute the means on their own, rounding off the values to two decimal points. Walk around the room and assist those who need help, making sure that the participants are getting the correct values. Allot 15 minutes for this task.

Say: "Now, let us compute the measures of variability. The first of these is the range. There is no range in MS Excel, so let me show you how to compute it following the definition. We will first have to find the maximum and the minimum values and then use the formula bar. Let me show you how to compute the range for IQ and test scores."

Show how to obtain the maximum and minimum values and how to use the formula bar to compute the range for the two variables. Then, ask the participants to do the same for the third variable. Allot 10 minutes for this task. After that, show how to compute the variance and the range using basic MS Excel computations.

Say: "Now, let us continue. Let us compute the variance and standard deviation for the three variables. You may follow on your laptops as I demonstrate this."

Demonstrate how to compute variance and standard deviation for IQ score, rounding off the values to two decimal points. Then, ask the participants to do the same for the remaining two variables, also rounding off the values to two decimal points. Observe and make sure that everyone is following the procedure to obtain the correct values. Give them 10 minutes to do this.

Say: "Now, let us see the scatter plot for IQ score and achievement test score and compute the correlation coefficient for the said two variables. You may follow on your laptops as I show you what to do."

Demonstrate how to produce a scatter plot for the two variables and how to compute the Pearson product-moment correlation coefficient, rounding off the value to two decimal points. Then, ask the participants to do the same for achievement test score and computer game time as well as for IQ score and computer game time, rounding off the values to two decimal points. Allot 10 minutes for this task.

Say: "After computing descriptive statistics, we need to present them in a way that is easy to read and understand. Use the following table to display the numbers you obtained." Show the following sample table formats with the table number and table title.

TABLE --. Descriptive Statistics for Variables in the Study

STATISTICS	VARIABLES		
	IQ Score	Achievement Test Score	Computer Game Time (hours per week)
Mode			
Median			
Mean			
Maximum			
Minimum			
Range			
Variance			
Standard Deviation			

TABLE --. Correlation Coefficients for Variables in the Study

	Achievement Test Score	Computer Game Time
IQ Score		
Ach Test Score		

Say: "Are there any questions? Now, if you have not yet activated MS Excel's Analysis ToolPak on your laptops, let me show you how to do it. The Analysis ToolPak will aid us in the computation of descriptive statistics. Follow the steps as I demonstrate. You may also refer to the handout that I am passing around."

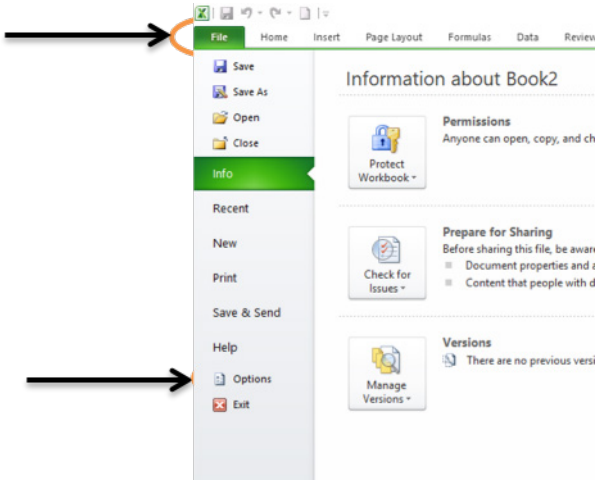
Distribute copies of the handouts "How to Activate MS Excel's Analysis Toolpak" together with the following sample data. Ask the participants to encode the data first. Then, demonstrate the steps on how to activate MS Excel's Analysis ToolPak.

TABLE --. Sample Data for MS Excel Analysis ToolPak

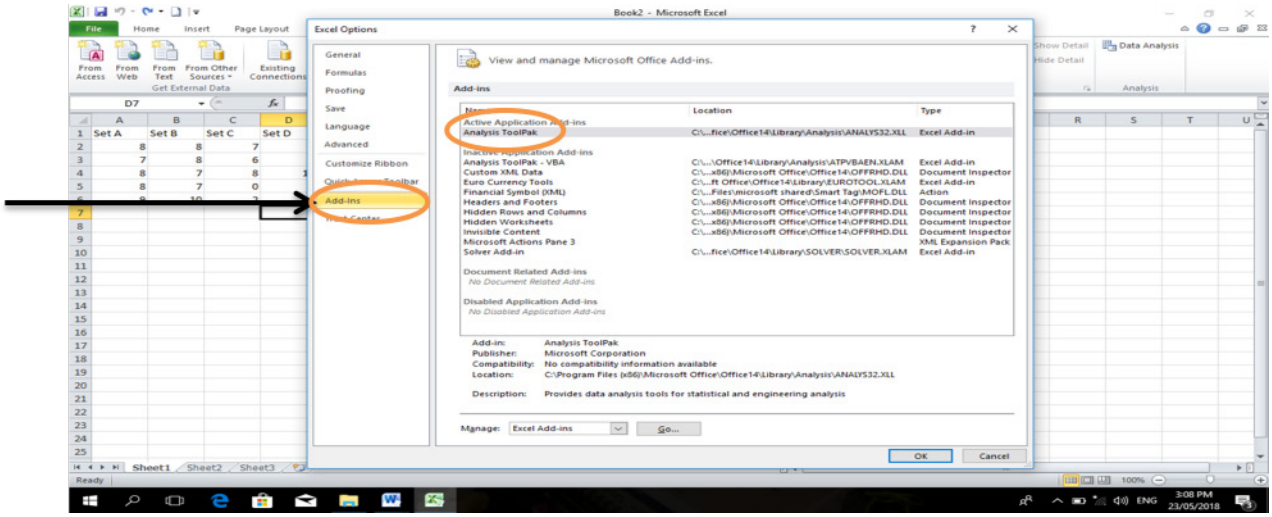
SET A	SET B	SET C	SET D
8	8	7	3
7	8	6	4
8	7	8	10
8	7	0	2
9	10	2	8

HOW TO ACTIVATE MS EXCEL'S ANALYSIS TOOLPAK

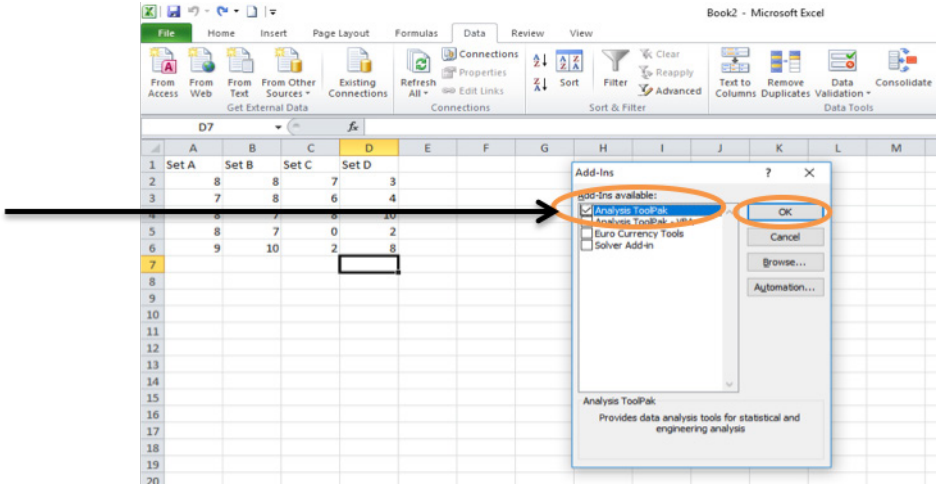
1 Begin by running MS Excel in your computer or laptop.
2 Click File, then Options.



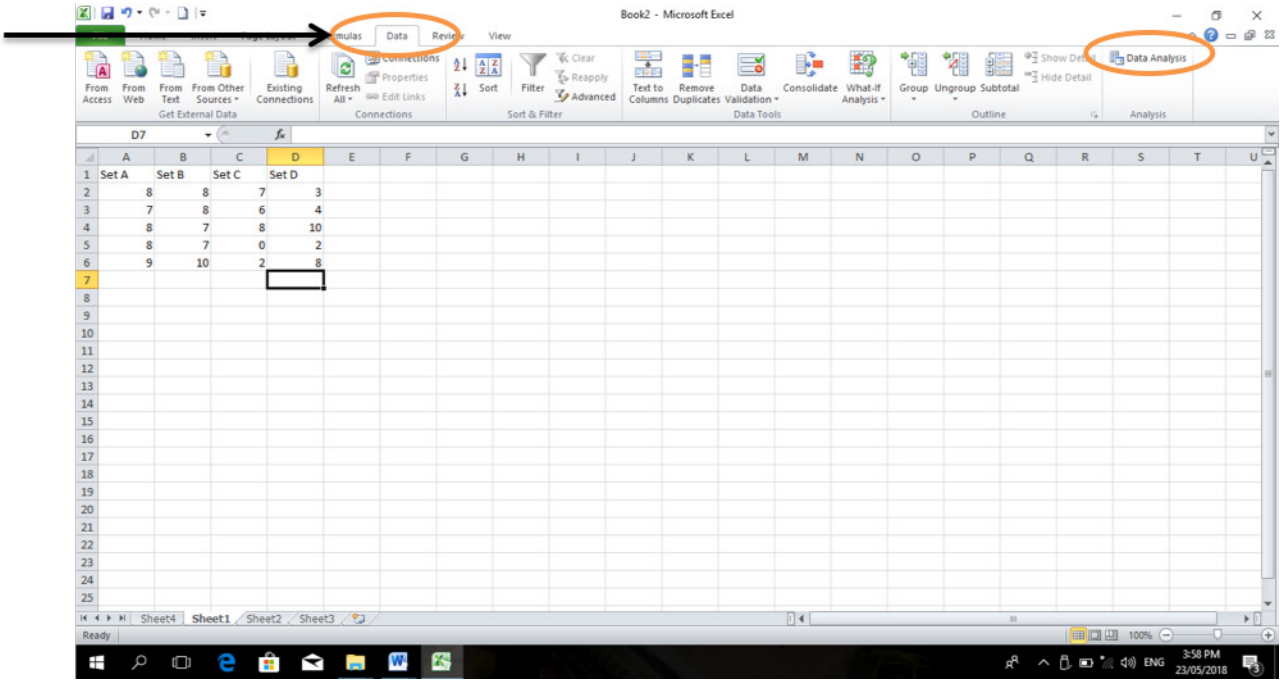
3 Click Add-Ins, select Analysis ToolPak, then Go.



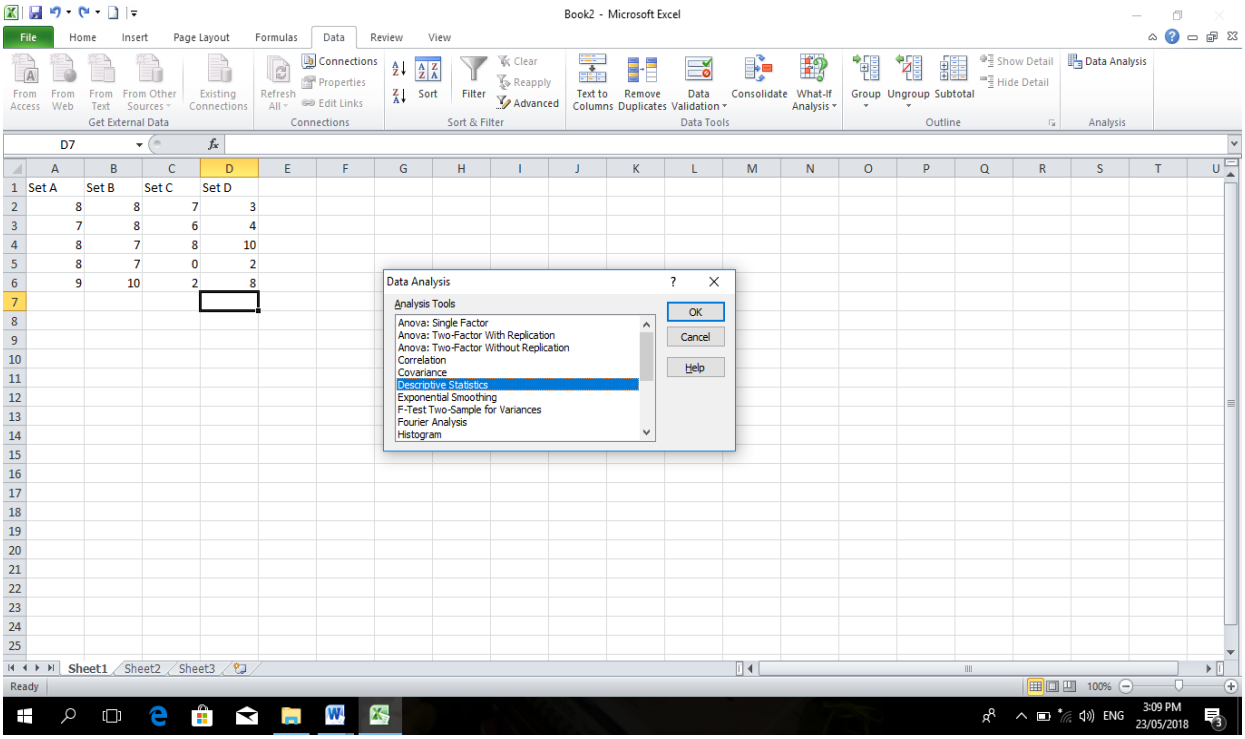
4 Check Analysis ToolPak, then click OK.



5 Click Data on the Toolbar, then click Data Analysis.

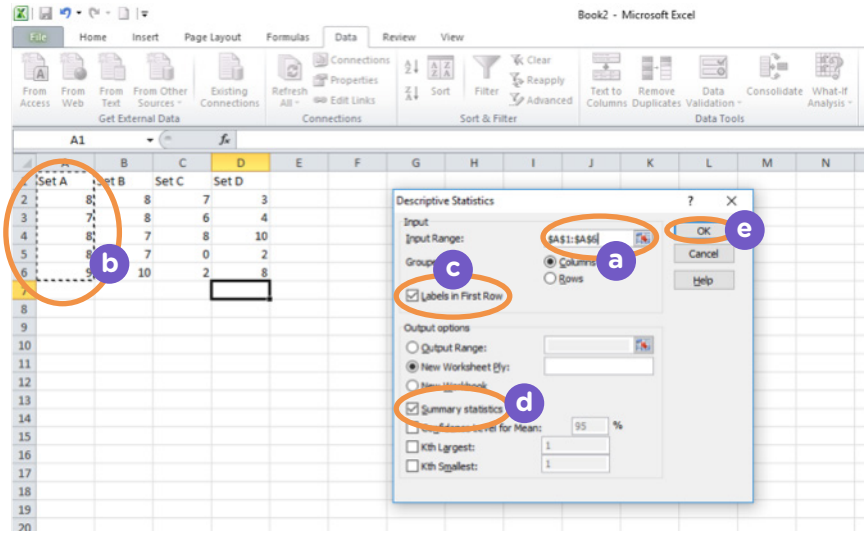


6 Click Data Analysis. A window will pop-up indicating you are now ready to perform statistical tasks using MS Excel.



7 Double click Descriptive Statistics.
   a. Place the cursor on the Input Range.
   b. Highlight the column for SET A in the worksheet.

c. Check Labels in first row.
d. Check Summary statistics.
e. Click "OK".



Advise the participants that MS Excel's Analysis ToolPak distinguishes only one data set or data column at a time. Go around and see if the participants are correctly entering data set in columns with their respective labels. The output should look something like the following.

OUTPUT AFTER DATA ARE ENTERED IN MS EXCEL

Inform the participants that output in MS Excel are seen on separate sheets. Then, ask the participants to use the Analysis ToolPak on the first data set with IQ scores, achievement test scores, and computer game time. Tell them to compare the results they obtained from basic MS Excel operations to those from the Analysis ToolPak. Ask them: "Are the answers the same? Do you now see how easy it is to perform statistical analyses? Has our session clarified some of your questions on descriptive statistics? Has it eased your anxieties about doing statistical analyses? Do you feel more confident now in conducting Action Research?" Pause after each question and listen to the participants responses. Clarify any questions and appease any remaining anxieties.

As an assignment, let the participants practice using MS Excel to compute descriptive statistics that were discussed today. They may use any data that they have. Tell them that they may show you first the data that they have so you can advise them on what analyses are appropriate for them. The following are examples of data sets that the participants may use.

1. Formative and summative scores in certain subjects
2. Enrollment and dropout data
3. School teachers' profile (gender, age, years of teaching experience)
4. Students' profile (gender, grade level, age, SHS track)
5. Assessment data (e.g., NAT scores)

Closing (5 minutes)

End the learning session by saying: "Thank you for your active participation in today's LAC session. I hope that I helped clarify some of your questions about descriptive statistics and that our use of the MS Excel software has helped ease your apprehensions about statistical analyses.

In our next LAC session, we will be discussing how to compare groups using inferential statistics. Please do not forget to bring your assignment output with you. Also, please bring data for two classes or groups of students (e.g., boys and girls). Goodbye for now and see you all next time."

ANSWERS TO THE TASKS UNDER APPLICATION

TABLE --. Descriptive Statistics for Variables in the Study

STATISTICS	VARIABLES		
	IQ Score	Achievement Test Score	Computer Game Time (hours/week)
Mode	98.00	82.00	4.00
Median	99.00	82.00	4.00
Mean	99.00	81.93	3.50
Maximum	109.00	91.00	7.00
Minimum	88.00	75.00	1.00
Range	21.00	16.00	6.00
Variance	37.69	17.15	2.73
Standard Deviation	6.14	4.14	1.65

TABLE --. Correlation Coefficients for Variables in the Study

	Achievement Test Score	Computer Game Time
IQ Score	0.73	-0.42
Ach Test Score		-0.58

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