

[Return to Cover Page](#)

LESSON 6 - MEASURES OF VARIATION

The same Minitab tools we used in Lesson 5 to find measures of central tendency, can be used to find measures of variation. Retrieve the worksheet K:\Minitab16\Sample Data \Student14\Depth.MTW. Clear everything below the date/time stamp then type your name, Lesson 6 and Examples on separate lines below the date/time stamp.

Below is a description provided by Minitab for this file:

Thirty-six people participated in a study of depth perception under different lighting conditions. The people were divided into three groups on the basis of age. Each of the 12 members of an age group was randomly assigned to one of three 'treatment' groups. All 36 people were asked to judge how far they were from a number of different objects. An average 'error' in judgment, in feet, was recorded for each person. One treatment group was shown the objects in bright sunshine, another under cloudy conditions, and the third, at twilight.

Column	Name	Count	Description
C1-T	AgeGroup	36	Age group; Young, MiddleAge, or Older
C2-T	Light	36	Lighting condition; Sun, Clouds, or Twilight
C3	Error	36	Average error in feet

Click on Stat > Basic Statistics > Display Descriptive Statistics. Select C3 Error into the "Variables:" box. Click on "Statistics" then click on the various check boxes so that "Mean", "Standard deviation", "Median", "Interquartile range", and "N total" are checked. Then click "OK" and "OK".

Now click Stat > Basic Statistics > Display Descriptive Statistics again but this time select C1 AgeGroup into the "By variables (optional):" box and click "OK". Now repeat the procedure with C2 Light in the "By variables (optional):" box.

The results for all of these procedures are shown at the top of the next page. What do these results seem to tell us about the effect of age and light on our ability to judge distances?

The mean and the median are telling us that increased age and decreased light both seem to make us less accurate in judging distance. The standard deviation and the interquartile range appear to be telling us that how much an individual is affected by age or light tend to be less consistent as the age goes up and the light goes down. These observations are only guesses on our part at this point. We must wait for future lessons to determine if the differences we have observed are significant or not.

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Lesson 6
Examples

Results for: Depth.MTW

Descriptive Statistics: Error

Variable	Total Count	Mean	StDev	Median	IQR
Error	36	7.708	2.230	7.100	3.075

Descriptive Statistics: Error

Variable	AgeGroup	Total Count	Mean	StDev	Median	IQR
Error	Young	12	6.992	1.759	6.750	2.625
	MiddleAge	12	7.158	1.933	7.050	3.250
	Older	12	8.975	2.520	8.550	5.025

Descriptive Statistics: Error

Variable	Light	Total Count	Mean	StDev	Median	IQR
Error	Sun	12	5.717	0.896	5.900	1.225
	Clouds	12	7.358	1.144	7.100	1.675
	Twilight	12	10.050	1.808	9.950	3.225

Now click Stat > Basic Statistics > Display Descriptive Statistics again and click on "Statistics". There are several other choices here that we have discussed. There are others that will be discussed later in the course. There are still others that are beyond the scope of this course. You can get more information about all of these choices by clicking the "Help" button on this dialog box. Please take a few minutes to look over some of these.

MINITAB ASSIGNMENT 6

See instructions on page 8.

1. The following data gives the GPA for 55 randomly selected students from Podunk University. The classes 1, 2, 3, 4 are for freshman, sophomore, junior, senior respectively. Enter this data with the class in C1 and the GPA in C2. Display the data. **Be sure to save this worksheet as you will need it again for lesson 7.** Find the mean, standard deviation, median, interquartile range, and count for GPA, first for all the students together, then by class.

(a) What does this information seem to be telling you about GPA as the classes advance? What is a likely explanation for this observation?

(b) Look particularly at the standard deviation and interquartile range for sophomores. What is strange about these? **NOTE:** We will have a better understanding for part of this after the next Minitab lesson.

Type your responses to questions (a) and (b) in the session window.

Class	4	4	1	4	2	2	3	3	2	1	4
GPA	3.33	3.18	2.26	4.00	2.78	3.40	2.34	2.14	3.45	2.12	3.10

Class	3	1	2	4	1	1	1	3	3	4	3
GPA	2.23	1.24	3.97	3.41	3.72	2.90	2.12	3.86	2.85	3.79	3.25

Class	4	2	2	4	3	3	2	1	1	2	4
GPA	2.35	2.55	0.45	3.98	3.95	3.87	3.89	1.93	2.32	3.93	3.06

Class	1	4	2	1	4	3	3	4	3	1	3
GPA	3.88	1.98	2.52	3.90	2.94	1.99	2.91	3.99	3.55	2.93	2.76

Class	3	3	2	2	1	2	1	2	4	3	1
GPA	3.92	3.67	2.68	1.80	2.38	2.47	3.92	2.99	2.64	2.73	2.91

[Return to Cover Page](#)