

You may do an individual project or you may do a project with one or two other students. You must investigate the relationship between two **numerical variables** (ratio or interval levels of measurement). You may perform your own experiment or you may simply gather data from some source. Here are a few examples to get you started thinking about your project. Be creative in choosing the pair of variables you wish to compare. The project or projects deemed most creative shall receive a bonus of up to 10 points.

- *Is there a difference between the taste and cost of different brands of chocolate chip cookies? (Taste can be measured on a scale of 1 to 10.)*
- *Is there a relationship between the salary of professional baseball players (football, basketball, etc.) and their season achievements?*
- *Is there a relationship between the weight of automobiles and their fuel consumption rates?*
- *Is there a relationship between women's (men's) foot sizes and their heights?*
- *Is there a relationship between student grade-point averages and the amount of TV watched?*
- *Is there a relationship between the heights of fathers and that of their firstborn son (mothers-first born daughters)?*
- *Is there a relationship between the time it takes to play a particular video game and the final score?*

I. Guidelines for your Project:

- The written portion must be done in Microsoft Word.
 - All graphs, tables, etc. must be embedded in the Word document. This can easily be done from Minitab, Excel, etc. using the copy and paste commands.
 - If you are unfamiliar with Word's equation editor, you can type equations in the format used by the TI-83 calculator.
 - It should have a title page that includes your name(s) and class.
 - It should be in Standard English, using correct grammar and mechanics.
- You will be required make an oral presentation of your project.
- You must include the attached grade form sheet to your project.
- You must include a floppy disk with your data on a Minitab Worksheet and your written report as a Microsoft Word file.
- You must hand in a printed copy of your report.

II. Specifics for written report:

The written portion of your project should include the following sections that are **clearly labeled using the lettering scheme (A through E)** indicated below. Ten points may be deducted from your project grade if you fail to follow these instructions, especially the A through E lettering scheme.

- A. A brief introductory paragraph (2 or 3 sentences) that briefly **summarizes** the following:
 - The purpose of your project. (What you were trying to show.)
 - How you gathered your data.
 - The pair of variables you compared, clearly identifying the response variable and the explanatory variable.
 - Whether or not you found a relationship between the variables, and if so, what type of relationship (linear, quadratic, etc.) and give its equation.
 - If you found a relationship that was linear, describe its strength.
- B. A detailed paragraph that describes how you gathered your data.
 - You should identify the response variable and the explanatory variable and give the level of measurement of each.
 - If your data came from an experiment you conducted, then describe in detail how you performed the experiment.
 - If your data came from the Internet, give me the address of its Web Site and include a printout of the Webpage in the appendix.
 - If it came from a publication, cite the publication and include a photocopy of the article in an appendix.
 - You should imbed a scatter plot of your data in your Microsoft Word document here.
- C. A detailed paragraph that describes
 - A suitable population for your data.
 - Explains whether or not your sample was a random sample.
 - Discusses potential biases in your sample.
- D. Imbed separate box plots from Minitab of your response variable and your explanatory variable.
 - For each box plot discuss indicate if the data is symmetrical, skewed-right or skewed-left.
 - From your box plots and your scatter plot identify any points that may be outliers and list their coordinates (x, y).
 - For each outlier give a rationale for why you choose to keep it or delete it.
- E. For your final data do the following:
 - Imbed a fitted line plot from Minitab of the model that best fits your data.
 - Include a copy of Minitab's regression printout analysis for the model you chose.
 - Imbed a copy of Minitab's worksheet containing both your original data and final data.

III. Specifics for oral presentation:

Essentially your oral presentation should be presenting the essence of your written report.

- It should be no longer than 10 minutes.
- It should merely summarize what you did and what conclusions you reached, including scatter plots, fitted line plots and the mathematical equations of any relationships you found.
- It may be done on Minitab, Power Point or using overhead projector transparencies. If you use Power Point, check the version of Power Point available on the computer at the front of the class to ensure that your presentation will work.
- The oral presentation will be worth 20 points and it will be graded primarily on content and to a lesser extent the quality of the presentation.
- If the project is a group project, then each member of the group must participate in the oral presentation. Any group members not significantly participating in the oral presentation will not receive full credit for this portion.

The following grading scheme will be used to grade your project. Scrutinize it carefully as you prepare your project and attach a copy of this sheet to front of your written report.

REGRESSION PROJECT GRADE FORM

Group Members: 1. _____

A. (20 points) Summary:

- _____ 1. Purpose of project.
- _____ 2. How data was gathered.
- _____ 3. Variables.
- _____ 4. Relationship.

Analysis:

- _____ 5. Strength & regression equation..

B. (16 points) Data Gathering:

- _____ 1. How taken or source completely cited.
- _____ 2. Response - level of measurement.
- _____ 3. Explanatory - level of measurement.
- _____ 4. Scatter Plot.

C. (12 points) Population & Sample:

- _____ 1. Suitable population.
- _____ 2. Random Sample
- _____ 3. Biases.

D. (16 points) Box Plots:

- _____ 1. Box plot Explanatory.
- _____ 2. Box plot Response
- _____ 3. Identify Outliers.
- _____ 4. Outlier Rationale.

2. _____

3. _____

E. (12 points) Regression

- _____ 1. Fitted Line plot.
- _____ 2. Scatter plot with regression line.
- _____ 3 Original & Final Data.

(4 points) Data & Report on Disk.

(20 points) Oral Presentation

_____ **Points Earned**

_____ **Points deducted for not following lettering scheme (A through E)**

_____ **Bonus points for creativity.**

_____ **Project Grade.**

You may do an individual project or you may do a project with one or two other students. You may compare a single sample mean or proportion to a given value for the population mean or proportion, or you may compare two sample means or proportions to determine if they are equal. In measuring means, sample sizes of as small as 30 are often sufficient to achieve meaningful results, but for proportions usually require several hundred to perhaps a thousand observations. You may perform your own experiment or you may simply use data from a source. Here are a few examples to get you started thinking about your project.

- *For college students, is the mean number of heartbeats per minute greater than 59? (Single sample mean compared to the given value of 59.) Here you must measure the heartbeats of a sample of college students.*
- *For college students, is the mean number of heartbeats per minute the same for women and men? (Comparing two independent sample means.) Here you must measure the heartbeats of a sample of female and male college students.*
- *For college students, is the mean number of heartbeats per second the same before and after exercise? (Comparing two dependent means - the difference in the mean values under two conditions.) Here you must measure the heartbeats of a sample of college students before and after they engage in a specified exercise.*
- *Is the mean error on peoples' wristwatches 0? (Single sample mean compared to the given value of 0.) Here you must obtain an accurate timepiece, and then take a sample of people and measure how many seconds fast or slow their watch is.*
- *Is the proportion of men and women who order Big Macs the same? (Comparing two sample proportions.) Here you must record the number of men and women who order food at McDonalds, and the number of each who order Big Macs.*
- *Is the average weight of a quarter pounder 4 ounces? (Single sample mean compared to the given value of 4 ounces.) Here you will first need to obtain a scale that can accurately weigh 4-ounce hamburgers, and then you must weigh a sample of quarter pounders.*
- *Does a quarter pounder weigh the same as at McDonalds and Burger King? (Comparing two independent sample means.) Here you will first need to obtain a scale that can accurately weigh 4-ounce hamburgers, and then you must weigh a sample of quarter pounders from both McDonalds and Burger King.*
- *Are older drivers more likely to wear seat belts? (Comparing two sample proportions.) Here you will be have to be able to classify drivers as old or young, and observe whether or not they are wearing a seat belt.*
- *For right-handed people, is the reaction time for their right hand the same as that for their left hand? (Comparing two dependent sample means - the reaction time of each subjects right and left hand.) Here you will have to devise a way to measure reaction time and then measure it for each subjects right and left hand.*

Be creative in choosing your variables. The project or projects deemed most creative may receive a bonus of up to 10 points.

I. Guidelines for your Project:

- The written portion must be done in Microsoft Word.
 - All graphs, tables, etc. must be embedded in the document.
 - If you are unfamiliar with Word's equation editor, you can type equations in the format used by the TI-83 calculator.
 - It should have a title page that includes your name(s) and class.
 - It should be in proper English, using correct English grammar.
- You will be required make an oral presentation of your project.
- You must include the attached grade form sheet to your project.
- You must include a floppy disk with your data on a Minitab Worksheet and your written report as a Microsoft Word file.
- You must hand in a printed copy of your report.

II. Specifics for written report:

The written portion of your project should include the following sections that are **clearly labeled using the lettering scheme (A through F)** indicated below. Ten points will be deducted from your project grade if you fail to follow these instructions, especially the A through F lettering scheme.

- A. A brief introductory paragraph (2 or 3 sentences) that briefly summarizes the following:
 - The purpose of your project. (What you were trying to show.)
 - How you gathered your data.
 - All conclusions you reached and at what level of significance or p -value.
- B. Following the format used in class, give a complete summary of the tests of hypotheses including the following:
 - Summary statistics for your data (i.e. sample size, mean, standard deviation, etc.).
 - Null and alternative hypotheses, level of significance, Statistical formula its value and corresponding p -value, decision rule in terms of critical region, and your conclusion in the verbiage of the problem.
 - Confidence intervals where appropriate.
 - Imbed graphs that best demonstrate you results and what you are trying to show (i.e. side-by-side box plots, dot plots, histograms, bar charts, back-to-back stem plots, etc.).
 - Imbed copies of Minitab output where possible.
- C. A detailed paragraph that describes how you gathered your data.
 - You should identify your variables and give their level of measurement.
 - Where applicable you should indicate whether or not the Anderson-Darling test indicates normality.

- If your data came from an experiment you conducted, then describe in detail how you performed the experiment.
 - If your data came from the Internet, give me the address of its Web Site and include a printout of the page in the appendix.
 - If it came from a publication, cite the publication and include a photocopy of the article in an appendix.
- D. A detailed paragraph that describes
- A suitable population for your data.
 - Explains whether or not your sample was a random sample.
 - Discusses potential biases in your sample.
 - Identify any outliers you may have found and give a rationale for why you choose to keep or delete each one.
- E. An appendix that includes the following where applicable:
- Imbed table that includes all of your data.
 - Photocopies of publication article or printout of website material.
 - Hand written copies of your calculations if performed on a calculator or by hand.
 - A floppy disk with your Minitab data and your Microsoft Word report.
- F. Assume that your boss asked you to perform the analysis for this project. Now you are asked to summarize your results to your boss's client. Assume that the client is not familiar with your study and is unfamiliar with statistics. Write a memo to that client describing what you did and your conclusions. You may include graphs or summary statistics in your response. Microsoft Word has memo formats that you can use for this purpose. You can find them under "file", "new" and click on the "memo" tab. Assume that your client's name is Melissa Jones, Ph.D.

Specific Suggestions for the following Tests of Hypotheses:

- **Tests for a Single Mean** - A stem & leaf diagram is a good way to summarize the data and a box plot or histogram can tell us whether or not the data is symmetrical. A check for normality is a must, as is a statement concerning the skewness of the data.
- **Tests for Two Independent Means** - Back-to-back stem & leaf diagrams are a good way to summarize the data. Side-by-side box plot or back-to-back histogram can tell us whether or not the data is symmetrical and it is great for comparing the results. A statement concerning the skewness or symmetry of the data is a must.
- **Tests for Proportions** - It is best to summarize the data in a table and it is appropriate to illustrate it with a bar chart.

III. Specifics for oral presentation:

Essentially your oral presentation should be presenting the essence of your written report.

- It should be no longer than 10 minutes.
- It should merely summarize what you did and what conclusions you reached. It should include the test of hypotheses information using the format used in class and appropriate graphs illustrating your conclusions.
- It may be done on Minitab, Power Point or using overhead projector transparencies. If you use Power Point, check the version of Power Point available on the computer at the front of the class to ensure that your presentation will work.
- The oral presentation will be worth 20 points and it will be graded primarily on content and to a lesser extent the quality of the presentation.
- If the project is a group project, then each member of the group must participate in the oral presentation. Any group members not significantly participating in the oral presentation will not receive full credit for this portion.

Check out the attached grade form. It can help you make sure everything is there. Make sure you use the lettering scheme (A through F) in your report.

PROJECT GRADE FOR PREDICTIVE STATISTICS

NAME: _____

- A. (6 points) Summary:**
 _____ 1. Purpose of project.
 _____ 2. How data was taken.
 _____ 3. All conclusions & levels of significance.

- B. (30 points) Inferences:**
 _____ 1. Summary Statistics.
 _____ 2. Tests of hypotheses.
 _____ 3. Used correct formulas.
 _____ 4. Format matches that used in class.
 _____ 5. Confidence intervals
 _____ 6. Appropriate Graphs
 _____ 7. Minitab Output

- F. (12 points) Memo:**
 _____ 1. Correct form.
 _____ 2. Written to appropriate audience.
 _____ 3. Coherent and/or persuasive.
 _____ 4. Factually correct.

- C. (20 points) Data:**
 _____ 1. Variables Defined.
 _____ 2. Level of Measurement.
 _____ 3. Normality.
 _____ 4. Source.

_____ **Points earned for Written Portion**
 _____ **(20 points) Oral Presentation**
 _____ **Points Earned**
 _____ **Points deducted for not following**
 _____ **Lettering scheme (A through F).**

- D. (6 points) Population & Sample:**
 _____ 1. Suitable population.
 _____ 2. Random.
 _____ 3. Biases?

_____ **Bonus points for creativity**
 _____ **Project Grade.**

- E. (6 points) Appendix:**
 _____ 1. Data in table form.
 _____ 2. Copy from source.
 _____ 3. Handwritten calculations.
 _____ 4. Floppy disk.