Biology 3A Laboratory 1
Statistical Analysis and Graphing For Excel 2007

Adding Analysis ToolPak for Excel 2007:
Click on the Microsoft logo in the top LEFT corner → click on the button “Excel Options” → Click “Add In” → Highlight the Analysis Tool Pack (analys32.xll) → Click “GO” → check the Analysis ToolPak box and Click “OK” → Click “YES” → the tool pack should start to configure, afterwards, you MAY or MAYNOT need to restart

To Begin Data Analysis:
- Enter your data into columns and sort them according to groups (see below)
- To sort your data, go under the DATA tab and select sort. You then will have options on how you would like to sort your data (by which category). Make sure that you do not sort apart your paired data (make sure the correct right and left finger measurements are paired).

Table 1: Example data sheet for male and female little finger lengths:

<table>
<thead>
<tr>
<th>Sex</th>
<th>Right (cm)</th>
<th>Left (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>F</td>
<td>5.3</td>
<td>5.1</td>
</tr>
<tr>
<td>F</td>
<td>4.2</td>
<td>4.1</td>
</tr>
<tr>
<td>F</td>
<td>5.1</td>
<td>5.1</td>
</tr>
<tr>
<td>F</td>
<td>5.2</td>
<td>5.1</td>
</tr>
<tr>
<td>F</td>
<td>6.1</td>
<td>6.0</td>
</tr>
<tr>
<td>M</td>
<td>6.3</td>
<td>6.4</td>
</tr>
<tr>
<td>M</td>
<td>6.5</td>
<td>6.4</td>
</tr>
<tr>
<td>M</td>
<td>5.9</td>
<td>5.8</td>
</tr>
<tr>
<td>M</td>
<td>5.7</td>
<td>5.8</td>
</tr>
<tr>
<td>M</td>
<td>7.4</td>
<td>7.8</td>
</tr>
<tr>
<td>M</td>
<td>5.8</td>
<td>5.8</td>
</tr>
<tr>
<td>M</td>
<td>8.1</td>
<td>8.0</td>
</tr>
<tr>
<td>M</td>
<td>5.9</td>
<td>5.9</td>
</tr>
</tbody>
</table>

If you were NOT ABLE to load the DATA ANALYSIS package:
- Select the location for where Excel will place the calculated p-value
- Click on the FORMULA TAB → click more functions → Highlight Statistical → on the dropdown menu → find TTEST
  - ARRAY 1 will be ALL the data for the raw data for group 1
  - ARRAY 2 will be ALL the data for the raw data for group 2
  - TAILS = you will need to know if you are running a 1 or 2 tailed test
    - Enter 1 for one-tailed and 2 for two-tailed
  - TYPE = enter 1 for PAIRED, 2 for homoscedastic or 3 for unequal
  - Click “OK”
  - The p-value will appear in the box that you select in the first bullet

Constructing a histogram in Excel 2007:
- Determine the category intervals (called BIN in Excel) for each group on the same worksheet as your raw data.
  - For example: in the above data set (Table 1), look at the minimum (4.1) and maximum (8.1) data points and determine the intervals (4, 4.5, 5, 5.5, 6, 6.5, 7, 7.5, 8, and 8.5)
- Click on the DATA TAB → Data Analysis (Far Right) → histogram & click “OK” (Just like how I showed you in lab)
  - Input Range → selected from your raw data for one of the variables.
  - BIN Range → selected from the BIN category that YOU generated
  - Check the chart output box (very last one in the output section) and click “OK.”
  - This will generated a BIN and frequencies table along with the histogram.
    - Highlight and copy the frequencies from the table and paste it next to your BIN values on your raw data sheet.
    - Do the same with the other variable.

Table 2: Example BIN and frequency table for little finger length data

<table>
<thead>
<tr>
<th>Categories (or BIN)</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.5</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>
To graph both histograms on the same graph in Excel 2007:

- You’ll need to have the BIN values and the frequencies for both variables.
- Highlight the DATA you want graphed
  - Click the INSERT TAB \rightarrow click on Column \rightarrow 2D Cluster Column (top left side)
  - If you need to adjust anything on the graph, you can click on the objects on the graph itself.

Excel 2007 TABS

- BAR graph (columns as Bill Gates calls them) \rightarrow select only one data point, click INSERT column 2D, then see the DESIGN TAB to add any additional data you want in your column graph. Each bar should be a different color.
  - IF the bars are the same color, you will need to go under the DESIGN TAB and edit the data by selecting only on value. If you do not, this will affect the error bars.
- LINE graph \rightarrow select the all the data \rightarrow click INSERT line 2D, then see the DESIGN TAB to add any additional data you want in your column graph
- XY SCATTER graph \rightarrow select the all the data \rightarrow click INSERT scatter with only markers, then see the DESIGN TAB to add any additional data you want in your column graph

Design TAB:

SELECT DATA radio button for

- Edit and existing series – highlight the series \rightarrow click EDIT
  - EDIT SERIES \rightarrow
    - Series name \rightarrow type the name of the series
    - Series values \rightarrow if you need to alter or change anything, select the data range on the worksheet
- Adding new series – click on the add series button
  - EDIT SERIES \rightarrow
    - Series name \rightarrow type the name of the series
    - Series values \rightarrow before you select the data range on the worksheet, delete the ={1}, then select the data range (If you do not, you could potentially have an error (=1)+Sheet1!A1:A6)
- X-AXIS LABELS \rightarrow to add in the correct X-axis labels, click on the EDIT radio button under Horizontal (Category) Axis Label
  - Axis label range: \rightarrow select the range of data that you want under the values instead of 1, 2, 3, etc.

LAYOUT TAB:

Once you data have been plotted you will need to add the axes labels, units, error bars, trendlines, R² values, etc.

Under the Labels Area

- Chart Title \rightarrow if you have a chart title \rightarrow DELETE IT!!!!!!!
- Axis Titles
  - Primary Horizontal Axis Title \rightarrow Title below axis \rightarrow then type in the Axis label and units (ie. Body Mass (g))
  - Primary Vertical Axis Title \rightarrow select Rotated Title \rightarrow then type in the Axis label and units (ie. Metabolic Rate (mL O₂ • g • min))

Under the Axes Area

- Axes
  - Click on the Axes radio button to scale the Y-axis \rightarrow select Primary vertical axis \rightarrow select more primary vertical axis options \rightarrow Axis options tab \rightarrow select Minimum Fixed \rightarrow enter minimum value
    - You can also alter the Maximum, Major and Minor unit values as well
- Gridlines
  - Click on the Gridlines radio button \rightarrow Primary Horizontal Gridlines \rightarrow none

Under the Analysis Area

- Trendline radio button \rightarrow More Trendline Options
  - Select Liner
  - Check Display Equation on chart
  - Check display R-squared value on chart
- Error Bars radio button \rightarrow More Error Bars Options
  - Direction \rightarrow both
  - Error Amount:
    - Custom \rightarrow Specify Value
    - Enter the error bar values for the Positive & Negative Values \rightarrow OK \rightarrow Close
CHANGE THE BAR COLORS SO THAT THEY WILL REPRODUCE NICELY WHEN PHOTO COPIED

FORMAT TAB
Select the bar that you want to change
  o  Shape Fill ➔ change the fill color