Mathematica Lab #2

Arav Bhardwaj

DIRECTIONS: you are ask to complete all of the items below. For submission, submit your work to the appropriate upload site with the file name: LastnameMMALab2.nb, for example: GotwalsMMALab2.nb. Show ALL of your inputs (commands) and resulting outputs. Before you submit, EVALUATE YOUR ENTIRE NOTEBOOK, including if it requests to evaluate INITIALIZATION CELLS!

In this file, I have shown you what the output should look like. You should DELETE all cells with my output, to be replaced by yours. Please do not delete the item-ed numbers.

1. Load the file a comma-separated values file "grades.csv" located at **on Canvas (Files --> Week 2).** Place this data into a variable called "grades".

In[ ]:=

```
grades = Import["http://chemistry.ncssm.edu/data/grades.csv"]
```

Out[ ]=

```
{{College.GPA, HS.GPA, SAT, RecLetterQuality}, {2.04, 2.01, 1070, 5},
 {2.56, 3.4, 1254, 6}, {3.75, 3.68, 1466, 6}, {1.1, 1.54, 706, 4}, {3, 3.32, 1160, 5},
 {0.05, 0.33, 756, 3}, {1.38, 0.36, 1058, 2}, {1.5, 1.97, 1008, 7}, {1.38, 2.03, 1104, 4},
 {4.01, 2.05, 1200, 7}, {1.5, 2.13, 896, 7}, {1.29, 1.34, 848, 3}, {1.9, 1.51, 958, 5},
 {3.11, 3.12, 1246, 6}, {1.92, 2.14, 1106, 4}, {0.81, 2.6, 790, 5}, {1.01, 1.9, 954, 4},
 {3.66, 3.06, 1500, 6}, {2, 1.6, 1046, 5}, {2.05, 1.96, 1054, 4}, {2.6, 1.96, 1198, 6},
 {2.55, 1.56, 940, 3}, {0.38, 1.6, 456, 6}, {2.48, 1.92, 1150, 7}, {2.74, 3.09, 636, 6},
 {1.77, 0.78, 744, 5}, {1.61, 2.12, 644, 5}, {0.99, 1.85, 842, 3}, {1.62, 1.78, 852, 5},
 {2.03, 1.03, 1170, 3}, {3.5, 3.44, 1034, 10}, {3.18, 2.42, 1202, 5},
 {2.39, 1.74, 1018, 5}, {1.48, 1.89, 1180, 5}, {1.54, 1.43, 952, 3}, {1.57, 1.64, 1038, 4},
 {2.46, 2.69, 1090, 6}, {2.42, 1.79, 694, 5}, {2.11, 2.72, 1096, 6}, {2.04, 2.15, 1114, 5},
 {1.68, 2.22, 1256, 6}, {1.64, 1.55, 1208, 5}, {2.41, 2.34, 820, 6}, {2.1, 2.92, 1222, 4},
 {1.4, 2.1, 1120, 5}, {2.03, 1.64, 886, 4}, {1.99, 2.83, 1126, 7}, {2.24, 1.76, 1158, 4},
 {0.45, 1.81, 676, 6}, {2.31, 2.68, 1214, 7}, {2.41, 2.55, 1136, 6}, {2.56, 2.7, 1264, 6},
 {2.5, 1.66, 1116, 3}, {2.92, 2.23, 1292, 4}, {2.35, 2.01, 604, 5}, {2.82, 1.24, 854, 6},
 {1.8, 1.95, 814, 6}, {1.29, 1.73, 778, 3}, {1.68, 1.08, 800, 2}, {3.44, 3.46, 1424, 7},
 {1.9, 3.01, 950, 6}, {2.06, 0.54, 1056, 3}, {3.3, 3.2, 956, 8}, {1.8, 1.5, 1352, 5},
 {2, 1.71, 852, 5}, {1.68, 1.99, 1168, 5}, {1.94, 2.76, 970, 6}, {0.97, 1.56, 776, 4},
 {1.12, 1.78, 854, 6}, {1.31, 1.32, 1232, 5}, {1.68, 0.87, 1140, 6}, {3.09, 1.75, 1084, 4},
 {1.87, 1.41, 954, 2}, {2, 2.77, 1000, 4}, {2.39, 1.78, 1084, 4}, {1.5, 1.34, 1058, 4},
 {1.82, 1.52, 816, 5}, {1.8, 2.97, 1146, 7}, {2.01, 1.75, 1000, 6}, {1.88, 1.64, 856, 4},
 {1.64, 1.8, 798, 4}, {2.42, 3.37, 1324, 6}, {0.22, 1.15, 704, 6}, {2.31, 1.72, 1222, 5},
 {0.95, 2.27, 948, 6}, {1.99, 2.85, 1182, 8}, {1.86, 2.21, 1000, 6}, {1.79, 1.94, 910, 6},
 {3.02, 4.25, 1374, 9}, {1.85, 1.83, 1014, 6}, {1.98, 2.75, 1420, 7}, {2.15, 1.71, 400, 6},
 {1.46, 2.2, 998, 7}, {2.29, 2.13, 776, 6}, {2.39, 2.38, 1134, 7}, {1.8, 1.64, 772, 4},
 {2.64, 1.87, 1304, 6}, {2.08, 2.53, 1212, 4}, {0.7, 1.78, 818, 6}, {0.89, 1.2, 864, 2}}
```

2. Display the data as a nice table:

In[ ]:=

```
grades // TableForm;
Grid[grades, Frame → All]
```

Out[ ]=

College.GPA	HS.GPA	SAT	RecLetterQuality
2.04	2.01	1070	5
2.56	3.4	1254	6
3.75	3.68	1466	6
1.1	1.54	706	4
3	3.32	1160	5
0.05	0.33	756	3
1.38	0.36	1058	2
1.5	1.97	1008	7
1.38	2.03	1104	4
4.01	2.05	1200	7
1.5	2.13	896	7
1.29	1.34	848	3
1.9	1.51	958	5
3.11	3.12	1246	6
1.92	2.14	1106	4
0.81	2.6	790	5
1.01	1.9	954	4
3.66	3.06	1500	6
2	1.6	1046	5
2.05	1.96	1054	4
2.6	1.96	1198	6
2.55	1.56	940	3
0.38	1.6	456	6
2.48	1.92	1150	7
2.74	3.09	636	6
1.77	0.78	744	5
1.61	2.12	644	5
0.99	1.85	842	3
1.62	1.78	852	5
2.03	1.03	1170	3
3.5	3.44	1034	10
3.18	2.42	1202	5
2.39	1.74	1018	5
1.48	1.89	1180	5
1.54	1.43	952	3
1.57	1.64	1038	4
2.46	2.69	1090	6
2.42	1.79	694	5
2.11	2.72	1096	6
2.04	2.15	1114	5
1.68	2.22	1256	6
1.64	1.55	1208	5

2.41	2.34	820	6
2.1	2.92	1222	4
1.4	2.1	1120	5
2.03	1.64	886	4
1.99	2.83	1126	7
2.24	1.76	1158	4
0.45	1.81	676	6
2.31	2.68	1214	7
2.41	2.55	1136	6
2.56	2.7	1264	6
2.5	1.66	1116	3
2.92	2.23	1292	4
2.35	2.01	604	5
2.82	1.24	854	6
1.8	1.95	814	6
1.29	1.73	778	3
1.68	1.08	800	2
3.44	3.46	1424	7
1.9	3.01	950	6
2.06	0.54	1056	3
3.3	3.2	956	8
1.8	1.5	1352	5
2	1.71	852	5
1.68	1.99	1168	5
1.94	2.76	970	6
0.97	1.56	776	4
1.12	1.78	854	6
1.31	1.32	1232	5
1.68	0.87	1140	6
3.09	1.75	1084	4
1.87	1.41	954	2
2	2.77	1000	4
2.39	1.78	1084	4
1.5	1.34	1058	4
1.82	1.52	816	5
1.8	2.97	1146	7
2.01	1.75	1000	6
1.88	1.64	856	4
1.64	1.8	798	4
2.42	3.37	1324	6
0.22	1.15	704	6
2.31	1.72	1222	5
0.95	2.27	948	6
1.99	2.85	1182	8
1.86	2.21	1000	6
1.79	1.94	910	6
3.02	4.25	1374	9
1.85	1.83	1014	6

1.98	2.75	1420	7
2.15	1.71	400	6
1.46	2.2	998	7
2.29	2.13	776	6
2.39	2.38	1134	7
1.8	1.64	772	4
2.64	1.87	1304	6
2.08	2.53	1212	4
0.7	1.78	818	6
0.89	1.2	864	2

3. Delete the header row and then extract out each variable and place it into its own variable name, using these variable names: collegegpa, hsgpa,sat,recs. Do NOT include the heading as a part of the dataset.

In[ ]:=
```
gradesNoHeader = Delete[grades, 1];
{collegegpa, hsgpa, sat, recs} = Transpose[gradesNoHeader]
```

Out[ ]=
```
{{2.04, 2.56, 3.75, 1.1, 3, 0.05, 1.38, 1.5, 1.38, 4.01, 1.5, 1.29, 1.9, 3.11, 1.92, 0.81,
  1.01, 3.66, 2, 2.05, 2.6, 2.55, 0.38, 2.48, 2.74, 1.77, 1.61, 0.99, 1.62, 2.03,
  3.5, 3.18, 2.39, 1.48, 1.54, 1.57, 2.46, 2.42, 2.11, 2.04, 1.68, 1.64, 2.41, 2.1,
  1.4, 2.03, 1.99, 2.24, 0.45, 2.31, 2.41, 2.56, 2.5, 2.92, 2.35, 2.82, 1.8, 1.29,
  1.68, 3.44, 1.9, 2.06, 3.3, 1.8, 2, 1.68, 1.94, 0.97, 1.12, 1.31, 1.68, 3.09,
  1.87, 2, 2.39, 1.5, 1.82, 1.8, 2.01, 1.88, 1.64, 2.42, 0.22, 2.31, 0.95, 1.99,
  1.86, 1.79, 3.02, 1.85, 1.98, 2.15, 1.46, 2.29, 2.39, 1.8, 2.64, 2.08, 0.7, 0.89},
 {2.01, 3.4, 3.68, 1.54, 3.32, 0.33, 0.36, 1.97, 2.03, 2.05, 2.13, 1.34, 1.51, 3.12,
  2.14, 2.6, 1.9, 3.06, 1.6, 1.96, 1.96, 1.56, 1.6, 1.92, 3.09, 0.78, 2.12, 1.85, 1.78,
  1.03, 3.44, 2.42, 1.74, 1.89, 1.43, 1.64, 2.69, 1.79, 2.72, 2.15, 2.22, 1.55, 2.34,
  2.92, 2.1, 1.64, 2.83, 1.76, 1.81, 2.68, 2.55, 2.7, 1.66, 2.23, 2.01, 1.24, 1.95, 1.73,
  1.08, 3.46, 3.01, 0.54, 3.2, 1.5, 1.71, 1.99, 2.76, 1.56, 1.78, 1.32, 0.87, 1.75,
  1.41, 2.77, 1.78, 1.34, 1.52, 2.97, 1.75, 1.64, 1.8, 3.37, 1.15, 1.72, 2.27, 2.85,
  2.21, 1.94, 4.25, 1.83, 2.75, 1.71, 2.2, 2.13, 2.38, 1.64, 1.87, 2.53, 1.78, 1.2},
 {1070, 1254, 1466, 706, 1160, 756, 1058, 1008, 1104, 1200, 896, 848, 958, 1246,
  1106, 790, 954, 1500, 1046, 1054, 1198, 940, 456, 1150, 636, 744, 644, 842, 852,
  1170, 1034, 1202, 1018, 1180, 952, 1038, 1090, 694, 1096, 1114, 1256, 1208, 820,
  1222, 1120, 886, 1126, 1158, 676, 1214, 1136, 1264, 1116, 1292, 604, 854, 814,
  778, 800, 1424, 950, 1056, 956, 1352, 852, 1168, 970, 776, 854, 1232, 1140, 1084,
  954, 1000, 1084, 1058, 816, 1146, 1000, 856, 798, 1324, 704, 1222, 948, 1182,
  1000, 910, 1374, 1014, 1420, 400, 998, 776, 1134, 772, 1304, 1212, 818, 864},
 {5, 6, 6, 4, 5, 3, 2, 7, 4, 7, 7, 3, 5, 6, 4, 5, 4, 6, 5, 4, 6, 3, 6, 7, 6, 5,
  5, 3, 5, 3, 10, 5, 5, 5, 3, 4, 6, 5, 6, 5, 6, 5, 6, 4, 5, 4, 7, 4, 6, 7, 6,
  6, 3, 4, 5, 6, 6, 3, 2, 7, 6, 3, 8, 5, 5, 5, 6, 4, 6, 5, 6, 4, 2, 4, 4, 4,
  5, 7, 6, 4, 4, 6, 6, 5, 6, 8, 6, 6, 9, 6, 7, 6, 7, 6, 7, 4, 6, 4, 6, 2}}
```

4. Put variables hsgpa and collegegpa into ONE list with the variable name: hscollege:

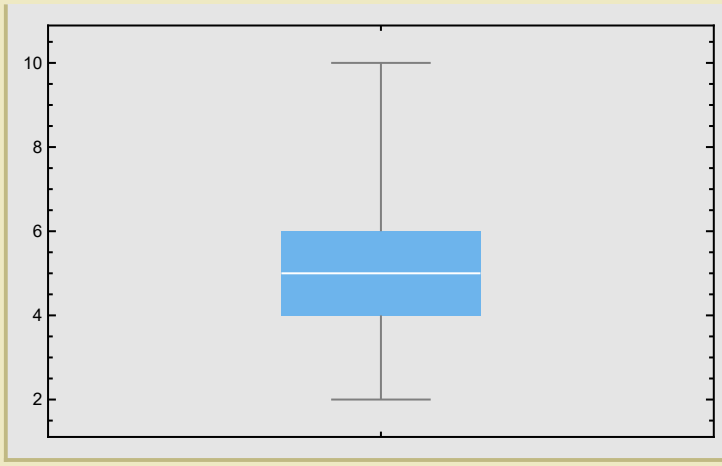
In[ ]:=
```
hscollege = Transpose [{hsgpa, collegegpa}]
```

Out[ ]=
```
{{2.01, 2.04}, {3.4, 2.56}, {3.68, 3.75}, {1.54, 1.1}, {3.32, 3}, {0.33, 0.05},
 {0.36, 1.38}, {1.97, 1.5}, {2.03, 1.38}, {2.05, 4.01}, {2.13, 1.5}, {1.34, 1.29},
 {1.51, 1.9}, {3.12, 3.11}, {2.14, 1.92}, {2.6, 0.81}, {1.9, 1.01}, {3.06, 3.66},
 {1.6, 2}, {1.96, 2.05}, {1.96, 2.6}, {1.56, 2.55}, {1.6, 0.38}, {1.92, 2.48},
 {3.09, 2.74}, {0.78, 1.77}, {2.12, 1.61}, {1.85, 0.99}, {1.78, 1.62},
 {1.03, 2.03}, {3.44, 3.5}, {2.42, 3.18}, {1.74, 2.39}, {1.89, 1.48}, {1.43, 1.54},
 {1.64, 1.57}, {2.69, 2.46}, {1.79, 2.42}, {2.72, 2.11}, {2.15, 2.04},
 {2.22, 1.68}, {1.55, 1.64}, {2.34, 2.41}, {2.92, 2.1}, {2.1, 1.4}, {1.64, 2.03},
 {2.83, 1.99}, {1.76, 2.24}, {1.81, 0.45}, {2.68, 2.31}, {2.55, 2.41}, {2.7, 2.56},
 {1.66, 2.5}, {2.23, 2.92}, {2.01, 2.35}, {1.24, 2.82}, {1.95, 1.8}, {1.73, 1.29},
 {1.08, 1.68}, {3.46, 3.44}, {3.01, 1.9}, {0.54, 2.06}, {3.2, 3.3}, {1.5, 1.8},
 {1.71, 2}, {1.99, 1.68}, {2.76, 1.94}, {1.56, 0.97}, {1.78, 1.12}, {1.32, 1.31},
 {0.87, 1.68}, {1.75, 3.09}, {1.41, 1.87}, {2.77, 2}, {1.78, 2.39}, {1.34, 1.5},
 {1.52, 1.82}, {2.97, 1.8}, {1.75, 2.01}, {1.64, 1.88}, {1.8, 1.64}, {3.37, 2.42},
 {1.15, 0.22}, {1.72, 2.31}, {2.27, 0.95}, {2.85, 1.99}, {2.21, 1.86}, {1.94, 1.79},
 {4.25, 3.02}, {1.83, 1.85}, {2.75, 1.98}, {1.71, 2.15}, {2.2, 1.46}, {2.13, 2.29},
 {2.38, 2.39}, {1.64, 1.8}, {1.87, 2.64}, {2.53, 2.08}, {1.78, 0.7}, {1.2, 0.89}}
```

5. Show a boxplot for the variable recs (recommendation letters)

In[ ]:=
```
BoxWhiskerChart[recs, Method → {"BoxWidth" → "Scaled"}, ChartStyle → "Pastel"]
```

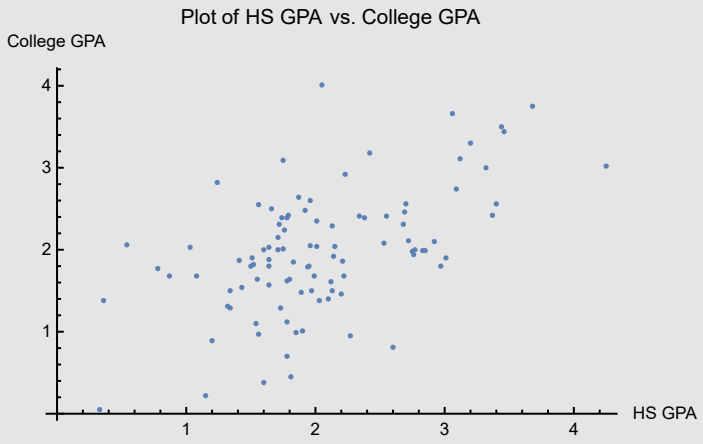
Out[ ]=



6. Plot hscollege as a graph with dots. Label the axes as shown in the graph below:

In[ ]:=
```
ListPlot[hscollege, PlotLabel → "Plot of HS GPA vs. College GPA",
 AxesLabel → {"HS GPA", "College GPA"}]
```

Out[ ]=



7. Perform a linear regression on the hscollege data set:

In[ ]:=
```
linearModel = LinearModelFit[hscollege, x, x];
linearModel["BestFit"]
```

Out[ ]=
```
0.822036 + 0.565491 x
```

8. Plot the original data points in hscollege with the line of best fit as an overlay:

In[ ]:=
```
Show[ListPlot[hscollege, PlotLabel → "Plot of HS GPA vs. College GPA",
  AxesLabel → {"HS GPA", "College GPA"}], Plot[linearModel["BestFit"], {x, 0, 5}]]
```

Out[ ]=