Introduction to Statistical Modeling: HW 01

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Submission Guidelines
Please follow these guidelines carefully when completing and submitting your homework. Clear and well-organized work helps ensure fair and accurate grading.

- Write your answers neatly and legibly.
- Circle or clearly mark your final answers so they can be easily found on the page.
- Do the problems in order (Problem 1 before Problem 2, etc.).
- Show all work for nontrivial calculations. Answers without supporting work may receive little or no credit.
- Do **not** write directly on the homework question pages. Use blank paper or a new page on your writing device to write your solutions.

Work that is excessively messy or difficult to follow may not receive full credit. Please take care to present your solutions clearly and logically.

Problem 1.1 - Factors and Levels

Employees at a dance club design a series of experiments with their sound system. They want to compare the sound quality of their new speakers with the previous speakers. They also want to examine any difference in sound quality between vinyl records, cassette tapes, and CDs. The employees repeatedly measure the sound quality of music in the dance club under the following conditions: New Speakers/Vinyl Record, New Speakers/Cassette Tape, New Speakers/CD, Old Speakers/Vinyl Record, Old Speakers/Cassette Tape, and Old Speakers/CD.

How many factors are there in this experiment? What are they? List the levels for each factor.

Problem 2.1 - Population and Sample

A historian is studying bronze church bells that were manufactured at Hammerhead Foundry in Pennsylvania during the 1840s. These bells have a reputation for being very loud, and he is interested in exactly how loud they are. He has accumulated a list of all such bells that are still in use, and will randomly select 15 of them to visit in person.

What is the population? What is the sample?

Problem 2.2 - Histogram and Shape

Refer to the story in the previous problem. The historian visits the 15 bells he randomly selected and measures their loudness in decibels (dB) when rung. The data are:

90.7	93.3	93.5	98.2	96.3
94.4	90.7	93.3	96.8	90.3
98.6	98.5	96.2	91.5	94.1

Draw a histogram using the following class intervals: [90, 92), [92, 94), [94, 96), ... etc. Other columns in your table should be frequency and relative frequency. Describe the histogram as right-skewed, left-skewed, or symmetric.

Problem 2.3 - Stem-and-Leaf Plots

Biologists are studying a woman who has given birth to twenty children (ten boys and ten girls). When each child reached 10 years of age, their height (in inches) was recorded:

Boys:
51.3, 52.8, 53.4, 53.5, 54.1, 54.6, 54.6, 55.2, 55.7, 55.8

Girls:
50.5, 51.0, 51.4, 52.7, 52.8, 53.1, 53.6, 54.4, 54.4, 55.3

Use this data to draw side-by-side stem-and-leaf plots. Have your stems be 50, 51, 52, 53, 54, 55. Describe the plots as right-skewed, left-skewed, or symmetric.

Problem 2.4 - Boxplot

A professor teaches a class with 51 students. The total possible points earned from homework, quizzes, and exams for the semester is 1000. At the end of the semester, the professor orders the data from least to greatest. For example, the student with the lowest point total is 64 and the student with the highest point total is 998.

1. 64	18. 659	35. 824
2. 365	19. 679	36. 831
3. 544	20. 686	37. 836
4. 564	21. 699	38. 844
5. 581	22. 701	39. 857
6. 582	23. 703	40. 861
7. 584	24. 704	41. 865
8. 605	25. 708	42. 868
9. 608	26. 718	43. 897
10. 612	27. 725	44. 901
11. 616	28. 726	45. 932
12. 622	29. 740	46. 941
13. 623	30. 755	47. 953
14. 628	31. 789	48. 954
15. 633	32. 796	49. 957
16. 647	33. 796	50. 985
17. 652	34. 811	51. 998

For the above data set, find the values of the Lower quartile (Q_1), median, upper quartile (Q_3), Interquartile range (IQR), Step, UIF, LIF, UOF, and LOF. *Note*: It is okay if any of the fence values are less than 0 or greater than 1000.

Use this information to draw a boxplot.

GOOD LUCK!