Math 121 **Test #1 Answers** **Spring 2010**

$(35, 58.5, 66.5, 73, 92)$, $\overline{x} = 66.4$.

1. (12 pts) $(2, 7.25, 10, 12, 12)$, $\overline{x} = 9.1$.

   (a) (4 pts) The null hypothesis is the status quo and it gets the benefit of the doubt.

   H_0 : The brakes are not prone to stick.

   H_1 : The brakes are prone to stick.

   (b) (4 pts) Because the p-value is less than the significance level, his decision is to reject H_0.

   (c) (2 pts) Yes. A Type I error is to reject H_0 when it is true.

   (d) (2 pts) No. A Type II error is to accept H_0 when it is false.

2. (15 pts) $(2, 6.25, 11, 12, 15)$, $\overline{x} = 9.2$.

   (a) (3 pts) The direction of extreme is to the right.

   (b) (6 pts) Use the morning class picture (H_0) for α. The rejection region includes 90 and 100. Their probability is $\frac{5}{21}$, which is α. Use the evening class picture (H_1) for β. The acceptance region includes 50 through 80. Their probability is $\frac{10}{21}$, which is β.

   (c) (3 pts) What is the p-value of her score of 80?Use the morning class picture, just as for α. The values at least as extreme as 80 are 80, 90, and 100. Their probability is $\frac{8}{21}$.

   (d) (3 pts) A Type I error would be to conclude that the student is from the evening class when, in fact, she is from the morning class.

3. (23 pts) $(8, 16, 17.5, 18, 23)$, $\overline{x} = 16.6$.

   (a) (3 pts) The sample consists of 662 African-American sixth- and seventh-graders from public middle schools in low-income communities.

   (b) (3 pts) The population is all African-American sixth- and seventh-graders from public middle schools in low-income communities, or you could just say all sixth- and seventh-graders.

   (c) (3 pts) There were several variables: which sex-education program were they given, whether they had sex within two years of the course, their age, and their gender.

   (d) (3 pts) All of the above variable except age are qualitative. Age is quantitative.

   (e) (4 pts) The study was experimental. The sex-education programs were administered to the students. Keep in mind that the response variable (in this case, whether they students had sex within two years) is never manipulated.

(f) (3 pts) The 47% figure is a statistic because it is a characteristic of the sample.

(g) (4 pts) Appropriate hypotheses are

H_0 : The abstinence-only program is just as effective as other sex-education programs.

H_1 : The abstinence-only program is just more effective than other sex-education programs.

In the alternative hypothesis, you could have said "less effective than" or "not equally as effective as."

4. (3 pts) $(0, 0, 1.5, 3, 3)$, $\overline{x} = 1.5$.

This would be a case of response bias. The wording of the question suggests that the respondent is expected to be angry.

5. (3 pts) $(0, 0, 3, 3, 3)$, $\overline{x} = 2.0$.

This would have been a case of selection bias. Not all likely voters would be equally likely to be chosen.

6. (25 pts) $(7, 12, 13.5, 16.75, 25)$, $\overline{x} = 14.7$.

(a) (8 pts) The stem-and-leaf display:

Stem	Leaf
0	4 5
1	0 1
2	0 0 8 5 0 5 0
3	8 0 0 5 5 0 8 0
4	8 0
5	0

(b) (3 pts) The shape is unimodel and symmetric.

(c) (3 pts) A pie chart would be inappropriate because these data are quantitative, not qualitative.

(d) (3 pts) Divide 22 by 4 and get 5.5. Therefore, depending on the starting value, the sample size will be either 5 or 6.

(e) (5 pts) Enter `124→rand` and press `ENTER`. Then enter `randInt(1,4)` and press `ENTER`. The result is 2. So choose members 2, 6, 10, 14, 18, 22. The sample is 2.0, 3.0, 1.0, 3.0, 0.5, 5.0.

(f) (3 pts) This is not a simple random sample because not all samples are equally likely. For example, the sample $\{1, 2, 3, 4\}$ is not possible by this method.

7. (10 pts) $(3, 7, 7.5, 10, 10)$, $\overline{x} = 7.9$.

   (a) (2 pts) Quantitative continuous.

   (b) (2 pts) Qualitative.

   (c) (2 pts) Qualitative. The ISBN is not recording the quantity of anything. It uses numbers merely as labels.

   (d) (2 pts) Quantitative discrete.

   (e) (2 pts) Quantitative continuous.

8. (9 pts) $(0, 3, 6, 8.75, 9)$, $\overline{x} = 5.5$.

   (a) (3 pts) Selection bias can be avoided by using a randomized design.

   (b) (3 pts) Response bias can be avoided by using a placebo, i.e., a single-blind design.

   (c) (3 pts) Experimenter bias can be avoided by using a double-blind design. The ones who record the observations do not know who was given the drug and who was given the placebo.