Math 121 **Test #1 Solutions** **Fall 2005**

Five-number summary: Min $= 38$, Q1 $= 67$, Median $= 78$, Q3 $= 84$, Max $= 99$.

1. (21 pts) $(3, 11, 12, 18, 21)$

   (a) The direction of extreme is to the right. In that direction, the values in Bag A become less likely while the values in Bag B become more likely.

   (b) $\alpha = \frac{1}{10}$. If the bag is Bag A, there is only a 1 in 10 chance that we will choose a voucher with value \$4 or more, leading to the wrong decision.

   (c) $\beta = \frac{3}{10}$. If the bag is Bag B, there are 3 vouchers worth less than \$4. If one of them is selected, then we will be led to the wrong decision.

   (d) p-value $= \frac{1}{10}$. There is only one voucher in Bag A whose value is at least as extreme as \$4.

   (e) p-value $= 0$. There is no voucher in Bag A whose value is at least as extreme as \$5.

   (f) If the voucher is worth \$3, we will accept H_0. Therefore, it is possible that we made a Type II error.

2. (6 pts) $(0, 3, 6, 6, 6)$ Here are five reasons:

   (a) People who are not watching the TV station at that time are systematically eliminated from the sample.

   (b) People without telephones are systematically eliminated from the sample.

   (c) Since responding to the poll requires motivation on the part of the respondent and costs money, people with strong feelings about the ordinance would be more likely to call.

   (d) Since responding costs money, poorer people would be less likely to call than richer people.

   (e) Some respondents may not be adults.

   Here are some wrong answers:

   (a) "Not all adults are surveyed." That is always the case when sampling from a population.

   (b) "Proponents and opponents were not equally represented." To represent them *equally* would be to set the outcome to 50-50, making the survey pointless.

3. (9 pts) $(1, 5, 8, 8, 9)$

   (a) Mr. Jones is using cluster sampling. He random selects the clusters, and then includes all members of the clusters in his sample.

(b) 2 rows will be selected out of 4 rows. Therefore, each row has a $\frac{2}{4}$ chance of being selected. Consequently, Emily has a $\frac{2}{4}$ chance of being in the sample.

(c) Enter `154→rand` and then `randInt(1,4)`. Hit `Enter` repeatedly and get 4 and 3. (You must hit `Enter` 3 times because the first value 4 was repeated.)

4. (12 pts) $(4, 8, 9, 12, 12)$

(a) The variable of interest is *whether* the student has ever downloaded music to his or her PC illegally.

(b) The variable is *qualitative*, i.e, not numerical.

(c) This calculation produces a *statistic* because it is a numerical value based on a sample, not the population.

(d) There might be *response* bias present because the students may feel there is a stigma to downloading music illegally.

5. (9 pts) $(3, 6, 7, 9, 9)$

(a) In this study he used *stratified* sampling.

(b) The variable is *the number of* varsity teams that the subject belongs to.

(c) The variable is *quantitative discrete*.

6. (18 pts) $(4, 14, 15, 18, 18)$

(a) H_0 is supported (because the test was *not* significant).

(b) A Type II error could have been committed, because the null hypothesis was accepted.

(c) The p-value must be greater than the significance level (5%), so a possible p-value is 10%.

(d) It was a *designed experiment* because the researchers administered Allegra to some subjects and the placebo to the others.

(e) The explanatory variable is the pill that was given to the subject (Allegra or placebo).

(f) The response variable is whether the subject reported feeling drowsy.

7. (12 pts) $(4, 10, 11, 12, 12)$

(a) A bar graph is more appropriate. The variable (country) is qualitative. For each category (country), the suicide rate was measured. That should be shown on the vertical scale.

To use a histogram (with a quantitative continuous scale), one would have to put the suicide rate on the horizontal scale and then the country (?!) on the vertical scale. That simply does not work.

(b) A pie chart is meant to show how much each category is of the whole. The percentages given are not part of a single whole.
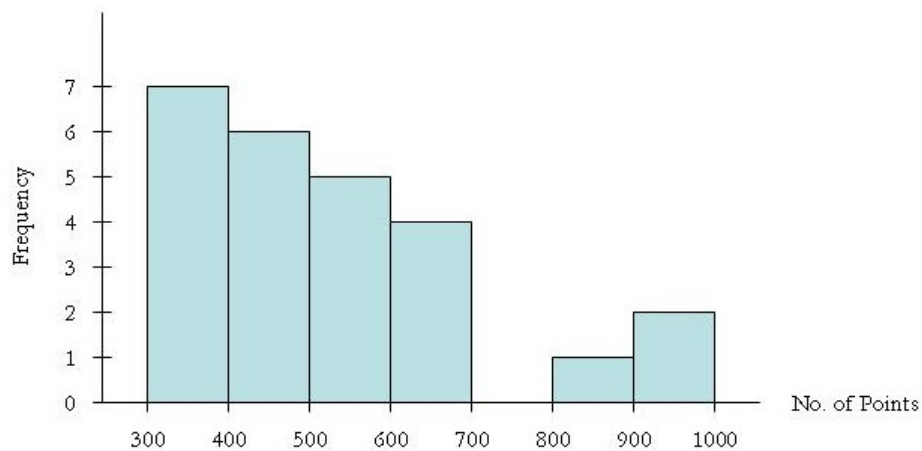
(c) The bar graph:
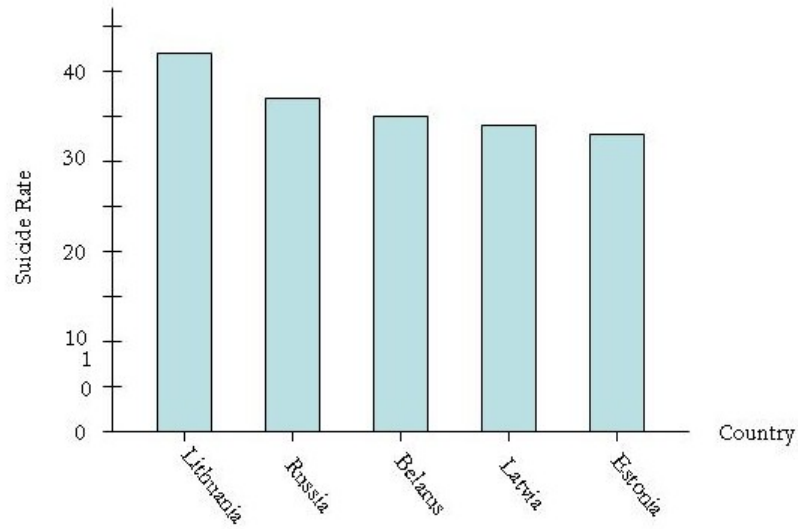
8. (13 pts) $(2, 7, 10, 12, 13)$

(a) The simplest choice is 300 - 390, 400 - 490, 500 - 590, 600 - 690, 700 - 790, 800 - 890, and 900 - 990. In the interval notation, they classes would be

$$[300, 390), [400, 490), [500, 590), [600, 690), [700, 790), [800, 890), [900, 990).$$

Other choices are possible.

(b) The histogram:

(c) The shape is unimodal and skewed to the right.