Math 121 **Test #1** **Spring 2007**

Grade distribution: $(52, 67, 80, 87, 93), \overline{x} = 76.9$.

1. (20 pts) $(6, 12.75, 16.5, 19, 20), \overline{x} = 15.3$.

   (a) (6 pts) Everyone had this correct.

   (b) (2 pts) The direction of extreme is to the left. That is the direction in which the values under H_0 become less likely and the values under H_1 become more likely.

   (c) (4 pts) There are 5 vouchers in Envelope A that are at least as extreme as \$20. So $\alpha = 5/25 = 0.2$.

   (d) (4 pts) To find β, look the distribution in Envelope B and count the number of vouchers in the acceptance region (\$30, \$40, and \$50). We find there are 6. So $\beta = 6/15 = 0.4$.

   (e) In this situation, a Type I error would be to conclude that we drew from Envelope B when in fact we had drawn from Envelope A.

   (f) (4 pts) Compute the p-value in the same manner as α. In Envelope A, there are 10 vouchers whose value is at least as extreme as \$30. So p-value $= 10/25 = 0.4$.

2. (6 pts) $(2, 4, 5.5, 6, 8), \overline{x} = 5.0$.

   In each case, the null hypothesis should be the statement that requires no special assumptions or evidence.

   (a) The null hypothesis should be the statement "The deceased died of natural causes."

   (b) The null hypothesis should be the statement "Coffee made with filtered water tastes the same as coffee made with tap water."

   (c) The null hypothesis should be the statement "Putting a 'deer whistle' on the front of a car will not prevent collisions with deer." Before we are convinced that a deer whistle works, we should require a fair amount of supporting evidence.

3. (26 pts) $(16, 19, 20, 24.25, 26), \overline{x} = 21.2$.

   (a) (3 pts) The sample consisted of 23,681 healthy Greek adults.

   (b) (4 pts) The explanatory variable is whether the person napped for about half an hour at least three times a week. The response variable is whether the person suffered a heart attack (during the next 6 years).

   (c) (4 pts) It appears to be an *observational* study. They did not tell who to take a nap and who not to take a nap. They let people take naps if they wanted to.

(d) (3 pts) It appears to be *prospective*. They started with individuals taking or not taking naps and then waited to see who had a heart attack. They could not have divided the sample according to who had a heart attack because that variable had not yet been observed.

(e) (3 pts) Three other variables which were taken into account are the person's diet, amount of exercise, and whether he smoked.

(f) (3 pts) Previous studies did not take into account the subject's health. Some unhealthy people took naps *because* they were unhealthy, and then went on to have a heart attack *because* they were unhealthy. So the heart attack had nothing to do with taking a nap.

(g) (3 pts) These numbers are *statistics*.

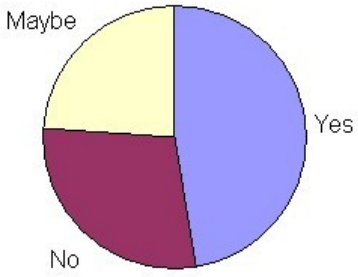
(h) (3 pts) The statement indicates that the data for women were statistically insignificant.

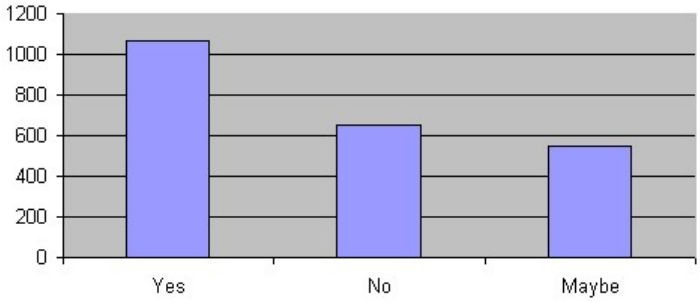
4. (14 pts) $(6, 9.75, 10, 11.25, 14), \overline{x} = 10.2$.

(a) (4 pts) This is a volunteer sample. In volunteer samples, people with strong opinions are more likely to respond. Therefore, they are overrepresented in the sample.

(b) (4 pts) The data are qualitative, so the best choice of statistic is a proportion or percentage. The value is $1069/2263 = 0.4724$.

(c) (6 pts) (Generated by Excel)





5. (10 pts) $(3, 6.75, 9, 10, 10), \overline{x} = 8.4$.

(a) (4 pts) Label the members of the population with the labels 1 through 1100. Then evaluate randInt(1,1100) 100 times on the TI-83. If you get repetitions, then evaluate again until you have 100 different numbers. The individuals with those labels will be in the sample.

(b) (3 pts) Enter `121` → `rand` to set the seed. then enter `randInt(1,1100)` and press `ENTER` 5 times. You should get the values 235, 621, 296, 855, and 99.

(c) (3 pts) This would be a *stratified* sample. He is taking a simple random sample from each of the 4 groups.

6. (6 pts) $(0, 2.5, 3.5, 6, 6), \overline{x} = 3.6$.

   (a) (3 pts) To find k, divide the population size by the sample size: $1100/100 = 11$, so $k = 11$.

   (b) (3 pts) Set the seed to 262. Then use `randInt(1,11)` to select a random integer in the first block of 11. That random number turns out to be 4. Then count off by 11s for the first 5 numbers: 4, 15, 26, 37, 48.

7. (12 pts) $(4, 7.75, 9.5, 10, 12), \overline{x} = 9.0$.

   (a) (4 pts) There are three level of fat content and three levels of temperature and 10 hamburgers at each combination. So the total number is $3 \times 3 \times 10 = 90$.

   (b) This is an *experiment*. They are manipulating the values of the explanatory variables (fat content, temperature).

   (c) (4 pts) This would be *response* bias. If a person is averse to eating fat, then he might say that the high-fat hamburger didn't taste good when it really did. Similarly for people who shun low-fat food.

   (d) (4 pts) This would be *selection* bias. The researchers are systematically selecting from a subset of the population that may not (probably is not) representative of the whole population.

8. (6 pts) $(3, 4, 4, 6, 6), \overline{x} = 4.5$.

   Identify each of the following variables as (i) qualitative, (ii) quantitative discrete, or (iii) quantitative continuous.

   (a) (2 pts) Time is continuous so this variable is quantitative continuous.

   (b) (2 pts) The responses are "yes" or "no," so the variable is qualitative.

   (c) (2 pts) The numbers 1 through 5 are used only as labels. "5" does not represent 5 of anything. So this variable is qualitative.