STAT 2509 B

Assignment #1

(Review of STAT 2507)

DUE: January 18th, 2012 (to be handed in during the class)

1. a) What are the important differences between a ***parameter*** and a ***statistic***?

b) Explain the difference between a ***population*** and a ***sample***.

2. Identify the following variables as : "*categorical (or qualitative)*", "*categorical and ranked*", "*quantitative and discrete*" or "*quantitative and continuous*".

a) average daily temperature during the month of January
b) province in which a person lives
c) number of passengers on a train from Ottawa to Toronto
d) rating of a newly elected politician (excellent, good, fair, poor)
e) the winning time for a horse running at the racetrack
f) letter grade obtained on a statistics test
g) number of children in grade 5 who are reading at or above grade level

3. Classify each of the following quantities as either a "*parameter*" or a "*statistic*":

(i) $\bar{x}$ (ii) σ^2 (iii) μ (iv) s^2 (v) β_1 (vi) $\hat{\beta}_1$

4. For any hypothesis test:

a) Explain what the null and alternative hypotheses are.
b) What are the two types of error that may be made?

5. If k is a constant and X and Y are random variables, then

a) (i) E(k)=?, (ii) E(kX)=?, (iii) E($X\pm Y$)=?
b) (i) V(k)=?, (ii) V(kX)=?, (iii) V($X\pm Y$)=? Show what happens when X and Y are independent of each other?

6. Find the following values from the tables:

a) $z_{0.3015}$ b) $z_{0.6985}$ c) $z_{0.002}$ d) $t_{11;0.05}$ e) $-t_{11;0.05}$ f) $t_{11;0.95}$

7. Consider a normal population distribution with the value of σ known.

a) What is the confidence level for the interval

(i) $\bar{x} \pm 1.96\,\sigma/\sqrt{n}$ (ii) $\bar{x} \pm 2.24\,\sigma/\sqrt{n}$ (iii) $\bar{x} \pm 3.09\,\sigma/\sqrt{n}$

b) What value of z in the confidence interval formula

$$\left(\bar{x} - z_{\alpha/2}\,\sigma/\sqrt{n}, \bar{x} + z_{\alpha/2}\,\sigma/\sqrt{n}\right)$$

results in a confidence level of

(i) 89.68% (ii) 99.20% (iii) 75.40%

8. Given that the sample variance is defined by

$$s^2 = \frac{1}{(n-1)} \sum_{i=1}^{n} (x_i - \bar{x})^2$$

where $x_1, \ldots, x_n$ is a sample, $\bar{x}$ the sample mean. Show that

$$s^2 = \frac{1}{(n-1)} \left(\sum_{i=1}^{n} x_i^2 - \frac{\left(\sum_{i=1}^{n} x_i \right)^2}{n} \right).$$