Biostatistics HW 7

1. Use Z table and find the values of $p = \Pr(Z > k)$
   (1) If $\Pr(Z > k) = 0.2$, k=?
   (2) If $\Pr(Z > k) = 0.1$, k=?
   (3) If $\Pr(Z > k) = 0.05$, k=?
   (4) If $\Pr(Z \leq k) = 0.2$, k=?
   (5) If $\Pr(Z \leq k) = 0.1$, k=?
   (6) If $\Pr(Z \leq k) = 0.05$, k=?

2. Deer mice are small rodents native to North America. Their body lengths (excluding tail) are known to vary approximately Normally with mean $\mu = 86$ mm and standard deviation $\sigma = 8$ mm. Deer mice are found in diverse habitats and exhibit different adaptations to their environment. A random sample of 14 deer mice in a rich forest habitat gives an average body length of $\bar{x} = 91.1$ mm. Assume that the standard deviation σ of all deer mice in this area is also 8 mm.
   (a) What is the standard deviation of the mean length of $\bar{x}$?
   (b) What critical value do you need to use in order to compute a 95% confidence interval for the mean μ?
   (c) Give a 95% confidence interval for the mean body length of all deer mice in the forest habitat.

3. The 14 deer mice described in the previous exercise had average body length of $\bar{x}=91.1$ mm. Assume that the standard deviation of body length in the population of all deer mice in the forest habitat is the same as the $\sigma=8$ mm for the general deer mouse population.
   (a) Following your approach in the previous exercise, now give a 90% confidence interval for the mean body length of all deer mice in the forest habitat.
   (b) This confidence interval is shorter than your interval in the previous exercise, even though the intervals come from the same sample. Why does the second interval have a smaller margin of error?

4. You are planning a survey of starting salaries for recent marketing majors. In 2005, the average starting salary was reported to be $38000 (美金).

Assuming the standard deviation for this study is $10,500.

What sample size do you need to have a margin of error equal to $900 with 95% confidence?

5. Finding critical t* values.
What critical value t* from T-Table should be used to construct
(a) a 95% confidence interval when n = 12?
(b) a 99% confidence interval when n = 24?
(c) a 90% confidence interval when n = 200?

Note: $\Pr(T_{df} > t^*) = \alpha / 2$, where $(1-\alpha)100\%$ is the confidence level.

6. 做 (a) (c)

Perceived organizational skills. In a study of children with attention deficit hyperactivity disorder (ADHD), parents were asked to rate their child on a variety of items related to how well their child performs different tasks.[11] One item was "Has difficulty organizing work," rated on a five-point scale of 0 to 4 with 0 corresponding to "not at all" and 4 corresponding to "very much." The mean rating for 282 boys with ADHD was reported as 2.22 with a standard deviation of 1.03.

(a) Do you think that these data are Normally distributed? Explain why or why not.

(b) Is it appropriate to use the methods of this section to compute a 99% confidence interval? Explain why or why not.

(c) Find the 99% margin of error and the corresponding confidence interval. Write a sentence explaining the interval and the meaning of the 99% confidence level.

Note: (b) 本來 five-point scale 0-4 不適宜用 t 分配 (因為 t 分配需要 normal 假設), 但是 n = 282 樣本大, 所以 t confidence interval 仍可以做為近似