Homework Set 4 Solutions

MAT 203, Elementary Statistics, Term IV — Dowman P. Varn, Instructor
Coker College — Due: 07 April 2009

Homework Policy: The point of homework is to learn by doing. I have no problem if you work in groups, use the internet or use human resources to help you complete the assignment. I do ask that you not copy someone else's homework. Please do all the mathematics yourself. By submitting your homework, you implicitly signify that it is your own. This assignment is due at the beginning of class on 07 April 2009.

1. Larson & Farber, problem 23, p. 249. Find the area under the standard normal curve to the left of $z = 1.96$.

The area to the left is just that area over the interval $(-\infty, 1.96)$. Using `normalcdf(-100, 1.96)` on the TI-83, we find the area is 0.975.

2. Larson & Farber, problem 13, p. 257. A survey was conducted to measure the height of U.S. men. In the survey, respondents were grouped by age. In the 20-29 age group, the heights were normally distributed, with a mean of 69.9 inches, and a standard deviation of 3.0 inches. A study participant is randomly selected. (a) Find the probability that his height is less than 66 inches. (b) Find the probability that his height is between 66 and 72 inches. (c) Find the probability that his height is more than 72 inches.

(a) We need to find the z-value that corresponds to 66 inches for this distribution. Recall, $z = \frac{x-\mu}{\sigma}$. Identifying $\mu = 69.6$ inches, $\sigma = 3.0$ inches, and $x = 66$ inches, we find $z = \frac{x-\mu}{\sigma} = \frac{66-69.6}{3.0} = \frac{-3.6}{3.0} = -1.2$. The probability is just the area under the normal curve over this interval, so $P =$ `normalcdf(-100, -1.2)` $= 0.115$.

(b) Now we need the z-value for 72 inches. $z = \frac{x-\mu}{\sigma} = \frac{72-69.6}{3.0} = \frac{2.4}{3.0} = 0.8$. So, $P =$ `normalcdf(-1.2, 0.8)` $= 0.673$.

(c) $P =$ `normalcdf(0.8, 100)` $= 0.212$.

3. Larson & Farber, problem 39, p. 267. In a survey of women in the United States (ages 20-29), the mean height was 64.1 inches with a standard deviation of 2.71 inches. (a) What height represents the 95th percentile? (b) What height represents the first quartile?

(a) This is most easily found using the `invNorm` function on the TI-83. Identifying $\mu = 64.1$ inches and $\sigma = 2.71$ inches, we find, `invNorm(0.95, 64.1, 2.71)` $= 68.6$ inches.

(b) Similarly, for the 25th percentile, `invNorm(0.25, 64.1, 2.71)` $= 62.3$ inches.

4. Larson & Farber, problem 20, p. 280. The mean age of employees at a large corporation is 47.2 years, with a standard deviation of 3.6 years. Random samples of size 36 are drawn from this population and the mean of each sample is determined. Use the Central Limit Theorem to find the mean and the standard error of the mean. Sketch a graph of the sampling distribution.

(a) The mean of the means of the sampling distributions is the same as that of the population, so $\mu_{\bar{x}} = \mu = 47.2$ years.

(b) The standard error of the mean is just $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{3.6}{\sqrt{36}} = 0.6$ years.

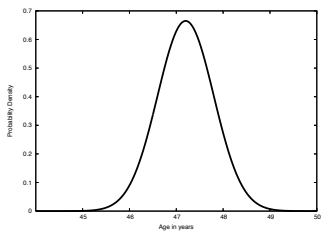

Figure 1: A graph of the Sampling Distribution