

Probability and Statistics in Engineering, Fall 2016

Exercise#8

1. An electrical firm manufactures light bulbs that have a length of life that is approximately normally distributed with a standard deviation of 40 hours. If a sample of 30 bulbs has an average life of 780 hours, find a 96% confidence interval for the population mean of all bulbs produced by this firm.

Sol:

$n = 30$, $\bar{x} = 780$, and $\sigma = 40$. Also, $z_{0.02} = 2.054$. So, a 96% confidence interval for the population mean can be calculated as

$$780 - (2.054)(40/\sqrt{30}) < \mu < 780 + (2.054)(40/\sqrt{30}),$$

or $765 < \mu < 795$.

2. The heights of a random sample of 50 college students showed a mean of 174.5 centimeters and a standard deviation of 6.9 centimeters.
 - (a) Construct a 98% confidence interval for the mean height of all college students.
 - (b) What can we assert, with 98% confidence, about the possible size of our error if we estimate the mean height of all college students to be 174.5 centimeters?

Sol:

$n = 50$, $\bar{x} = 174.5$, $\sigma = 6.9$, and $z_{0.01} = 2.33$.

- (a) A 98% confidence interval for the population mean is
 $174.5 - (2.33)(6.9/\sqrt{50}) < \mu < 174.5 + (2.33)(6.9/\sqrt{50})$, or $172.23 < \mu < 176.77$.
- (b) $e < (2.33)(6.9)/\sqrt{50} = 2.27$.