

Answer on Question #63240 – Math – Statistics and Probability

Question

The Raid test kitchen. According to scientists, the cockroach has had 300 million years to develop a resistance to destruction. In a study conducted by researchers for S. C. Johnson & Son, Inc. (manufacturers of Raid® and Off®), 5,000 roaches (the expected number in a roach-infested house) were released in the Raid test kitchen. One week later, the kitchen was fumigated and 16,298 dead roaches were counted, a gain of 11,298 roaches for the 1-week period. Assume that none of the original roaches died during the 1-week period and that the standard deviation of x , the number of roaches produced per roach in a 1-week period, is 1.5. Use the number of roaches produced by the sample of 5,000 roaches to find a 95% confidence interval for the mean number of roaches produced per week for each roach in a typical roach-infested house.

Solution

It is given that

$$\sigma = 1.5.$$

If we assume that none of the original roaches died during the 1-week period all 16,298 dead roaches were produced by the sample of 5,000.

$$\bar{x} = \frac{16,298}{5,000} = 3.2596.$$

A 95% confidence interval for the mean number of roaches produced per week for each roach in a typical roach-infested house is

$$CI = \left(\bar{x} - z^* \frac{\sigma}{\sqrt{n}}; \bar{x} + z^* \frac{\sigma}{\sqrt{n}} \right),$$

where $z^* = 1.96$ for 95% confidence level.

$$CI = \left(3.2596 - 1.96 \frac{1.5}{\sqrt{5000}}; 3.2596 + 1.96 \frac{1.5}{\sqrt{5000}} \right) = (3.2180; 3.3012).$$

Answer: (3.2180; 3.3012).