Statistics

Homework 4 – Confidence Intervals

Abraham Murciano

April 22, 2020

1. The lifetime of a certain device is a random variable X which is distributed normally with a standard deviation of $\sigma = 3$. Five devices were checked and found to have an average life of $\bar{x} = 30$.

   (a) We are to find a 90% confidence interval for the lifetime of this device. Since $1 - \alpha = 0.9$, we have $\alpha = 0.1$. We can use the following formula.

   $$P\left(\bar{x} - z_{1-\frac{\alpha}{2}} \cdot \frac{\sigma}{\sqrt{n}} < \mu < \bar{x} + z_{1-\frac{\alpha}{2}} \cdot \frac{\sigma}{\sqrt{n}}\right) = 1 - \alpha$$
   $$P\left(30 - z_{0.95} \cdot \frac{3}{\sqrt{5}} < \mu < 30 + z_{0.95} \cdot \frac{3}{\sqrt{5}}\right) = 0.9$$
   $$P\left(30 - 2.575 \cdot \frac{3}{\sqrt{5}} < \mu < 30 + 2.575 \cdot \frac{3}{\sqrt{5}}\right) = 0.9$$
   $$P\left(26.545 < \mu < 33.455\right) = 0.9$$

   Therefore the confidence interval is $(26.545, 33.455)$.

   (b)

3.

4.

5.

8.

9.

13.