Answer on Question #51193 – Math – Statistics and Probability

An investigator wants to estimate the mean number of days since the onset of diabetes in diabetic patients. The investigator wants to be 95% confident that the sample estimate will be within 7 days of the true mean. The standard deviation is known to be 70 days. What sample size would be required?

Solution:

In given problem we want to be 95% confident that our estimate is within 7 days of μ. In terms of the margin of error ME, the Confidence interval for μ can be expressed as:

$$\bar{x} \pm ME$$

The Confidence interval for μ is

$$\bar{x} \pm z\left(\frac{S}{\sqrt{n}}\right)$$

Thus the ME is equal

$$ME = z\frac{s}{\sqrt{n}}$$

Where ME is the desired margin of error
z is the z-score that we use to calculate the confidence interval, that depends on both the degrees of freedom and the desired confidence level,
s is the standard deviation,
n is the sample size we want to find.

From the noted above formula we can find determine the value of n.

$$n = \left(\frac{z \cdot S}{ME}\right)^2$$

Where n = sample size, z-value will be 1.96 using a z-table to represent the 95% confidence interval, standard deviation = 70, ME = 7 days.

Now we can substitute the given values into the formula.

$$n = \left(\frac{1.96 \cdot 70}{7}\right)^2 = 384.16$$

Thus, the sample size would be required 384 days in order to satisfy the given condition of the task.