

Answer on Question #54875 – Math – Statistics and Probability

A normal population has a mean of 0.1 and standard deviation 2.1. Find the probability that the mean of a sample of size 900 will be negative.

Solution

In accordance with the given problem, we have the following data:

$\mu = 0.1, \sigma = 2.1$ and $n = 900$. It is known that $x \sim M(\mu, \sigma^2)$ and $z \sim N(0,1)$,

Where z equal to

$$z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$$

Thus, we can substitute the given values into the noted above formula:

$$z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}} = \frac{\bar{x} - 0.1}{\frac{2.1}{\sqrt{900}}} = \frac{\bar{x} - 0.1}{0.07}$$

Then,

$$P(\bar{x} < 0) = P(0.1 + 0.07z < 0)$$

$$P(\bar{x} < 0) = P(z < \frac{-0.1}{0.07})$$

Simplify the obtained fraction:

$$P(\bar{x} < 0) = P(z < -1.429)$$

$$P(z > 1.429) = 0.5 - P(0 < z < 1.43)$$

$$P(z > 1.429) = 0.5 - 0.4236 = 0.0764$$

Thus, we can conclude the probability that the mean of a sample of size 900 will be negative is 0.0764.