Answer on Question #67848 – Math – Statistics and Probability

Question

Suppose that the weight distribution of monitor lizards is normal, with 10% of all monitor lizards having a weight of more than 10.6340 kg and 5% having a weight of less than 9.7565 kg. Find the mean and standard deviation of the weight distribution.

Solution

Let X be a random variable which corresponds to the weight distribution of monitor lizards. We have that

$$P\{X > 10.6340\} = \frac{10}{100} = 0.1$$

and

$$P\{X < 9.7565\} = \frac{5}{100} = 0.05.$$

If X is normally distributed with the mean μ and the variance σ^2, then $\frac{X-\mu}{\sigma}$ has the standard normal distribution.

Therefore,

$$P\{X > 10.6340\} = P\left\{\frac{X-\mu}{\sigma} > \frac{10.6340-\mu}{\sigma}\right\} = 0.1$$

and

$$P\{X < 9.7565\} = P\left\{\frac{X-\mu}{\sigma} < \frac{9.7565-\mu}{\sigma}\right\} = 0.05.$$

By Excel we get that

$$\frac{10.6340-\mu}{\sigma} = 1.2816$$

and

$$\frac{9.7565-\mu}{\sigma} = -1.6449.$$

In order to find μ and σ we have to solve the system of linear equations

$$\begin{cases} 10.6340 - \mu = 1.2816\,\sigma, \\ 9.7565 - \mu = -1.6449\,\sigma. \end{cases}$$

Hence $\mu = 10.2498$ and $\sigma = 0.2998$.

Answer: the mean is $\mu = 10.2498$ and the standard deviation is $\sigma = 0.2998$.