

Answer on Question #63200 – Math – Statistics and Probability

Question

Shell lengths of sea turtles. Refer to the Aquatic Biology (Vol. 9, 2010) study of green sea turtles inhabiting the Grand Cayman South Sound lagoon, Exercise 2.83 (p. 65). Research shows that the curved carapace (shell) lengths of these turtles has a distribution with mean

$\mu = 50$ cm and standard deviation $\sigma = 10$ cm. In the study, $n = 76$ green sea turtles were captured from the lagoon; the mean shell length for the sample was $= 55.5$ cm. How likely is it to observe a sample mean of 55.5 cm or larger?

Solution

Since the sample is large, the central limit theorem can be applied.

The mean of the sampling distribution of sample means:

$$\mu_{\bar{x}} = \mu = 50.$$

The standard error of the sampling distribution of sample means:

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}};$$

$$\sigma_{\bar{x}} = \frac{10}{\sqrt{76}} = 1.147.$$

$$z = \frac{\bar{x} - \mu_{\bar{x}}}{\sigma_{\bar{x}}};$$

$$z = \frac{55.5 - 50}{1.147} = 4.795.$$

$$P(\bar{x} > 55.5) = P(z > 4.795) = 1 - P(z < 4.795)$$

The probability value associated with the calculated z-score can be either obtained from the standard normal table, or calculated using the technology (MS Excel function NORM.S.DIST()).

$$P(z < 4.795) = 1;$$

$$P(\bar{x} > 55.5) = 1 - 1 = 0.$$

Answer: it is nearly impossible to obtain a sample of 76 turtles with the sample mean of 55.5 cm or larger.