Basic Stat Vocabulary

Define the following terms, in your own words:

1. Population
2. Sample
3. Random Sample
4. Mean ($\mu$)
5. Variance ($\sigma^2$)
6. Standard Deviation ($\sigma$)

What is Normal, Anyway?

The normal distribution is one of the most important distributions occurring variables and one of the most widely used in statistics. The normal distribution is a continuous, symmetrical distribution with a bell-shaped curve that is bell-shaped and symmetrical about the mean. The mean, median, and mode are all equal in a normal distribution. The area under the curve is equal to 1, and the total probability is 1. The probability density function is given by

$$f(x) = \frac{1}{\sigma \sqrt{2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$$

The Normal Curve

The Normal Curve

- The curve is symmetrically placed about the mean.
- The mean, median, and mode are all equal.
- The area under the curve represents the total probability, which is 1.
- The Empirical Rule states that about 68% of the data lies within one standard deviation of the mean, 95% of the data lies within two standard deviations of the mean, and 99.7% of the data lies within three standard deviations of the mean.

Example

The weights of Kemp’s ridley (Lepidochelys kempii) sea turtles observed off the coast of Florida are normally distributed with a mean of 45 kg and a standard deviation of 4 kg. A turtle is chosen at random. Find the probability that it weighs less than 37 kg.

Using the mean and standard deviation of the data, we can standardize the normal distribution by finding the normal deviate, or $z$-score, in each situation. This is done through the formula:

$$z = \frac{x - \mu}{\sigma}$$

Set the mean to 45 kg and each 1 unit of the $x$-axis is 4 kg standard deviation.

Example

The lengths of adult Loggerhead sea turtle shells follow a normal distribution. It is known that 20% of these turtle shells have a length less than 85 cm and 10% have a length greater than 103 cm. Find the value of the mean $\mu$ and the standard deviation $\sigma$.

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Set the mean to 85 cm and each 1 unit of the $x$-axis is 1 standard deviation.

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Set the mean to 45 kg and each 1 unit of the $x$-axis is 4 kg standard deviation. Shade the region of the curve that represents this probability.